

**Department of Mathematics**  
**Faculty of Mathematics & Computer Science**  
**PhD, Mathematics**

<b>Course Code</b>	AM 602
<b>Course Title</b>	Swarm and Evolutionary Algorithms
<b>Course Credits</b>	04

**Course Objectives:**

This course is aimed at exploring the foundational concepts of swarm intelligence and evolutionary computation based algorithms. Students will not only learn the fundamentals but also the implementation of these algorithms. All the algorithms will be explained using numerical examples. Latest application area and the possible research directions in the field will also be explored.

**Minimum Pre-requisites:**

Prerequisites: working knowledge of optimization, algebra and linear algebra.

**Course Structure:**

- Introduction to population based optimization algorithms, Introduction to Swarm and Evolutionary Algorithms
- Particle Swarm Optimization, Artificial Bee Colony Algorithm, Ant Colony Optimization, Spider Monkey Optimization, Grey Wolf Optimizer, Gravitational Search Algorithm
- Differential Evolution, Genetic Algorithms, Biogeography Based Optimization
- Multi-objective Optimization, Multi-objective Genetic Algorithms, Multi-objective Particle Swarm Optimization
- Comparing various Swarm and Evolutionary Algorithms, Evaluating Swarm and Evolutionary Algorithms

**Reading Suggestions:**

- Engelbrecht, A. P. (2007). *Computational intelligence: an introduction*. John Wiley & Sons.
- Bansal, J. C., Singh, P. K., & Pal, N. R. (Eds.). (2019). *Evolutionary and swarm intelligence algorithms* (pp. 1-9). Berlin, Germany: Springer.

- Whitley, D., Rana, S., Dzubera, J., & Mathias, K. E. (1996). Evaluating evolutionary algorithms. *Artificial intelligence*, 85(1-2), 245-276.
- Clerc, M. (2010). Particle Swarm Optimization. *Part. Swarm Optim.*, 1-17.
- Clerc, M. (2019). *Iterative Optimizers: Difficulty Measures and Benchmarks*. John Wiley & Sons.

**Evaluation and weightage:**

- Assignment /quiz / Class performance: 20%
- Mid-term Evaluation: 40%
- Final Examination: 40%