ME 697Y
Intelligent Systems

Course Outcomes

1. Learn the unified and exact mathematical basis as well as the general principles of various soft computing techniques for modeling, optimization and decision making.
2. Provide detailed theoretical and practical aspects of intelligent modeling, optimization and control of non-linear systems.
3. Prepare the students for developing intelligent systems through case studies, simulation examples and experimental results.

Intelligent Modeling (4.5 wks)

1. Introduction of soft computing techniques
2. Fuzzy logic systems; fuzzy sets, inferencing, fuzzy relation models, Tagaki-Sugeno models
3. Neural networks: paradigms, training
4. Neuro-fuzzy systems
5. Modeling of nonlinear relationships
6. Modeling of dynamical systems

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Optimization (2.5 wks)

1. Model building
2. Fuzzy inverse model development
3. Optimization techniques: genetic algorithm, evolutionary strategies, support vector machine
4. Application of model-based optimization to numerical examples
5. Application of model-based optimization scheme to practical problems

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Intelligent Control (4 wks)

1. Neural control
2. Rule-based fuzzy control
3. Model-based fuzzy control
4. Stability analysis
5. Fuzzy control for SISO nonlinear systems
6. Fuzzy control application to practical problems

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Multivariate Systems and Applications (4 wks)

1. Intelligent control for MISO nonlinear systems
2. Knowledge-based multivariabe fuzzy control
3. Model-based multivariate fuzzy control

COURSE NUMBER: ME 697Y

COURSE TITLE: Intelligent Systems

REQUIRED COURSE OR ELECTIVE COURSE: Elective

TERMS OFFERED: Spring (Alternate Years)

TEXTBOOK/REQUIRED MATERIAL: Y.C. Shin and C. Xu, *Intelligent Systems: Modeling, Optimization and Control, CRC Press, 2008*.

PRE-REQUISITIES: Graduate Standing

COORDINATING FACULTY: Y.C. Shin

COURSE DESCRIPTION: A unified and unique mathematical treatment of various soft computing techniques for constructing intelligent systems, in modeling, optimization and control. The course covers the theory and applications of neural networks, fuzzy logic, evolutionary strategies and genetic algorithms in developing intelligent systems with examples and practical applications.

COURSE OUTCOMES:

1. Learn the *unified and exact mathematical basis* as well as the *general principles* of various soft computing techniques.
2. Provide detailed theoretical and practical aspects of intelligent modeling, optimization and control of non-linear systems.
3. Prepare the students for developing intelligent systems through case studies, simulation examples and experimental results.

ASSESSMENTS TOOLS:

1. Mini projects (monthly).
2. A term project.

RELATED ME PROGRAM OUTCOMES: N/A

PROFESSIONAL COMPONENT:

1. Engineering Topics: Engineering Science – 3.0 credits (60%)
2. Engineering Topics: Engineering Design – 3.0 credits (40%)

NATURE OF DESIGN CONTENT: Design issues in real-world problems analyzed in projects.

COMPUTER USAGE: Students are required to carryout programming as part of the project using either matlab or C or C++.

COURSE STRUCTURE/SCHEDULE:

1. Lecture – 2 days per week at 75 minutes.

PREPARED BY: Y.C. Shin

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