Department of Mathematics
Faculty of Mathematics & Computer Science
M.Sc. (Applied Mathematics), 4th Semester

Course Code	AM 403 (c)
Course Title	Soft Computing
Course Credits	04

Course objectives:

Objective of the course is to introduce some latest and popular soft computing techniques and their implementation for real world problems. Students are inspired to understand how and why these techniques work, when they can be applied and their relative merits to each other and to more deterministic approaches.

Minimum pre-requisites:

Programming in C++ or Matlab.

Course structure:

Introduction of soft computing, soft computing vs. hard computing, various types of soft computing techniques, applications of soft computing.

Evolutionary Algorithms: Basic concepts of Genetic Algorithms (GA), various GA operators, mathematical derivations of different GA operators, working of GA, Introduction of Differential Evolution. Introduction to Biogeography Based Optimization, probability analysis of species migration in BBO.

Swarm Intelligence Algorithms: An Introduction to Swarm Intelligence, Motivation, Definitions, and Key Principles, Introduction to Particle Swarm Optimization, Mathematical background of particle swarm optimization, Artificial Bee Colony Algorithms with its theoretical background.

Fuzzy logic and Fuzzy Systems: Fuzzy set theory, Fuzzy set versus crisp set, Crisp relation and Fuzzy relation, Fuzzy rules and fuzzy reasoning.

Artificial Neural Network: Basic-concepts-single layer perception-Multi layer perception-Supervised and unsupervised learning, Back propagation networks.

Reading suggestions:

- Computational Intelligence, An Introduction by Andries P. Engelbrecht, John Wiley and Sons, 2007
- Neuro-Fuzzy and Soft Computing: A computational approach to learning and Machine Intelligence, J.-S.R. Jang, C.-T. Sun, E. Mizutani, PHI learning pvt. Ltd, 2012.
- Optimization for Engineering Design: Algorithms and Examples, Kalyanmoy Deb, PHI learning pvt. Ltd, 2012.
- D. E. Goldberg; Genetic Algorithms in Search, Optimization & Machine Learning, Pearson Education Asia, 2001.

Evaluation and weightage:

- Surprise Quiz / test – 15 Marks
- Assignments and interaction during the class - 15 Marks
- Mid Semester Examination – 30 Marks
- End Semester Examination – 40 Marks