M.E Semester: 3
Electrical Engineering (Electrical Power System)
Subject Name: Artificial Intelligence application in power systems

A. Course Objective:

- To provide insight into fundamentals of Artificial Intelligence Techniques to the students.

- To convey application of Artificial Intelligence techniques in power system.

B. Teaching / Examination Scheme

SUBJECT		Teaching Scheme				Total Credit	Evaluation Scheme					Total
CODE	NAME	L	T	P	Total		THEORY		IE	CIA	PR. / VIVO	Marks
		Hrs	Hrs	Hrs	Hrs		Hrs	Marks	Marks	Marks	Marks	
MEEPS-301	Artificial Intelligence application in power systems	4	0	2	6	5	3	70	30	20	30	150

C. Detailed Syllabus

SR No.	Unit No	Topic	No. of Hours	Approx. Weightage In exams
1	Unit:1	**Artificial Intelligence:** History and Applications Introduction, Intelligence, Communication, Learning, Artificial Intelligence, History, Early Works, Importance, Definitions, Programming Methods, Techniques, Progress of Artificial Intelligence, Growth of AI, AI and Industry, AI and the world, Current Trends in Applied AI, Modeling, Simulation and AI, Intelligent Systems, Role of IS, Comparisons with conventional programs, Fundamentals of various IS	8	10%
2	Unit: 2	**Artificial Neural Network:** difference between human machine and intelligence, biological neural network, artificial neuron model, Concept of Perceptron, ADALINE, Feedback in Neural Network, Neural Network Architectures: Neural Learning, Application of Neural Network in Power System	12	15%
3	Unit: 3	**Fuzzy Logic:** Introduction, Foundation of Fuzzy Systems, Representing Fuzzy Elements, Basic Terms and Operations, Properties of Fuzzy Sets, Fuzzification, Arithmetic Operations of Fuzzy Numbers, The alpha cut method, The extension method , Linguistic Descriptions and their Analytical Forms, Fuzzy Linguistic Descriptions, Fuzzy Relation Inferences,	12	20%

		Fuzzy Implication and Algorithms, Defuzzification Methods, Centre of Area Defuzzification, Centre of Sums Defuzzification		
4	Unit: 4	**Genetic Algorithms and Evolutionary Programming:** Introduction, Genetic Algorithms, Procedure of Genetic Algorithms, Genetic Representations, Initilization and Selection, Genetic Operators, Mutation, The Working of Genetic Algorithms, Evolutionary Programming, The Working of Evolutionary Programming	10	15%
5	Unit: 5	**Application of AI in Power Systems:** Application of Neural Network and Expert Systems in Voltage Control, Application of ANN for security assessment, Schedule Maintenance of Electrical Power Transmission Networks using Genetic Algorithm, Intelligent Systems for Demand Forecasting	18	40%

D. Instructional Methods

- At the start of course, the course delivery pattern , prerequisite of the subject will be discussed

- Lecture may be conducted with the aid of multi-media projector, black board, OHP etc.

- Attendance is compulsory in lectures and laboratory, which may carries five marks in overall evaluation.

- Two internal exams may be conducted and average of the same may be converted to equivalent of 15 marks as a part of internal theory evaluation.

- Assignment based on course content will be given to the student for each unit/topic and will be evaluated at regular interval. It may carry an importance of five marks in the overall internal evaluation.

- Surprise tests/Quizzes/Seminar/Tutorial may be conducted and having share of five marks in the overall internal evaluation.

- The course includes a laboratory, where students have an opportunity to build an appreciation for the concept being taught in lectures.

- Experiments shall be performed in the laboratory related to course contents.

E. Students Learning Outcomes

- Students should be able to understand concepts of Artificial Intelligence and their role in optimization.

F.   Recommended Study Materials

● **Text & Reference Books:**

1. Artificial Intelligence and Intelligent Systems, OXFORD University Press, New Delhi, 2005- N. P. Padhy
2. Understanding Neural Networks and Fuzzy Logic: Basic concepts and Applications, Prentice Hall India Private Limited, New Delhi,2002- Stamations V. Kartalopoulos
3. Artificial Intelligence Techniques in Power Systems, IEE Power Engineering Series, UK, 1997- Kevin Warwick, Arthur Ekwue and Raj Aggarwal
4. Intelligent Systems and Signal Processing in Power Engineering, Springer Berlin Heidelberg, New York- Abhisek Ukil