

Branch Name:	Electrical Engineering
ProgramCode:	ET213
CourseName:	Elective:III- Artificial Intelligence Applications to Power System
CourseCode:	2ET2130302T
Pre-requisiteCourse:	Basic concepts and principles of Power Systems Analysis.

Course Objectives:

1. To understand the detailed concepts of various soft computing techniques.
2. To solve the problems of power systems engineering using soft computing techniques.
3. To apply the function of approximation, control of frequency/voltage and power system optimization.

Teaching and Examination Scheme:

Credit	Teaching Scheme Hours per week				Evaluation Scheme (Marks)								Total (Marks)
					Theory (Marks)				Practical (Marks)				
	L	T	P	Total	SEE		CCA		SEE		CCA		
					Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	
4	4	-	-	4	24	60	16	40	-	-	-	-	100

Subject Contents:

Sr. No	Topic	Total Hours	Weightage (%)
1	Introduction: Introduction, definition of AI difference between soft computing techniques and hard computing systems, expert systems brief history of ANN, Fuzzy and GA.	04	10%
2	Artificial Neural Networks: Introduction, History of neural network research, Basic concepts of Neural Networks, Human brain, Model of Artificial Neuron, Neural Network architectures, Single layer feed forward Network, Multi-layer feed forward network, recurrent networks, characteristics of NN, Learning Methods Perceptron. Architecture of Back propagation Network, Nonlinear activation operators, single and multilayer ANN, learning methods like Back propagation etc. training and testing of ANN.	10	25%
3	Fuzzy Logic: Introduction, Comparison between Fuzzy and crisp logic, Fuzzy sets, Membership function, Basic fuzzy set operations, properties of Fuzzy set, fuzzy relations, Fuzzy inference system, Mamdani, Sugeno, Fuzzy rule based system, defuzzification methods.	08	20%
4	Genetic Algorithm: Working principles, difference between GA and traditional methods, Different types of coding methods, fitness function, different types GA operators 1. Roulette wheel selection 2. Stochastic remainder Roulette wheel selection, Rank selection, Tournament selection and stochastic universal sampling, different types of cross over methods in GA, Mutation, Schema theorem, elite preserving operator, GA's for constrained optimization, understating of working of GA using flow chart.	10	25%
5	Applications of ANN, Fuzzy logic and GA in power systems operation and control: for solving problems of load forecasting, voltage control, voltage stability, security assessment, feeder load balancing, AGC, Economic load dispatch, Unit commitment, Condition monitoring.	10	20%

Text Books:

1. Artificial intelligence techniques in power systems by KEVIN WARWICK, ARTHUR E. KWU, RAJ AGRAWAL
2. Multi-objective Optimization using Evolutionary Algorithms By Kalyanmoy Deb Wiley Publication

Reference Books:

1. Neural Networks, Fuzzy logic and Genetic algorithms By S. Rajasekaran, G.A. Vijayalakshmi Pai PHI publication,
2. Optimization for Engineering Design by Kalyanmoy Deb PHI publication.

Students may use other software's such as C, C++ etc in lieu of MATLAB List of Open Source

Software/learning website:

MATLAB Software. C, C++, SCILAB

NPTEL courses related to power system analysis and Soft Computing.

Course Learning Outcomes (CLO): On completion of this course, the students will be able to:

CLO	Description	Bloom's Taxonomy Level
CLO1	Understand how the soft computing techniques can be used for solving the problems of power systems operation and control.	2 Understanding
CLO2	Design and analyze ANN based systems for function approximation used in load forecasting.	4 Analyze 6 Creating
CLO3	Understand about different learning methods.	2 Understanding
CLO4	Analyze and design of fuzzy based systems for load frequency control in power systems.	4 Analyze 6 Creating
CLO5	Analyze and design of genetic algorithm used for optimization problem of electrical power systems.	4 Analyze 6 Creating
CLO6	Solve problem of Optimization in power systems.	5 Evaluate

Mapping of CLOs with POs & PSOs

Course Learning Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CLO1	L			M			L				M		M			L
CLO2			L		M	L		M				M		M	H	
CLO3				M			L				M		M			L
CLO4	M		L		M			M		L		M		M	H	
CLO5	L		L		M			M		L		M		M	H	
CLO6		H	M		L				L					L	H	