Artificial Intelligence

Faculty Name: Archana Lopes

Course Code: EXC7052

Subject Name: Artificial Intelligence

Academic Year and Term: 2018-2019 Jul-Dec 2018

1. Syllabus

Course Code	Course Name	Teaching Scheme			Credits Assigned			
		Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
EXC7052	Artificial Intelligence	04	--	--	04	--	--	04

Course Code	Course Name	Examination Scheme							
		Theory Marks				Term Work	Practical	Oral	Total
		Internal assessment			End Sem. Exam				
		Test 1	Test 2	Ave. Of Test 1 and Test 2					
EXC7052	Artificial Intelligence	20	20	20	80	-	-	-	100

Course Prerequisite:

- Knowledge of linear algebra, multivariate calculus, and probability theory
- Knowledge of a programming language (MATLAB /C/C ++ recommended)

Course Objective:

1. To study basics of biological Neural Network.
2. To understand the different types of Artificial Neural Networks
3. To know the applications of ANN
4. To study fuzzy logic and fuzzy systems

Course Outcome: At the end of completing the course of Artificial Neural Networks, a student will be able to:

1. Choose between different types of neural networks
2. Design a neural network for a particular application
3. Understand the applications of neural networks
4. Appreciate the need for fuzzy logic and control

Module No.	Unit No.	Topics	Hrs.
1.		**Fundamental Concepts of Neural Networks**	8
	1.1	Difference between fuzzy and crisp sets and applications of fuzzy logic and	
	1.2	Biological neurons, McCulloch and Pitts models *of* neuron, Important Terms of ANNs, McCulloch-Pitts Neuron, Hebb Network, Supervised learning,	
	1.3	Applications and scope of Neural Network	
2		**Supervised Learning Networks**	12
	2.1	Perception Networks: Adaline, Madaline	
	2.2	Back Propagation Network	
	2.3	Function Network	
3		**Unsupervised learning network**	12
	3.1	Max Net, Mexican Hat, Kohonen Self-organizing Feature	
	3.2	Maps, Learning Vector Quantization, Adaptive Resonance Theory	
4		**Associative networks**	10
	4.1	Pattern Association, Auto-associative Memory Network, Hetero-associative Memory Network, Bidirectional Associative Memory, Discrete Hopfield Networks	
	4.2	**Special networks:** Simulated annealing neural networks, Boltzmann machine, Brain-in-a-Box	
5		**Fuzzy logic**	10
	5.1	Fuzzy sets, Properties, Operations on fuzzy sets, Fuzzy relation Operations on fuzzy relations,	
	5.2	The extension principle, Fuzzy mean Membership functions, Fuzzification and defuzzification methods	
	5.3	Fuzzy controllers, Adaptive neuro-fuzzy information systems (ANFIS)	
		Total	52

2.Course Outcomes

Course Objective:

- To study basics of biological Neural Network.
- To understand the different types of Artificial Neural Networks
- To know the applications of ANN
- To study fuzzy logic and fuzzy systems

Course Outcomes:

At the end of the course student will be able to

EXC7052.1 Implement the algorithms for Supervised and Unsupervised Neural Network.

EXC7052.2 Design Fuzzy Logic based controllers.

EXC7052.3 Compare various Associative Neural Networks.

EXC7052.4 Identify and Analyze the issues involved in Neural Network design.

Mapping of CO with PO/PSO:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2
CO 1	**1**		**2**		**3**								**2**	
CO 2	**2**		**3**		**3**								**2**	
CO 3		**3**												
CO 4		**3**	**2**										2	

Mapping of CO with PO with Justification

CO	PO	Justification
EXC7052.1	**PO1**	Acquiring the understanding of various algorithms for Supervised Learning by applying knowledge of mathematics.
	PO3	Implementing algorithms of Supervised and Unsupervised Learning can be used to design and conceptualize systems to realize practical applications.
	PO5	Use MATLAB or Neural Network Simulators to implement Supervised and Unsupervised algorithms.
EXC7052.2	**PO1**	Acquire and apply knowledge of mathematics required for design of Fuzzy Controllers.
	PO3	Design a fuzzy controller to conceptualize systems for realizing practical applications .
	PO5	Use MATLAB/C++ to implement fuzzy controller.
EXC7052.3	**PO2**	Understanding the various Associative Network algorithms after analysis of system.
EXC7052.4	**PO2**	Identify the problems involved in designing neural network by analyzing the present problem.
	PO3	Design a Neural Network to solve practical applications.
	PO10	Preparing students for technical paper writing and paper presentation.

Mapping of CO with PSO with Justification

CO	PSO	Justification
EXC7052.2	**PSO2**	Design and test fuzzy controller for different applications.

Contribution to outcomes will be achieved through content delivery:
Modes of Content Delivery:

i	Class Room Teaching	v	Self Learning Online Resources	ix	Industry Visit
ii	Tutorial	vi	Slides	x	Group Discussion
iii	Remedial Coaching	vii	Simulations/Demonstrations	xi	Seminar
iv	Lab Experiment	viii	Expert Lecture	xii	Case Study

Modes of delivery

Modes of Delivery	Brief description of content delivered	Attained COs	Attained POs
Class room lecture	• **Fundamental Concepts of Neural Networks** • **Supervised Learning Networks** • **Unsupervised learning network** • **Associative networks** • **Fuzzy logic**	**EXC7052.1** **EXC7052.2** **EXC7052.3**	**PO1** **PO2** **PO3** **PO5**
Assignments	• **Assignment 1 on problems based on algorithms of Supervised and Unsupervised Learning Algorithms** • **Assignment 2 on Associative Networks** • **Assignment 3 on Fuzzy Logic**	**EXC7052.1** **EXC7052.2** **EXC7052.3**	**PO1** **PO2** **PO3** **PO5**
Students presentations	• **IEEE paper on Neural Network and fuzzy system will be given to the students** • **Mini Project** • **Poster Presentation**	**EXC7052.4**	**PO2** **PO3** **PO5** **PO10**

CO Assessment Tool

Course Outcome						*Assessment Method*				
			Direct Method (70 %)							*Ind Met (30*
	Unit Tests		Assignments			Laboratory Practical	Case Study	Mini Project	End Sem Result	Cou surv
	1	2	1	2	3					
EXC705 2.1	20%		10%			20%			50%	100
EXC705 2.2		30%			10%	10%			50%	100
EXC705 2.3		20%		10%		20%			50%	100
EXC705 2.4							25%	25%	50%	100

Rubrics for assessing Course Outcome CO1, CO2 and CO3 with each assessment tool:

Rubrics				

Assignment	Timeline(2)	Level of content(4)	Reading and Understanding(4)	
Laboratory Experiments	Timeline(3)	Knowledge(4)	Skill(3)	
Case study	Timeline(2)	Level of content(4)	Reading and Understanding(4)	Presentation and Report (20)
Mini Project	Timeline(3)	Implementation(5)	Understanding(2)	

3. ***Lesson Plan***

Faculty : Archana Lopes

CLASS		BE Electronics, Semester VII	
Academic Term		July-Dec 2018	
Subject		**Artificial Intelligence**	
Periods (Hours) per week	***Lecture***	***4***	
	Practical	***2***	
	Tutorial	***--***	
Evaluation System		***Hours***	***Marks***
	Theory examination	3	80
	Internal Assessment	--	20
	Practical Examination	--	--
	Oral Examination	--	25
	Term work	--	25
	Total	--	150

Time Table	***Day***	***Time***
	Tuesday	1.30 p.m.
	Wednesday	1.30 p.m.
	Thursday	1.30 p.m.
	Friday	8.45 a.m.

Course Content and Lesson plan

Module 1:Fundamental concepts of Neural Networks

Week	Lecture No.	Date		Topic	Remarks(If any)	Text Book	CO	PO
		Planned	Actual					
1	1	03/07/2018	03/07/2018	Introduction		TB1 TB2 TB4 TB6	EXC7052.1	PO1 PO3 PO5
	2	05/07/2018	04/07/2018	Biological neuron,McCulloch and Pitts models *of* neuron, Important Terms of ANNs				
	3	06/07/2018	05/07/2018	Learning Rule				
	4	10/07/2018	13/07/2018	Hebb Network				
2	5	11/07/2018	17/07/2018	Applications of neural networks				
	6	13/07/2018	17/07/2018	Problems solving based on Mc-Culloch and Pitts model and Hebb				

				network.				
	7	17/07/2018	18/07/2018	Problems solving based on Mc-Culloch and Pitts model and Hebb network.				
	8	18/07/2018	18/07/2018	Perceptron Networks				
	Module 2: Supervised Learning Networks							
3	9	19/07/2018	19/07/2018	Problems based on Perceptron networks	Assignment 1			
	10	20/07/2018	20/07/2018	Adaline-Delta Learning rule		TB1 TB2 TB4 TB6	**EXC7052.1**	PO1 PO3 PO5
	11	24/07/2018	24/07/2018	Problems based on Adaline				
	12	25/07/2018	25/07/2018	Madeline				
4	13	26/07/2018	27/07/2018	Back Propagation Neural Networks				
	14	27/07/2018	31/07/2018	Back Propagation Neural Networks				
	15	31/07/2018	02/08/2018	Problems based on BPNN				
	16	01/08/2018	03/08/2018	RBF networks	Submission of Assignment 1			
5	17	02/08/2018	03/08/2018	Problems based on RBF networks			**EXC7052.1**	PO1 PO3 PO5
	18	03/08/2018	04/08/2018	Functional Link networks				
	19	07/08/2018	04/08/2018	Revision Problems	Assignment 2			
	20	08/08/2018	07/08/2018	Introduction to Unsupervised learning network.			**EXC7052.1**	PO1 PO3 PO5
Module 3:Unsupervised Learning Networks								

7	21	09/08/2018	07/08/2018	Maxnet		TB1 TB2 TB4 TB6	**EXC7052.1**	PO1 PO3 PO5
	22	10/08/2018	08/08/2018	Maxican Hat net				
	23	21/08/2018	09/08/2018	Hamming Network				
	24	23/08/2018	10/08/2018	Kohonen Self Organizing Feature Maps				
8	25	24/08/2018	11/08/2018	Learning Vector quantization				
	26	28/08/2018	23/08/2018	ART networks				
	27	29/08/2018	23/08/2018	ART networks				
9	28	30/08/2018	23/08/2018	Problem solving				
Module 4: Associative Networks								
9	29	31/08/2018	24/08/2018	Associative Networks-training algorithm	Submission of Assignment 2			
9	30	04/09/2018	28/08/2018	Auto Associative Memory Network		TB1 TB2 TB4 TB6	**EXC7052.3**	PO2
	31	05/09/2018	29/08/2018	Bi-directional Associative Memory				
10	32	06/09/2018	30/08/2018	Hopfield Networks				
	33	11/09/2018	30/08/2018	Hopfield Networks				
	34	12/09/2018	31/08/2018	Special Networks-Simulated Annealing Network				
11	35	18/09/2018	04/09/2018	Boltzmann Machine				
	36	19/09/2018	05/09/2018	Brain in a box				
Module 5: Fuzzy Logic								
11	37	25/09/2018	25/09/2018	Fuzzy sets and fuzzy set operations, Fuzzy relations	Assignment 3			
	38	26/09/2018	26/09/2018	Operations on Fuzzy Relations, The extension principle	Submission of Assignment 3	TB3 TB5	**EXC7052.2**	PO1 PO3PO5

12	39	27/09/2018	27/09/2018	Fuzzy mean membership functions				
	40	28/09/2018	28/09/2018	Fuzzy controllers and ANFIS				

Text- Books:

1. Simon Haykin, "Neural Network a -Comprehensive Foundation"
2. Dr. S.N. Sivanandam, Mrs. S. N. Deepa, Introduction to Soft Computing tool
3. Timothy Ross, "Fuzzy Logic with Engineering Applications"
4. Satish Kumar , Neural Network: A classroom Approach
5. Rajsekaran S, Vijayalakshmi Pai, Neural Networks, Fuzzy Logic and Genetic Algorithms
6. Hagan, Demuth, “Neural Network Design”

Examination Scheme

Module		Lecture Hours	Marks distribution in Test (For internal assessment/TW)		Approximate Marks distribution in Sem. End Examination
			Test 1	Test 2	
1.	Fundamental Concepts of Neural Networks	8	08		20
2.	Supervised Learning Networks	12	08		30
3	Unsupervised Learning Networks	12	04		20
4	Associative Networks	10		08	20
5	Fuzzy Logic	10		12	30

Term Work:

The term work shall consist of at least **two assignments and ten experiments** covering the whole of syllabus, duly recorded and graded.

The distribution of marks for term work shall be as follows:

Laboratory work (Experiments and Journal) : 15 marks.