GANPAT UNIVERSITY									
FACULTY OF TECHNOLOGY									
Programme	Bachelor of Technology					Branch/Spec.	Computer Science Engineering (BDA)		
Semester	V					Version	1.0.0.0		
Effective from Academic Year			2018-19			Effective for the batch Admitted in			June 2016
Subject code	2CSE50E16		Subject Name			Soft Computing			
Teaching scheme						Examination scheme (Marks)			
(Per week)	Lecture(DT)		Practical(Lab.)		Total		CE	SEE	Total
	L	TU	P	TW					
Credit	**3**	**0**	**1**	**0**	4	Theory	40	60	100
Hours	**3**	**0**	**2**	**0**	5	Practical	30	20	50

Pre-requisites:

Algorithm analysis & Design

Learning Outcome:

Learning Outcomes:

After learning the course the students should be able to:

- Identify and describe soft computing techniques and their roles in building intelligent machines
- Recognize the feasibility of applying a soft computing methodology for a particular problem
- Apply fuzzy logic and reasoning to handle uncertainty and solve engineering problems
- Apply genetic algorithms to combinatorial optimization problems
- Apply neural networks to pattern classification and regression problems
- Effectively use existing software tools to solve real problems using a soft computing approach
- Evaluate and compare solutions by various soft computing approaches for a given problem.

Theory syllabus

Unit	Content	Hrs
1	**Introduction** What is soft computing? Differences between soft computing and hard computing, Soft Computing constittuents, Methods in soft computing, Applications of Soft Computing	**6**
2	**Introduction to Genetic Algorithms** 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	**8**
3	**Neural Networks** Concept, biological neural syste,. Evolution of neural network, McCulloch-Pitts neuron model, activation functions, feedforward networks, feedback networks, learning rules – Hebbian, Delta, Percepron learning and Windrow-Hoff, winner-take-all	**7**
4	**Supervised learning** Perceptron learning, single l layer/multilayer perceptron, linear separability, hidden layers, back popagation 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	**8**
5	**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	**8**

	Systems, Fuzzy Expert Systems, Fuzzy Decision Making; Neuro-fuzzy modeling- Adaptive Neuro-Fuzzy Inference Systems, Coactive Neuro-Fuzzy Modeling, Classification and Regression Trees, Data Clustering Algorithms, Rulebase Structure Identification and Neuro-Fuzzy Control , Applications of neuro-fuzzy modeling	
6	**Swarm Intelligence** 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	**8**

Practical content

- Practical will be based on genetic algorithm, crossover, mutation and generation gap.
- Labs will be requiring involvement of a learner in neural network, fuzzy logic and neuro-fuzzy modelling.
- Practical understating for swarm intelligence will be visualized by learners active participation
- Practical will be based on Fuzzy Relations, Membership Functions, Fuzzy Rules & Fuzzy Reasoning, Fuzzy Inference Systems, Fuzzy Expert Systems,
- Practical will be based on Fuzzy Decision Making; Neuro-fuzzy modeling- Adaptive Neuro-Fuzzy Inference Systems, Coactive Neuro-Fuzzy Modeling,
- Practical will be based on Rulebase Structure Identification and Neuro-Fuzzy Control , Applications of neuro-fuzzy modeling
- Practical will be based on Percepron learning and Windrow-Hoff
- Practical will be based on adaptive resonance architecture,
- Practical will be based on face recognition,
- Practical will be based on application of neural networks in image processing

Text Books

1	S.N. Shivanandam, Principle of soft computing, Wiley. ISBN13: 9788126527410 (2011)
2	Jyh-Shing Roger Jang, Chuen-Tsai Sun, EijiMizutani, “Neuro-Fuzzy and Soft Computing”, Prentice-Hall of India, 2003.
3	George J. Klir and Bo Yuan, “Fuzzy Sets and Fuzzy Logic-Theory and Applications”, Prentice Hall, 1995.
4	James A. Freeman and David M. Skapura, “Neural Networks Algorithms, Applications, and Programming Techniques”, Pearson Edn., 2003.

Reference Books

1	Mitchell Melanie, “An Introduction to Genetic Algorithm”, Prentice Hall, 1998.
2	David E. Goldberg, Genetic Algorithms in Search, Optimization & Machine Learning, Addison Wesley, 1997.