

Adaptive and Fuzzy Control System **(EE-6702)**

Total Credits: 03

Course Instructor

Dr. Muhammad Bilal Kadri

Course Description:

The course is aimed at providing an in depth understanding of the fuzzy logic theory and adaptive systems with application in control engineering. Most of the real world systems are highly non-linear and classical control methodology cannot be applied to achieve good control performance. This course focuses on systems where information can be gathered and the fuzzy controller can be adapted online. At the end of this course the student should be able to design a fuzzy controller on his own using Matlab/SIMULINK and be able to compare its performance with the conventional controller such as PID.

Note: This course is specifically designed for MS students.

Course Contents

1. Fuzzy sets and fuzzy logic.
2. Introduction to rule based modelling.
3. Mamdani Fuzzy Controller.
4. Takagi Sugeno Models and its application in modelling and control.
5. Real time parameter estimation, Least Squares method and Gradient based methods.
6. System Identification using Takagi-Sugeno Models.
7. Adaptive Fuzzy Control Systems
8. Fuzzy-PID Controllers

Pre-requisites

1. Control system engineering.
2. Programming in Matlab.

Text Books

1. "Introduction to Fuzzy Sets, Fuzzy Logic and Fuzzy Control Systems" by Guanrong Chen and Trung Tat Pham
2. "Fuzzy Control" by Kevin M. Passino & Stephen Yurkovich
3. "Fuzzy Logic with Engineering Applications" by Timothy Ross

Reference Books

1. "An Introduction to Fuzzy Control", Springer Verlag 1993, Driankov, Hellendoorn, Reinfrank
2. "Essentials of Fuzzy Modeling & Control", John Wiley 1994, Yager and Filev
3. "Adaptive Control" second edition, Karl J Astrom and Bjorn Wittenmark, Dover Publications, 2008