Course Number: CSc 876
Course Title: Soft Computing and Decision Support Systems
Course Level: Graduate/Senior undergraduate
Number of Credits: 3
Schedule: Three hours of lecture per week.
Prerequisite: CSc 810 or consent of instructor for students who completed CSc 510

Catalog Description

Expanded Description
The goal of this course is to present computing models and techniques that deal with imprecision, uncertainty, partial truth, and approximation, in a way that is similar to processing performed by human mind. Attempts to develop models that are similar to human reasoning resulted in important concepts of fuzzy sets, rough sets, fuzzy logic, possibility theory, preference logic, multicriteria decision models, and many applications based on neural networks, evolutionary computing, machine learning, probabilistic reasoning, etc. The goal of this course is to present selected areas of soft computing in an advanced research-oriented way, following current developments in this dynamic area. In particular, the course will include the following topics:

- **Fuzzy Sets and Fuzzy Logic**
  - Crisp sets and fuzzy sets
  - Alpha-cuts
  - Operations of fuzzy sets
  - t-norms and conorms
  - Fuzzy relations
  - Multivalued logics
  - Fuzzy propositions and quantifiers
  - Linguistic variables and their use
  - Inference in fuzzy systems
  - Information and uncertainty
  - Rough sets and their use

- **Applications of Fuzzy Logic**
  - Methods of using expert opinions
  - Fuzzy expert systems
  - Approximate reasoning
  - Design of fuzzy controllers
- Fuzzy decision making
- Fuzzy ranking methods
- Concepts of perceptual computing
- Concepts of granular computing

- **Graded Logic and Aggregation**
  - Partial Truth and Logic Conditions in Evaluation
  - Observable Properties of Human Evaluation Logic
  - Andness and Orness
  - Relative Importance and Weights
  - Graded Conjunction/Disjunction
  - Partial Absorption
  - Compound Preference Logic Functions
  - Nonstationary Criteria

- **LSP Method**
  - An Overview of the LSP Method
  - System Attribute Tree
  - Elementary Criteria
  - Logic Aggregation of Preferences
  - Cost/Preference Analysis
  - Reliability Analysis
  - Sensitivity Analysis
  - Tradeoff Analysis
  - System Optimization
  - LSP Software Technology

- **Multiple Criteria Decision Analysis**
  - Preference modeling
  - Utility theory
  - Value function methods
  - The Analytic Hierarchy Process
  - Outranking methods

- **Decision engineering: applications of MCDM methods**
  - Personal decision making
  - Medical decision making
  - Evaluation in ecology
  - Suitability maps
  - Evaluation of software systems
  - Software support for MCDM

**Method of Evaluation**
Student learning will be evaluated on the basis of completeness and quality of project assignments.
Textbooks

Recommended Literature

Journals

Conferences
FUZZ-IEEE, IPMU, IEEE WCCI, WCSC, EUSFLAT, AGOP, MDAI (Proceedings of these conferences contain the latest research results in this area)

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Last Revision Date: Feb. 14, 2018