**Course Title**

Soft Computing

**Prerequisites**

Some programming background.

**Course Objectives:**

To understand the theory and algorithms of topics under soft computing such as swarm and evolutionary computing.

To be able to critically evaluate the use of them in an application.

To be able to apply them in any suitable application

**Outline of Lectures:**

Emergence and Self-Organization

Swarm Computing – Particle Swarm

Firefly and Artificial Bees Colony

Artificial Ant Colony

Evolutionary Algorithms – Differential Evolution

Evolutionary Algorithms - Covariance Matrix Adaptation Evolution Strategy

Genetic Algorithms

Genetic Algorithms – Game Playing

Each weekly session will be comprised of lectures and practical programming exercises.

**Textbook**

Introduction to Natured Inspired Optimization, Lindfield & Penny, Academic Press, 2017

Ant Colony Optimization, Dorigo & Stutzle, MIT Press, 2004.

Grokking Deep Reinforcement Learning, Miguel Morales, Manning Press, 2020.

**Reference**

Complexity A Guided Tour, Melanie Mitchell, Oxford University Press, 2009

*Godel, Escher, Bach,* Douglas Hofstadter, Basic Books, 1999.

Swarm Intelligence, Kennedy, Eberhart, & Shi, 2001. Morgan Kaufman

Swarm Intelligence from Natural to Artificial Systems, Bonabeau, Dorigo & Theraulaz.

Evolutionary Computation a unified approach, De Jong, 2006, MIT Press

Nature-inspired Computation and Swarm Intelligence algorithms, Xin-She Yang et al

Evolutionary Optimization Algorithms, Dan Simon, 2013

Reinforcement Learning: An Introduction, Sutton and Barto, 2nd Edition, 2015.

**Notice**

This course is suitable for students with some programming background who is interested to understand and implement algorithms and application using reinforcement learning, swarm, evolutionary and nature-inspired computing and optimization.

**Assessment Method**

Coursework, presentation, report and project work.

**Software**

pip install --upgrade swarmlib

pip install deap

pip install cma