

Detailed Syllabus

Subject Code	19M12CS211	Semester odd	Semester M.Tech II sem Session 2018- 2019 Month from Jan to June
Subject Name	Nature Inspired Computation and Applications		
Credits	3	Contact Hours	3
Faculty (Names)	Coordinator(s)	Dr. Anuja Arora	
	Teacher(s) (Alphabetically)	Dr. Anuja Arora	

SNO	Description	Cognitive Level (Bloom Taxonomy)
CS211.1	Identify the need of computational complexity, evolutionary, and approximate algorithms.	Apply Level (Level 3)
CS211.2	Understand nature inspired algorithms, its strength, weakness, and suitability	Understand Level (Level 2)
CS211.3	Make use of nature-inspired algorithms to design, learn and optimize problem	Apply Level (Level 3)
CS211.4	Evaluate performance of Nature inspired algorithm in context of problem solving in optimized manner	Evaluate Level (Level 5)
CS211.5	Create a real environment effective artificial system with the use of properties exhibited from nature.	Create Level (Level 6)

Module No.	Subtitle of the Module	Topics in the module	No. of Lectures for the module
1.	Nature Inspired Computation Fundamental	Computational Complexity, NP-Hardness, Reductions, Approximation Algorithms vs. Heuristics, Newton Raphson Method, Characteristics of Natural Systems/Algorithms	5
2.	Empirical and Evolutionary Algorithms	Empirical Algorithms, Empirical hardness. Evolutionary Algorithms, optimization Fitness landscape Analysis, EA Theory	5
3	Evolutionary Algorithms	Genetic Algorithm, GA Encoding Techniques, Selection techniques, Variation(Crossover and Mutation) Techniques, Genetic Programming Differential Evolution Algorithm, sample problems, DE-Crossover and Mutation techniques	8
4	Swarm Intelligence	Particle Swarm Optimization, PSO	15

		Sample Problems, Binary PSO, Ant Colony Optimization and real life case study solutions, Artificial Bee Colony Algorithm, Cuckoo Search and its applications, Firefly Algorithm	
5	Modeling and problem solving	Artificial Neural network, , Artificial Immune System, Self-organizing Maps, Pattern Recognition and Binding, Forest's Algorithm,	4
11	Case Studies and Applications	World Wide Web, Social Network, Image Processing, Earthquake, routing & scheduling	5
Total number of Lectures			42

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)	
1.	Evolutionary Optimization Algorithms, D. Simon (2013), Wiley.
2.	Bio-Inspired Artificial Intelligence: Theories, Methods, and Technologies, D.Floreano and C. Mattiussi (2008), MIT Press.
3.	Fundamentals of Natural Computing: Basic Concepts, Algorithms, and Applications, L. N. de Castro (2006), CRC Press.
4.	Leandro Nunes de Castro, " Fundamentals of Natural Computing, Basic Concepts, Algorithms and Applications", Chapman & Hall/ CRC, Taylor and Francis Group, 2007
5.	Marco Dorigo, Thomas Stutzle," Ant Colony Optimization", PHI,2005
6.	Albert Y.Zomaya, "Handbook of Nature-Inspired and Innovative Computing", Springer, 2006