DEPARTMENT OF COMPUTER APPLICATIONS

NATIONAL INSTITUTE OF TECHNOLOGY, TIRUCHIRAPPALLI

COURSE PLAN – PART I			
Name of the programme and specialization	M.Sc. Computer Science		
Course Title	Soft Computing		
Course Code	CAS7A2	No. of Credits	3
Course Code of Pre-requisite subject(s)	-		
Session	July 2018	Section (if, applicable)	-
Name of Faculty	Dr. R. Eswari	Department	Computer Applications
Email	eswari@nitt.edu	Telephone No.	0431-2503744
Name of Course Coordinator(s) (if, applicable)			
E-mail		Telephone No.	
Course Type	☐ Core course	☑ Elective course	

Syllabus (approved in BoS)

Soft Computing and its Techniques, Soft Computing verses Hard Computing. Applications of Soft Computing in the current industry. Fuzzy Sets, Operations on Fuzzy sets, Fuzzy Relations, Fuzzy Measures, Applications of Fuzzy Set Theory to different branches of Science and Engineering.

Neural Network (NN), Biological foundation of Neural Network, Neural Model and Network Architectures, Perceptron Learning, Supervised Hebbian Learning, Back-propagation, Associative Learning, Competitive Networks, Hopfield Network, Computing with Neural Nets and applications of Neural Network.

NeuroFuzzy and Soft Computing, Adaptive Neuro-Fuzzy Inference System Architecture, Hybrid Learning Algorithm, Learning Methods that Cross-fertilize ANFIS and RBFN. Coactive Neuro Fuzzy Modeling, Framework Neuron Functions for Adaptive Networks, Neuro Fuzzy Spectrum. Hybridization of other techniques.

Genetic Algorithm, Fundamentals, basic concepts, working principle, encoding, fitness unction, reproduction, Genetic modeling: Inheritance operator, cross over, inversion & deletion, mutation operator, Bitwise operator, Generational Cycle, Convergence of GA, Applications & advances in GA, Differences & similarities between GA & other traditional methods. Hybrid Systems, Integration of neural networks, fuzzy logic and genetic algorithms.

Introduction to Swarm Intelligence and key principles (e.g., self-organization, stigmergy), natural and artificial examples, computational and embedded SI. From real

to virtual ants: Ant System (AS), the first combinatorial optimization algorithm based on ant trail. Application to a classical operational research problem: the Travel Salesman Problem (TSP). Introduction to unsupervised multi-agent machine-learning techniques for automatic design and optimization: terminology and classification, Genetic Algorithms (GA) and Particle Swarm optimization (PSO). Comparison between both techniques in theory and practice.

COURSE OBJECTIVES

- To introduce the techniques of soft computing.
- To explain the hybridization of soft computing systems.
- To distinguish between conventional AI and Soft Computing systems in terms of its tolerance to imprecision and uncertainty.

COURSE OUTCOMES (CO)

Course Outcomes	Aligned Programme Outcomes (PO)
1. Implement soft computing algorithms	
2. Model global optimization solutions for various real life problems	

COURSE PLAN – PART II

COURSE OVERVIEW

This course deals with approximate models and gives solution to complex real-life problems. Unlike hard computing, soft computing is tolerant of imprecision, uncertainty, partial truth, and approximations. It covers fuzzy logic, artificial neural networks, genetic algorithm, neuro-fuzzy and some biological inspired methodologies. On Successful completion of this course, students should be able to solve complex problems using these techniques.

COURSE TEACHING AND LEARNING ACTIVITIES

S.No.	Week/Contact Hours	Topic	Mode of Delivery
1	1	Introduction to soft computing, Introduction to fuzzy logic, Fuzzy membership functions	Chalk and Talk , Power Point Presentation
2	2	Fuzzy operations, Fuzzy relations, Fuzzy implications and inferences	-do-
3	3	Defuzzification techniques, Fuzzy Logic Controller	-do-
4	4	Introduction to artificial neural networks, ANN architectures, Training ANNs	-do-

5	5	Perceptron learning, supervised hebbian learning, Back propagation, associative learning, Hopfield network	-do-
6	6	Concept of genetic algorithm, GA operator encoding schemes, GA operator selection	-do-
7	7	GA cross over techniques, GA operator mutation and other	-do-
8	8	Neurofuzzy and soft computing, Hybrid learning algorithms, ANFIS and RBFN	-do-
9	9	Coactive neuro fuzzy modelling, Neuro functions for adaptive networks, Hybridization of other techniques	-do-
10	10	Introduction to swarm intelligence and key principles, Examples, Ant systems	-do-
11	11	PSO, Applications, Soft computing tools	-do-

COURSE ASSESSMENT METHODS (shall range from 4 to 6)

S.No.	Mode of Assessment	Week/Date	Duration	% Weightage
1	Cycle test1	4th week of August	1 Hr	15
2	Cycle test2	3rd week of october	1 Hr	15
3	Problem solving	4th week of Oct.	5 hrs	20
4	End semester exam	At the end of course	3 hrs	50

COURSE EXIT SURVEY (mention the ways in which the feedback about the course shall be assessed)

- The students through the class representative may give their feedback at any time to the course faculty which will be duly addressed.
- The students may also give their feedback during Class Committee meeting.

COURSE POLICY (preferred mode of correspondence with students, compensation assessment policy to be specified)

MODE OF CORRESPONDENCE (email/ phone etc)

The students can get the availability of faculty member over phone and email. They

can get their doubts clarified at any time with their faculty member with prior appointment.

COMPENSATION ASSESSMENT POLICY

One compensation assessment for absentees in assessments (other than final assessment) is mandatory. Only genuine cases of absence shall be considered.

ATTENDANCE POLICY (A uniform attendance policy as specified below shall be followed)

- **At least 75% attendance in each course is mandatory.**
- **A maximum of 10% shall be allowed under On Duty (OD) category.**
- Students with **less than 65% of attendance** shall be prevented from writing the final assessment and **shall be awarded 'V' grade.**

ACADEMIC DISHONESTY & PLAGIARISM

- Possessing a mobile phone, carrying bits of paper, talking to other students, copying from others during an assessment will be treated as punishable dishonesty.
- Zero mark to be awarded for the offenders. For copying from another student, both students get the same penalty of zero mark.
- The departmental disciplinary committee including the course faculty member, PAC chairperson and the HoD, as members shall verify the facts of the malpractice and award the punishment if the student is found guilty. The report shall be submitted to the Academic office.

  The above policy against academic dishonesty shall be applicable for all the programmes.

ADDITIONAL INFORMATION

FOR APPROVAL

Course Faculty _____ **CC-Chairperson** _____ **HOD** _____