**BBE 4102 Intelligent Systems**

Course description

Theory and implementation of a variety of techniques used to simulate intelligent behavior. Expert systems, fuzzy logic, neural networks, evolutionary computation, and two-player game-tree search will be covered in depth. Knowledge representation, pattern recognition, hybrid approaches, and handling uncertainty will also be discussed

Course Objectives

By covering the course in Intelligent Systems, the student will be able to:

1. Appreciate the concepts of Artificial Intelligence and the diversity of approaches and definitions with which it is associated.

2. Develop an understanding of heuristic methods.

3. Learn the underlying theory and practice of evolutionary computation, including genetic algorithms and genetic programming.

4. Appreciate knowledge engineering, develop expert systems, and understand fuzzy expert systems.

5. Develop an understanding of and implement artificial neural networks.

6. Implement a two-player strategy game with optimized adversarial search.

7. Implement, observe and evaluate alternative approaches to intelligent systems

Course Content

**Optimization Methods**

 Gradient methods

 Linear Programming

 Constrained Problems and Lagrange Multiplier Method

 Search Method

 Ordinal Optimization

 Genetic Algorithms

 Applications

**Fundamentals of Neural Networks**

 Basic concepts

 Back-propagation algorithm

 Applications

**Advanced Neural Networks**

 Competitive learning

 Data clustering networks

 Application in hierarchical modeling for complex systems

**Knowledge Representation Methods**

 Linguistic knowledge representation

 Mathematical foundation: Random Sets

 Applications

**Information Fusion Techniques**

 Fusion of linguistic and stochastic information

 Application in intelligent segmentation

 Application in sensor fusion

Reference Materials

1. Michael Negnevitsky, 2005. Artificial Intelligence: A Guide to Intelligent Systems. Addison- Wesley- ISBN 0321204662

72

2. George F. Luger, Peder Johnson, Jean E. Newman, Carl Stern, Ronald Yeo - C*ognitive Science: The Science of Intelligent Systems.* Academic Press (1994) - ISBN 0124595707

3. Jatinder N. D. Gupta, Guisseppi A. Forgionne, Manuel Mora. *Intelligent Decision-making*

*Support Systems: Foundations, Applications and Challenges.* Springer (2006)-ISBN 1846282284

Requirements

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| --- | --- | --- | --- | --- | --- | --- | --- |
| Hours per Semester | | | | Weighted  Total Mark | Weighted  Exam Mark | Weighted Continuous  Assessment Mark | Credit  Units |
| LH | PH | TH | CH | WTM | WEM | WCM | CU |
| 45 | 30 | 00 | 60 | 100 | 60 | 40 | 4 |