

Syllabus for MATLAB Fuzzy Logic and Artificial Neural Networks

(It is assumed that the student who wants to join this course has already done Basic MATLAB, Graphics, GUI and Simulink courses.)

Fuzzy basics

- What is Fuzzy Logic, Fuzzy Logic Toolbox in MATLAB, GUI of Fuzzy Toolbox, Membership Function Editor, Editing input and output membership functions.
- Fuzzy logic operations, Triangular Norm, Mapping.
- Fuzzy reasoning.
- GMP (forward chaining) and GMP (backward chaining)

Example: Car driving problem, with solution.

FIS Editor, Rule Editor, Rule Viewer, Surface Viewer, Rule Base.

Sugeno- style fuzzy inference, Mamdani Reasoning, Fuzzy Singleton, Data fitting.

✓ **Neural networks basics**

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- What is an Artificial Neural network(ANN)?
- ANN and Fuzzy Logic
- MATLAB Functions for implementing ANN.
- Radial Basis Function Networks, Back propagation Networks, Back propagation Algorithm, Single layer network, Multi-layer feed forward network

✓ Assembling the data, Creating the network, assigning weights.

✓ Training the Network, About training algorithm, Levenberg-Marquardt (LM) Training Algorithm

✓ MATLAB Program to train the ANN.

✓ Radial basis network, Network with two layers, Neuron model, Network architecture, Design procedure, radbas neuron, newrb command.

✓ Simulating and plotting results, simulation parameter, Simulating a Hybrid system, Simulink Model.

✓ **ANFIS (Adaptive Neuro-Fuzzy Inference System)**

- Basic Flow diagram
- GENFIS1 and ANFIS Commands.
- Example Programs and exercises with solutions and graphs, Simulink model.
