

# Intelligent Systems and Control - Video course

## Course Objectives

1. Biological motivation to design intelligent systems and control
2. The study of control-theoretic foundations such as stability and robustness in the frame work of intelligent control.
3. Analysis of learning systems in conjunction with feedback control systems
4. Computer simulation of intelligent control systems to evaluate the performance.
5. Exposure to many real world control problems.

## Course Outline

- Module I (9 classes): Biological foundations to intelligent systems I: Artificial neural networks, Back-propagation networks, Radial basis function networks, and recurrent networks.
- Module II (6 classes): Biological foundations to intelligent systems II: Fuzzy logic, knowledge representation and inference mechanism, genetic algorithm, and fuzzy neural networks.
- Module III (6 classes): Fuzzy and expert control (standard, Takagi-Sugeno, mathematical characterizations, design example), Parametric optimization of fuzzy logic controller using genetic algorithm.
- Module IV (6 classes): System identification using neural and fuzzy neural networks.
- Module V (6 classes): Stability analysis: Lyapunov stability theory and Passivity Theory.
- Module VI (4 classes): Adaptive control using neural and fuzzy neural networks, Direct and Indirect adaptive control, and Self-tuning Pill Controllers.
- Module VII (5 classes): Applications to pH reactor control, flight control, robot manipulator dynamic control, underactuated systems such as inverted pendulum and inertia wheel pendulum control and visual motor coordination.



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## Electrical Engineering

### Coordinators:

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