

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.
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
4. Neuro-fuzzy systems
5. Modeling of dynamical systems



Optimization
(2 wks)

1. Model building
2. Fuzzy inverse model development
3. Model-based forward optimization
4. Application of model-based optimization to numerical examples
5. Application of model-based optimization scheme to practical problems



Intelligent Control
(4.5 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



Multivariate Systems and Applications
(4 wks)

1. Intelligent control for MISO nonlinear systems
2. Knowledge-based multivariate 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, <i>Intelligent Systems: Modeling, Optimization and Control</i> , 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:	
ASSESSMENTS TOOLS:		<ol style="list-style-type: none"> 1. Learn the <i>unified and exact mathematical basis</i> as well as the <i>general principles</i> 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:			
<ol style="list-style-type: none"> 1. Bi-weekly deliverables. 2. A term project. 			
PROFESSIONAL COMPONENT:		RELATED ME PROGRAM OUTCOMES: N/A	
<ol style="list-style-type: none"> 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:			
<ol style="list-style-type: none"> 1. Lecture – 2 days per week at 75 minutes. 			
PREPARED BY: Y.C. Shin		REVISION DATE: Nov. 8, 2008	