

<b>Course</b>	Name	: Intelligent Control System
	Code	: EE184922
	Credits	: 3
	Semester	: Elective

### Description of Course

Intelligent Control Systems studies the method of control systems design using fuzzy control and neural network, and optimization using genetic algorithm. Design of basic rules of fuzzy systems of the Mamdani and Sugeno types use heuristic method are discussed. The Takagi-Sugeno fuzzy model is used to represent the dynamics of a nonlinear system on the basis of rules for controllers using the concept of Parallel Distributed Compensation. Validation of fuzzy system design is applied to real systems. Neural network methods are also discussed and used for system control purposes, while genetic algorithms are used to solve optimization problems in the control system.

### Learning Outcomes

#### Knowledge

(P03) Mastering the concepts and principles of design procedure in power systems, control systems, multimedia telecommunications, or electronics

#### Specific Skill

(KK02) Able to describe the completion of engineering problems in power systems, control systems, multimedia telecommunications, or electronics.

#### General Skill

(KU02) Able to demonstrate independent performance, quality, and measurable.

(KU12) Able to implement information and communication technology (ICT) in the context of implementation of his/her work.

#### Attitude

(S09) Demonstrating attitude of responsibility on work in his/her field of expertise independently.

(S12) Working together to be able to make the most of his/her potential.

### Course Learning Outcomes

#### Knowledge

Mastering the concepts and principles of intelligent control systems, i.e fuzzy control and neural network for analysis and design of nonlinear systems, and genetic algorithm for optimization purposes in control system design.

#### Specific Skill

Able to design intelligent control systems for real systems with the help of Matlab / Simulink.

#### General Skill

Able to work independently showing quality and measurable performance through intelligent control system design tasks and able to use Matlab / Simulink software to perform system simulation design results

#### Attitude

Demonstrate an attitude of responsibility for work in his area of expertise independently and can work together in teams to obtain good system design results.

---

### Main Subjects

---

1. Introduction to Intelligent Control System Concepts
2. Fuzzy Logic and Fuzzy Systems
3. Takagi-Sugeno Fuzzy Model
4. Fuzzy Control Application on the Pendulum-Cart System
5. Synthesis of Fuzzy Control with Other Control Techniques
6. Neural Network and Its Application in Control
7. Optimization using the Genetic Algorithm Technique

---

### Reference(s)

---

- [1] Kevin M. Passino and Stephen Yurkovich, "Fuzzy Control," Addison-Wesley Longman Inc., 1998.
- [2] Kazuo Tanaka, Hua O. Wang, "Fuzzy Control Systems Design and Analysis: A Linear Matrix Inequality Approach," John Wiley & Sons, 2001
- [3] Stuart J. Russell and Peter Norvig, "Artificial Intelligence: A Modern Approach," 3rd Edition., Pearson Education, Inc., 2010
- [4] Melanie Mitchell., An Introduction to Genetic Algorithms., the MIT press, 1996
- [5] Stephen I. Gallant, "Neural Network Learning and Expert Systems," the MIT press, London,1993

---

### Prerequisite(s)

---

EE184404 Introduction to Control Systems

---