	National Institute of Technology Meghalaya An Institute of National Importance	**CURRICULUM**

Programme	**Bachelor of Technology in Electrical and Electronics Engineering**	Academic Year of Regulation	**2018-19**
Department	**Electrical Engineering**	Semester	**VII**

Course Code	Course Name	Pre-Requisite	Credit Structure				Marks Distribution		
			L	T	P	C	Continuous Assessment		Total
EE451	**Soft Computing Lab**	**EE301**	**0**	**1**	**2**	**2**	**01 Experiment**	**10**	**100**

Course Objectives		Course Outcomes		
	To introduce necessity for soft techniques and tools		CO1	**Able to acquire knowledge about basic of MATLAB and SIMULINK softwares**
	To teach various non-conventional optimization techniques suitable for solving complex power system problems		CO2	**Able to acquire knowledge and apply evolutionary techniques in real time problems**
			CO3	**Able to acquire knowledge and apply neural networks in real time problems**
			CO4	**Able to acquire knowledge and apply fuzzy systems in real time problems**
			CO5	**Able to acquire knowledge and apply hybrid systems in real time problems**
			CO6	

No.	COs	Mapping with Program Outcomes (POs)												Mapping with PSOs		
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	CO1	**3**	**2**	**3**	**2**	**3**	**2**	**0**	**0**	**1**	**0**	**0**	**1**	**3**	**0**	**3**
2	CO2	**3**	**2**	**3**	**2**	**3**	**2**	**0**	**0**	**1**	**0**	**0**	**1**	**2**	**0**	**2**
3	CO3	**3**	**2**	**3**	**2**	**3**	**2**	**0**	**0**	**1**	**0**	**0**	**1**	**2**	**3**	**2**
4	CO4	**3**	**2**	**3**	**2**	**3**	**2**	**0**	**0**	**1**	**0**	**0**	**1**	**2**	**3**	**2**
5	CO5	**3**	**2**	**3**	**2**	**3**	**2**	**0**	**0**	**1**	**0**	**0**	**1**	**2**	**3**	**2**

SYLLABUS

No.	Content	Hours	COs
I	**Introduction to MATLAB and SIMULINK softwares** **Basics, programming skill, graphical user inference skills, electrical system tool box**	**03**	**CO1**
II	**Evolutionary Techniques** **Introduction to Genetic Algorithms (GA), Representation, Operators in GA, Fitness function, population, building block hypothesis and schema theorem.; Genetic algorithms operators- methods of selection, crossover and mutation, simple GA(SGA), other types of GA, generation gap, steady state GA, Applications of GA**	**06**	**CO2**
III	**Neural Network Systems** **Concept, biological neural system, Evolution of neural network, McCulloch- Pitts neuron model, activation functions, feed forward networks, feedback networks, learning rules – Hebbian, Delta, Percepron learning and Windrow- Hoff, winner-take-all, Perceptron learning, single l layer/multilayer perceptron, linear separability, hidden layers, back propagation algorithm, Radial Basis Function network; Unsupervised learning - Kohonen, SOM, Counter-propagation, ART, Reinforcement learning, adaptive resonance architecture, applications of neural networks to pattern recognition systems such as character recognition, face recognition, application of neural networks in image processing, Applications of neural network systems**	**06**	**CO3**
IV	**Fuzzy Systems** **Basic definition and terminology, set-theoretic operations, Fuzzy Sets, Operations on Fuzzy Sets, Fuzzy Relations, Membership Functions, Fuzzy Rules & Fuzzy Reasoning, Fuzzy Inference Systems, Fuzzy Expert Systems, Fuzzy Decision Making; Neuro-fuzzy modelling- Adaptive Neuro-Fuzzy Inference Systems, Coactive Neuro-Fuzzy Modeling, Classification and Regression Trees, Data Clustering Algorithms, Rule base Structure Identification and Neuro-Fuzzy Control , Applications of neuro-fuzzy modelling**	**05**	**CO4**
V	**Hybrid Systems and Recent Soft Techniques** **Introduction, basic concepts, neuro-fuzzy systems, What is swarm intelligence? Various animal behavior which have been used as examples, ant colony optimization, swarm intelligence in bees, flocks of birds, shoals of fish, ant-based routing, particle swarm optimization**	**04**	**CO5**
Total Hours		**24**	

Essential Readings

1. S.N.Sivanandam and S.N.Deepa, “Principles of Soft Computing”, Wiley, 2011.
2. David E. Goldberg, “Genetic Algorithm in Search Optimization and Machine Learning”, Pearson Education, 2013.
3. George J. Klir, Ute St. Clair, Bo Yuan, “Fuzzy Set Theory: Foundations and Applications”, Prentice Hall, 1997.
4. James A. Freeman, David M. Skapura, “Neural Networks Algorithms, Applications, and Programming Techniques”, Pearson Education, 1991.
5. J.S.R.Jang, C.T. Sun and E.Mizutani, “Neuro-Fuzzy and Soft Computing”, Pearson Education, 2004

Supplementary Readings

1. Simon Haykin, “Neural Networks Comprehensive Foundation”, Pearson Education, 2005.
2. S.Rajasekaran, “Neural Networks, “Fuzzy Logic and Genetic Algorithm: Synthesis and Applications”, Prentice Hall, 2006