AI TECHNIQUES IN POWER SYSTEMS

PE-IV:EPS								
Course Code	**Category**	**Hours / Week**			**Credits**	**Maximum Marks**		
BPSC19	**Core**	**L**	**T**	**P**	**C**	**CIE**	**SEE**	**Total**
		3	0	0	3	30	70	100
Contact Classes: 45	**Total Tutorials: Nil**	**Total Practical Classes: Nil**				**Total Classes: 45**		

I. COURSE OVERVIEW:

This course introduces the differences between conventional power system and restructured power system. The course provides restructuring experiences of different countries with special focus on Indian power system. It elaborates the design of power markets, market architectural aspects, changes in operational aspects with new operational challenges like congestion management. It provides an insight to develop economically efficient power system.

II. COURSE OBJECTIVES:

The students will try to learn:

I. The role of the different types of organizations that operate in the various market structures
II. The consumer and supplier behavior, various components of production cost and tariff setting principles.
III. The deregulation of various power systems and the methods of congestion management.
IV. The pricing mechanism and power exchange in Indian power market.

III. COURSE OUTCOMES:

After successful completion of the course, students will be able to:		
CO 1	**Understand** the concepts of biological foundations of artificial neural networks for learning techniques	Understand
CO 2	**Analyze** the associative models in neural networks for correlations between data cases in the space of models.	Analyze
CO 3	**Identify** the neural networks control schemes for closed-loop performance in terms of small tracking errors and bounded controls.	Apply
CO 4	**Evaluate** fuzzy logic and its controllersforfuzzy rule base, data base and inference engine.	Evaluate
CO 5	**Analyze** the knowledge of genetic algorithm for for solving both constrained and unconstrained optimization problems	Analyze
CO 6	**Develop** applications of AI Techniques in electrical engineering for power generation, control, and transmission devices used by electric utilities.	Apply

IV. SYLLABUS

MODULE –I: OVERVIEW OF RESTRUCTURED POWER SYSTEM (09)

Regulation and deregulation, vertically integrated and deregulated power industry, market models, Market Clearing Price (MCP), Independent System Operator (ISO), role of ISO, Ancillary service management, deregulation in Power Industry (Technical and Economic Issues).

MODULE –II: ECONOMIC CONSIDERATIONS IN RESTRUCTURED POWER SYSTEM (09)

Introduction, Consumer and Supplier behavior, Demand elasticity, Supply elasticity, Short-run and Long-run costs, various costs of production. Electricity pricing: Electricity pricing in generation, transmission and distribution, Introduction to Marginal cost, opportunity Costs, Dynamic pricing mechanism (ABT), Price elasticity of demand, Tariff setting principles, Distribution tariff for HT and LT consumers.

MODULE –III: GLOBAL AND INDIAN MODELS OF RESTRUCTURED POWER SYSTEM (10)

Global models of restructured power system: Market evolution and deregulation in UK, USA, South America, Nordic pool, China, PJM ISO, and New York market.

Indian power market evolution: Electricity Act 2003 and various national policies and guidelines, Ministry of Power, Role of CEA, CERC, state ERC, load dispatch centers etc., implications of ABT tariff on Indian power sector, introduction to Indian power exchange.

MODULE –IV: TRANSMISSION PRICING AND CONGESTION MANAGEMENT (08)

Transmission price components, various transmission pricing mechanisms, tracing of power, network usage and loss allocation; Introduction to congestion in transmission network, methods of congestion management.

MODULE –V: OASIS (09)

Introduction of OASIS, Structure of OASIS, Pooling of information, transfer capability on OASIS and various concepts like ATC, TTC, TRM, and CBM.

V. Text Books:

1. Mohammad Shahidehpour, MuwaffaqAlomoush, "Restructured electrical power systems: operation, trading and volatility", Marcel Dekker. 2nd Edition, 1998.
2. Prayas Energy Group, Pune,"Know Your Power", A citizens Primer on the Electricity Sector, 2nd Edition, 2002.

VI. Reference Books:

1. Daniel Kirschen, GoranStrbac, "Fundamentals of Power System Economics", John Wiely& Sons Ltd. 2004
2. Kankar Bhattacharya, Jaap E Daadler, Math H J Boolen, "Operation of restructured power systems", Kluwer Academic Pub., 1st Edition, 2001.
3. Steven Stoft, "Power system economics: designing markets for electricity", John Wiley and Sons, 1st Edition, 2002.
4. Sally Hunt, "Making competition work in electricity", John Wiely& Sons, Inc., 1st Edition, 2002
5. Loi Lei Lai, "Power System Restructuring and Deregulation" John Wiley and Sons, 1st Edition, 2001.

VII. Web References:

3. https://www.nptel.ac.in/courses/108101005
4. https://epdf.tips/restructured-electrical-power-systems-power.

VIII. E-Text Books:

1. shodhganga.inflibnet.ac.in/bitstream/10603/17295/13/13_chapter3.**pdf**