

## Course G. Intelligent Control

<b><u>Course Objectives:</u></b>	To study the fundamentals of neural networks and fuzzy set theory with emphasis on their applications in control systems.
<b><u>Prerequisite:</u></b>	Completed undergraduate courses in engineering mathematics and linear control systems.

### Teaching Plan:

Week	Topics	Text
1	Introduction of fuzzy logic systems	Teng[1]: Chapters 1
2	Fuzzy sets and operations,	Teng[1]: Chapters 1
3	Introduction of fuzzy inference systems	Teng[1]: Chapters 1
4	Fuzzy inference systems: Mandani fuzzy models, Sugeno fuzzy model & Tsukamoto fuzzy model	Jang et al: Chapters 4
5	Introduction to fuzzy logic control , control of inverted pendulum	Teng[1]: Chapter 2
6	Static fuzzy Logic controller. Self-organizing fuzzy logic control	Harris: Chapter 4, Chapter 5
7	Adaptive fuzzy logic controller	Wang: Chapter 23
8	Adaptive Linear Neuron (ADALINE) and the Delta Rule, Backpropagation Training	Fausett: Sec. 2.3 & 2.4
9	Introduction of neural network control architectures: Supervised control, model reference control and inverse controllers.	Jang et al: Chapter 17
10	Design example: Neural network control of a single link robot. Basic neuro-fuzzy control.	Demuth & Beale: Chapter 11-32
11	Introduction of Adaptive Neuro-Fuzzy Inference System (ANFIS). Application of ANFIS to the water bath temperature control.	Jang et al: Chapter 7, Lin ( A.2)

### Main Texts

**Fausett, L 1994** Fundamentals of Neural Networks - Architectures, Algorithms, and Applications; Prentice Hall.

**Demuth, H & M Beale 1999** Neural Network Toolbox User Guide.

**Harris, C J, C G Moore & B Brown 1993** Intelligent Control, World Scientific.

**Jang J S R, C T Sun & E Mizutani 1997** Neuro-Fuzzy and Soft Computing; Prentice Hall.

**Lin, C T & C S G Lee 1996** Neural Fuzzy Systems, Prentice Hall

**Teng[1], F C 2000** Basic Fuzzy Logic Control, unpublished notes.

**Wang 1997** A Course in Fuzzy Systems & Control, Prentice Hall.

**Additional Reference:**

**Jang J S R & N. Gullet 1995** Fuzzy Logic Toolbox for use with MATLAB The MathWorks.

**[TENG2] Teng, F C, K W Ang & H J Yap 1998[2]** " Real-Time Fuzzy Logic Controller of Double-Link Inverted Pendulum" Proceeding of the Fifth International Conference on Control, Automation, Robotics and Vision (ICARCV'98), 1127-1131 ( Invited Paper )

**[TENG3] Teng, F C K W Ang & H J Yap 1998[3]** " Real-Time Fuzzy Logic Controller of Self-Erecting Inverted Pendulum" Proceeding of the Fifth International Conference on Control, Automation, Robotics and Vision (ICARCV'98), 1121-1126 ( Invited Paper)