

AI TECHNIQUES IN POWER SYSTEMS

PEC-IV: EPS								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
BPSB16	Elective	L	T	P	C	CIA	SEE	Total
		3	-	-	3	30	70	100
Contact Classes: 45	Tutorial Classes: Nil	Practical Classes: Nil			Total Classes: 45			
I. COURSEOVERVIEW:								
<p>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.</p>								
II.COURSE OBJECTIVES:								
The course should enable the students to:								
I. Learn the basic knowledge regarding activation function, learning rules and various neuralnetworks.								
II. Understand the knowledge of crisp set, fuzzy set and fuzzy logiccontrollers								
III. Apply the genetic algorithms in the tuning ofcontrollers.								
IV. Design controllers using simulation software fuzzy logic toolbox & NNtoolbox.								
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 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:								
UNIT-I	NEURAL NETWORKS						Classes: 09	
Neural Networks: biological neurons, Artificial neurons, activation function, learning rules, feed forward networks, supervised and unsupervised learning, Perceptron network, linear separability, back propagation networks algorithms, radial basis function networks.								
UNIT-II	ASSOCIATIVE MODELS AND CONTROL SCHEMES IN NN						Classes: 09	
Auto & hetero associative memory, bi-directional associative memory, self organizing feature maps, Hopfield networks, Neural networks for non -linear system, schemes of Neuro control, system identification, forward model and, inverse model, case studies.								

UNIT-III	FUZZY LOGIC AND ITS CONTROLLERS	Classes: 09
<p>Fuzzy set: Crisp set, vagueness, uncertainty and imprecision, fuzzy set, fuzzy operation, properties.</p> <p>Crisp versus fuzzy relations, fuzzy relations, fuzzy Cartesian product and composition, composition of fuzzy relations Fuzzy to crisp conversion, structure of fuzzy logic controller, database, rule base, inference engine.</p>		
UNIT-IV	GENETIC ALGORITHMS	Classes: 09
<p>Genetic Algorithms (GA): Working principles, terminology, importance of mutation, comparison with traditional methods, constraints and penalty function, GA operators, real coded GAs.</p>		
UNIT-V	APPLICATIONS OF AI TECHNIQUES	Classes: 09
<p>Applications of neural network, fuzzy system, genetic algorithms for power systems and power electronics systems- designing of controllers using simulation software, NN tool box & fuzzy logic toolbox.</p>		
Text Books:		
<ol style="list-style-type: none"> 1. Jack M.Zurada, "Introduction to Artificial Neural Systems", Jaico publishing house 1st Edition,2006 2. Simon Haykin, "Neural Networks – A comprehensive foundation", Pearson Education Asia, 1st Edition,2002 		
Reference Books:		
<ol style="list-style-type: none"> 1. Timothy J. Ross, "Fuzzy Logic with Engineering Applications", McGraw Hill International Edition, USA, 1st Edition, 1997. 2. Awrence Fausatt, "Fundamentals of neural networks", Prentice Hall of India, New Delhi, 1st Edition, 1994. 3. Bart kosko, "Neural Networks and Fuzzy Systems", Prentice Hall of India, New Delhi, 1st Edition, 1994. 4. Zimmerman H.J., "Fuzzy set theory – and its applications", Kluwer Academic Publishers, 1st Edition, 1994. 5. Kalyanmoy Deb, "Optimization for Engineering Design", prentice hall of India first edition, 2nd Edition, 1988. 6. David E Goldberg, "Genetic Algorithms in search, optimization and machine learning", Pearson Education, 1st Edition,2009. 7. Driankov, Dimitra, "An Introduction to Fuzzy Control", Narosa Publication, 1st Edition,1998. 8. Golding, "Genetic Algorithms", Addison-Wesley Publishing Com, 1st Edition,2002. 		
Web References:		
<ol style="list-style-type: none"> 1. https://ocw.mit.edu/.../lecture-notes/Lecture1Final.pdf 2. https://zohaibjahan.blogspot.com/2014/11/free-download-artificial 		
E-Text Books:		
<ol style="list-style-type: none"> 1. https://bookboon.com/en/artificial-intelligence-ebooks 2. https://smtebooks.eu/book/9719/artificial-intelligenceE 		