

Department of Computer Science
University of Kerala
M Sc Computer Science & M Sc Computer Science (Sp: Artificial Intelligence)
CSA-DSE-436(v): Nature Inspired Computing
Facilitator: Vinod Chandra S S, Professor
Lecture Plan

Module 1 : Models of Life and Intelligence

Sl. No.	Date & Time	Area	Remarks
L#1		Life-models- Intelligence	
L#2		Fundamentals of bio-inspired models and bio-inspired computing	
L#3		Evolutionary models and techniques	
L#4		Swarm models and its self-organisation	
L#5		Swarm and evolutionary algorithms	
L#6		Single and multi-objective optimisation	
L#7		Optimization and its variants, Important Nature Inspired Algorithms	
L#8		Heuristic and meta-heuristic	
L#9		Heuristic and hyper heuristic functions	

Module 2 : Genetic algorithms

Sl. No.	Date & Time	Area	Remarks
L#10		Mathematical foundation, Basics of GA	

L#11		Genetic problem solving, and Genetic programming	
L#12		Genetic algorithms steps	
L#13		Single and uniform crossover, mutation	
L#14		Genetic algorithms and Markov process	
L#15		Examples of genetic algorithms	
L#16		Applications of genetic algorithms	
T#3		<i>Implement Genetic algorithm for a case study</i>	

Module 3 : Ant Colony Algorithms

Sl. No.	Date & Time	Area	Remarks
L#17		Ant colony basics	
L#18		Hybrid ant system, ACO basics	
L#19		ACO in combinatorial optimization	
L#20		Variations of ACO, case studies, applications of ACO	
L#21		General examples and case studies	
T#5		<i>Implement basic ACO algorithm for TSP</i>	

Module 4 : Particle Swarms & Artificial Bee Colony

Sl. No.	Date & Time	Area	Remarks
L#22		Particle Swam algorithms – basics of particles moves	
L#23		Particle swarm optimization	
L#24		Variable length PSO and variants of PSO	
L#25		Applications of PSO, case studies	
L#25		Artificial Bee Colony algorithms - ABC basics	
L#26		ABC in optimization	
L#26		Multi-dimensional bee colony algorithms	
L#26		Applications of bee algorithms and case studies	
T#6		<i>Implement PSO for a case study</i>	
T#7		<i>Implement ABC for a case study</i>	

Module 5&6 : Selected nature inspired optimization techniques

Sl. No.	Date & Time	Area	Remarks
L#27		Hill climbing, simulated annealing, Gaussian adaptation	
L#28		Cuckoo search, Firey algorithm	
L#29		SDA algorithm, bat algorithm	

L#30		Social spider algorithm, Cultural algorithms, Harmony search algorithm	
L#30		Intelligent water drops algorithm, Artificial immune system, Flower pollination algorithm	
L#30		Other nature inspired techniques, Bacterial colony optimization	
L#30		Glow-worm Swarm optimization, Plant growth adaptation in optimization	
L#30		Termite colony optimization, African Buffalo optimization	
L#30		Case studies and examples	
L#31		Case studies and examples	
T#8		<i>Exercises in nature inspired techniques</i>	
T#9		<i>Exercises in nature inspired techniques</i>	

References:

- Albert Y.Zomaya - "Handbook of Nature-Inspired and Innovative Computing", Springer, 2006
- Floreano, D. and C. Mattiussi -"Bio-Inspired Artificial Intelligence: Theories, Methods, and Technologies", MIT Press, 2008
- Leandro Nunes de Castro - " Fundamentals of Natural Computing, Basic Concepts, Algorithms and Applications", Chapman & Hall/ CRC, Taylor and Francis Group, 2007
- Marco Dorigo, Thomas Stutzle -" Ant Colony Optimization", Prentice Hall of India, New Delhi, 2005
- Vinod Chandra S S, Anand H S - "Machine Learning: A Practitioners Approach", Prentice Hall of India, New Delhi, 2020

Internal Marks:

The internal marks are awarded based on class tests and assignments/ lab reports for theory and attendance.