Detailed Syllabus

Subject Code	19M12CS211	**Semester odd**	**Semester M.Tech II sem Session 2019-2020** **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 Prof. R.B. Mishra

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 (Anuja Arora)	Computational Complexity, NP-Hardness, Reductions, Approximation Algorithms vs. Heuristics, Newton Raphson Method, Characteristics of Natural Systems/Algorithms	3
2.	Empirical and Evolutionary Algorithms (RB Mishra)	Empirical Algorithms, Empirical hardness. Evolutionary Algorithms, optimization Fitness landscape Analysis, EA Theory	4
3	Evolutionary Algorithms (RB Mishra)	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	NIC Algorithm for Problem Solving and Modeling (Anuja Arora)	Particle Swarm Optimization Binary PSO Ant Colony Optimization Artificial Bee Colony Algorithm, Cuckoo Search Firefly Algorithhm Gravitational Search Algorithm BAT Algorithm	17
5	Modeling and problem solving (RB Mishra)	Feed Forward and Feed Network, Supervised and unsupervised learning, Hopfield Network, Recurrent Network, Artificial Immune System, Self-organizing Maps, Pattern Recognition Applications	8
11	NIC in Real Context (Anuja Arora)	World Wide Web, Social Network, Modeling, Image Processing, Earthquake, routing & scheduling	2
		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.	Eberhart, Russell C., and Yuhui Shi. Computational intelligence: concepts to implementations. Elsevier, 2011
2.	Evolutionary Optimization Algorithms, D. Simon (2013), Wiley.
3.	Bio-Inspired Artificial Intelligence: Theories, Methods, and Technologies, D.Floreano and C. Mattiussi (2008), MIT Press.
4.	Fundamentals of Natural Computing: Basic Concepts, Algorithms, and Applications, L. N. de Castro (2006), CRC Press.
5.	Leandro Nunes de Castro, " Fundamentals of Natural Computing, Basic Concepts, Algorithms and Applications", Chapman & Hall/ CRC, Taylor and Francis Group, 2007
6.	Marco Dorrigo, Thomas Stutzle," Ant Colony Optimization", PHI,2005
7.	Albert Y.Zomaya, "Handbook of Nature-Inspired and Innovative Computing", Springer, 2006