| CS408: Swarm and Evolutionary Computing | L | T | P | Discrete Mathematics, Artificial Intelligence |
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**Course Objective:** The course explores a variety of evolutionary algorithms and their application for problem solving. The student should be able to understand the bio- inspired algorithms and apply them to optimize parameters in real-world problems.

| S. No. | Course Outcomes (CO) |
|---|---|
| CO1 | Describe components, strategies, and fitness functions in evolutionary computing. |
| CO2 | Implement and analyze the Particle Swarm Optimization algorithm and its update mechanisms. |
| CO3 | Develop and apply genetic algorithms, including chromosome generation, fitness evaluation, and evolutionary operations. |
| CO4 | Analyze and implement hybrid approaches combining Particle Swarm and Genetic Algorithms for multi-objective optimization. |
| CO5 | Utilize nature-inspired algorithms like Cuckoo Search and Ant Colony Optimization for real-world optimization challenges. |

| S. No | Contents | Contact Hours |
|---|---|---|
| UNIT 1 | Introduction to Evolutionary Computing: Global Optimization, Components of an evolutionary algorithm, Evolution strategies, Fitness Functions, Learning Classifier systems, Parameter Control, Multi-modal Problems | 8 |

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| **UNIT 2** | Swarm Intelligence: Introduction to Swarm Intelligence and its application to optimization problems, Particle Swarm Optimization algorithm, position and velocity updation | **8** |
| **UNIT 3** | Genetic Algorithm: Population and generation of chromosomes, Fitness function, survival of the fittest, reproduction, cross-over and mutation, Genetic algorithm convergence, Genetic programming | **10** |
| **UNIT 4** | Hybrid Methods and Multi-objective Evolutionary Algorithms: Variants of Particle Swarm optimization and Genetic Algorithm, Hybridization of Particle Swarm and Genetic based optimizations, Hybrid Multi-objective Optimization algorithms | **8** |
| **UNIT 5** | Recent nature-inspired evolutionary algorithms: Cockoo search algorithm, Artificial Bee Colony Optimization, Ant Colony Optimization, Fire-fly algorithm, Bacterial Foraging, Application to the travelling salesman problem | **8** |
| **UNIT 6** | Application to real world optimization problems | **6** |
| | **Total** | **48** |