Academic Course Description

BHARATH UNIVERSITY

Faculty of Engineering and Technology

Department of Electronics and communication Engineering

BCS002- NEURAL NETWORKS

Sixth Semester, 2016-17 (Even Semester)

Course (catalog) description

- Basic neuron models: McCulloch-Pitts model and the generalized one, distance or similarity based neuron model, radial basis function model, etc.
- Basic neural network models: multilayer perceptron, distance or similarity based neural networks, associative memory and self-organizing feature map, radial basis function based multilayer perceptron, neural network decision trees, etc.

Compulsory/Elective course : Elective for ECE students

Credit & Contact hours : 3 & 45

Course Coordinator : Ms D.Vimala, Asst Professor

Instructors :

Name of the instructor	Class handling	Office location	Office phone	Email (domain:@ bharathuniv.ac.in	Consultation
Ms D.Vimala	Final Year	SA 104			9.00-9.50 AM
Mr.Arunachalam	Final Year	SA 103		Arun89chal@gmail.com	12.45-1.15 PM

Relationship to other courses:

Pre –requisites : Mathematics-I, Mathematics-II, Numerical Methods

Assumed knowledge : The students will have a electronics and computer background obtained at a high school (or Equivalent) level. In particular, working knowledge of basic electronics including Networks, oops are assumed.

Following courses : Fuzzy Logic

SYLLABUS

UNIT-I BACK PROPAGATION 9

Introduction to Artificial Neural systems - Perception - Representation - Linear Separability - Learning - Training algorithm - The back propagation network - The generalized data rule - Practical considerations - BPN applications.

UNIT-II STATISTICAL METHODS **9**

Hopfield nets - Cauchy training - Simulated annealing-The Boltzmann machine. Associative memory - Bidirectional associative memory -Applications.

UNIT-III COUNTER PROPAGATION NETWORK & SELF ORGANISATION MA **9**

CRN building blocks - CPN data processing. SQM data processing - Applications

UNIT-IV ART AND SPATIO TEMPORAL PATTERN CLASSIFICATION **9**

ART network description - ART1 -ART2-Application. The formal avalanche -Architecture of station temporal networks - The sequential competitive avalanche field - Applications of STNs.

UNIT-V NEO-CONGNITRON **9**

Cognitron - Structure & training - The neocognitron architecture - Data processing - Performance - Addition of lateral inhibition and feedback to the neocognitron. Optical neural networks - Holographic correlators.

TOTAL NO OF PERIODS: 45

TEXTBOOKS

1. James Freeman A and David Skapura M. "Neural Networks – Algorithms, Applications & Programming Techniques", Pearson Education, 2005.
2. Yegnanarayana B., "Artificial Neural Networks", Prentice Hall of India Private Ltd, 2003

REFERENCES

1. Neural Network Design, Martin T Hagan, 2nd edition, 2014.
2. Principle of neural science, Eric R.Kandel, 5th edition, 2012.
3. http://hagan.okstate.edu/NNDesign.pdf

Computer usage: Nil

Professional component

General	-	0%
Basic Sciences	-	0%
Engineering sciences & Technical arts	-	0%
Professional subject	-	100%

Broad area : Instrumentation | Electronics | Transmission Lines and Networks | Biomedical

Test Schedule

S. No.	Test	Tentative Date	Portions	Duration
1	Cycle Test-1	August 1st week	Session 1 to 12	2 Periods
2	Cycle Test-2	September 2nd week	Session 17 to 25	2 Periods
3	Model Test	October 2nd week	Session 1 to 45	3 Hrs
4	University Examination	TBA	All sessions / Units	3 Hrs.

Mapping of Instructional Objectives with Program Outcome

To develop problem solving skills and understanding of circuit theory through the application of techniques and principles of electrical circuit analysis to common circuit problems. This course emphasizes:	Correlates to program outcome		
	H	**M**	**L**
Be able to analyze a problem for NN solution in terms of these methods.	a	b,d	
Have an awareness of the computational theory underlying NN.	b,d		
Have a working knowledge of a typical neural network simulation	b,d	a	
Experience in programming NN applications from scratch.	b,c,d		
Have knowledge of sufficient theoretical background to be able to reason about the behaviour of neural networks.	b,d	f	a

H: high correlation, M: medium correlation, L: low correlation

Draft lecture schedule

Session	Topics	Problem solving (Yes/No)	Text / Chapter
UNIT I	**SCIENCE OF MEASUREMENT**		
1.	Introduction to Artificial Neural systems - Perception	No	[T1]
2.	Representation - Linear Separability	No	
3.	Learning - Training algorithm - The back propagation network	No	
4.	The generalized data rule	No	
5.	Practical considerations	No	
6.	BPN applications	No	
UNIT II	**STATISTICAL METHODS**		
7.	Hopfield nets - Cauchy training	No	[T1]
8.	Simulated annealing	yes	
9.	The Boltzmann machine	No	
10.	Associative memory	yes	
11.	Bidirectional associative memory	No	
12.	Applications.	No	
UNIT III	**COUNTER PROPAGATION NETWORK & SELF ORGANISATION MAPS**		
13.	CRN building blocks	No	[T1]
14.	CPN data processing.	No	
15.	SQM data processing	No	
16.	Applications	No	
UNIT IV	**ART AND SPATIO TEMPORAL PATTERN CLASSIFICATION**		
17.	ART network description - ART1 Application	No	[T1]
18.	ART2-Application	No	
19.	The formal avalanche	No	
20.	Architecture of station temporal networks	No	
21.	The sequential competitive avalanche field	No	
UNIT V	**NEO-CONGNITRON**		
22.	Cognitron - Structure & training	No	[T1]
23.	The neocognitron architecture - Data processing	No	
24.	Performance - Addition of lateral inhibition	No	
25.	feedback to the neocognitron.	No	
26.	Optical neural networks	No	
27.	Holographic correlators	No	

Teaching Strategies

The teaching in this course aims at establishing a good fundamental understanding of the areas covered using:

- Formal face-to-face lectures
- Tutorials, which allow for exercises in problem solving and allow time for students to resolve problems in understanding of lecture material.
- Laboratory sessions, which support the formal lecture material and also provide the student with practical construction, measurement and debugging skills.
- Small periodic quizzes, to enable you to assess your understanding of the concepts.

Evaluation Strategies

Cycle Test – I	-	5%
Cycle Test – II	-	5%
Model Test	-	10%
Assignment /Seminar/online test/quiz	-	5%
Attendance	-	5%
Final exam	-	70%

Prepared by: Ms D.Vimala, Asst Professor. **Dated :**

Addendum

ABET Outcomes expected of graduates of B.Tech / ECE / program by the time that they graduate*:*

a. An ability to apply knowledge of mathematics, science, and engineering

b. An ability to design and conduct experiments, as well as to analyze and interpret data

c. An ability to design a hardware and software system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability

d. An ability to function on multidisciplinary teams

e. An ability to identify, formulate, and solve engineering problems

f. An understanding of professional and ethical responsibility

g. An ability to communicate effectively

h. The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context

i. A recognition of the need for, and an ability to engage in life-long learning

j. A knowledge of contemporary issues

k. An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

Program Educational Objectives

PEO1: PREPARATION

Electronics Engineering graduates are provided with a strong foundation to passionately apply the fundamental principles of mathematics, science, and engineering knowledge to solve technical problems and also to combine fundamental knowledge of engineering principles with modern techniques to solve realistic, unstructured problems that arise in the field of Engineering and non-engineering efficiently and cost effectively.

PEO2: CORE COMPETENCE

Electronics engineering graduates have proficiency to enhance the skills and experience to apply their engineering knowledge, critical thinking and problem solving abilities in professional engineering practice for a wide variety of technical applications, including the design and usage of modern tools for improvement in the field of Electronics and Communication Engineering.

PEO3: PROFESSIONALISM

Electronics Engineering Graduates will be expected to pursue life-long learning by successfully participating in post graduate or any other professional program for continuous improvement which is a requisite for a successful engineer to become a leader in the work force or educational sector.

PEO4: SKILL

Electronics Engineering Graduates will become skilled in soft skills such as proficiency in many languages, technical communication, verbal, logical, analytical, comprehension, team building, interpersonal relationship, group discussion and leadership ability to become a better professional.

PEO5: ETHICS

Electronics Engineering Graduates are morally boosted to make decisions that are ethical, safe and environmentally-responsible and also to innovate continuously for societal improvement.

Course Teacher	Signature
Ms D.Vimala	

Course Coordinator **HOD/ECE**