

Course Title: Neural Network and Fuzzy Logic

Course Code: ETEG 425

Credit Hours: 3

Course Description:

This course covers artificial neural network and fuzzy logic. This acts as a base for use of artificial intelligence in solving engineering problems.

Course Contents:

Unit 1: Fundamentals of Artificial Neural Networks

Biological neurons and their artificial models, Neural processing, Learning and Adaptation, Neural Network Learning Rules - Hebbian, Perceptron, Delta, Widrow - hof, Correlation, Winter - take - all, Outstar learning rules

Unit 2: Single Layer Perceptrons and Multilayer Feedforward Networks

Error back propagation training algorithm, Problems with propagation, Boltzmann training, Cauchy training, Combined back propagation/Cauchy training, Hopfield networks, Recurrent and Bidirectional Associative Memories, Counter, Propagation Network, Artificial Resonance Theory (art)

Unit 3: Application of Neural Networks

Hand written digit and character recognition, Traveling salesman problem, Neuro controller - inverted pendulum controller, Cerebellar model articulation controller, Robot kinematics, Expert systems for Medical diagnosis.

Unit 4: Introduction to Fuzzy Set Theory

Classical set Vs fuzzy set, Properties of fuzzy sets, Operations on fuzzy sets - union, Intersection, Complement, T-norm and co T-norm

Unit 5: Fuzzy Relations

Operations on fuzzy relations, Cylindrical extensions and projections, Extension principle

Unit 6: Theory of Approximate Reasoning

Linguistic variables, Fuzzy propositions, Linguistic approximations, Fuzzy If - then statements, Inference rules, Compositional rule of inference.

Unit 7: Introduction to Fuzzy Logic Control

Structure of FLC, Fuzzification, Knowledge base, Inference Engine, Defuzzification, Design and Tuning of FLC - Choice of membership functions, Choice of scaling factor, Choice of Fuzzification and Defuzzification procedure.

Unit 8: Application of Fuzzy Logic Control (FLC)

Washing machine, Vacuum cleaner, Cement kiln, Traffic regulation, Lift operation in a multistoried building; A brief introduction to Neuro Fuzzy Control

References:

1. S. M. Zurada, *Introduction to artificial Neural Systems*, Jaico Publishing House 1992.
2. Bart Kosko, *Neural Networks and Fuzzy Systems*, Prentice Hall
3. D. Driankov, H. H Doom, and M. Reinfrank, *An Introduction to Fuzzy Control*, Narosa Publishing House, New Delhi 1993