Academic Course Description

BHARATH UNIVERSITY
Faculty of Engineering and Technology
Department of Electrical and Electronics Engineering

BEE014 Fuzzy Logic And Neural Network
Seventh Semester(Odd Semester)

Course (catalog) description

To master the various fundamental concepts of fuzzy logic and artificial neural networks. This will help you to get sufficient knowledge to analyze and design the various intelligent control systems

Compulsory/Elective Course: Elective For EEE Students

Credit hours& contact hours: 3 & 45 hours

Course Coordinator : MR.K.S.S.PRASAD

Instructors : MR.K.S.S.PRASAD

Name of the instructor	Class handling	Office location	Office phone	Email (domain:@ bharathuniv.ac.in	Consultation
MR.K.S.S.PRASAD	Final Year EEE	KS 303	**04422290125**	Hod.eee@**bharathuniv.ac.in**	9.00-9.50 AM

Relationship to other courses:

Pre –requisites **:** Fundamental of Computing

Assumed knowledge : A fuzzy control system is a control system based on fuzzy logic—a mathematical system that analyzes analog input values in terms of logical variables that take on continuous values between 0 and 1, in contrast to classical or digital logic.

Following courses : BEE027-MICROCONTROLLED BASED SYSTEM DESIGN, BEC013-AUTOMOTIVE ELECTRONICS, BE1704 VIRTUAL INSTRUMENTATION

Syllabus Contents:

UNIT I FUNDAMENTALS OF FUZZY LOGIC 9

Basic concepts: fuzzy set theory- basic concept of crisp sets and fuzzy sets- complements- union-intersection- combination of operation- general aggregation operations- fuzzy relations-compatibility relations-orderings- morphisms- fuzzy relational equations-fuzzy set and systems

UNIT II ARCHITECTURE OF NEURAL NETWORKS 9

Architectures: motivation for the development of natural networks-artificial neural networks-biological neural networks-area of applications-typical Architecture-setting weights-common activations functions-Basic learning rules- Mcculloch-Pitts neuron- Architecture, algorithm, applications-single layer net for

pattern classification- Biases and thresholds, linear separability - Hebb'srule- algorithm -perceptron - Convergence theorem-Delta rule

UNIT III BASIC NEURAL NETWORK TECHNIQUES 9

Back propagation neural net:standard back propagation-architecture algorithm- derivation of learning rules-number of hidden layers--associative and other neural networks- hetro associative memory neural net, auto associative net- Bidirectional associative memory-applications-Hopfield nets-Boltzman machine

UNIT IV COMPETITIVE NEURAL NETWORKS 9

Neural network based on competition: fixed weight competitive nets- Kohonenself organizing maps and applications-learning vector quantization-counter propagation nets and applications adaptive resonance theory: basic architecture and operation-architecture, algorithm, application and analysis of ART1 & ART2

UNIT V SPECIAL NEURAL NETWORKS 9

Cognitron and Neocognitron - Architecture, training algorithm and application-fuzzy associate memories, fuzzy system architecture- comparison of fuzzy and neural systems.

Text book(s) and/or required material

1. T1. Kliryvan- Fuzzy System & Fuzzy logic Prentice Hall of India, First Edition.
2. Lawrence Fussett- fundamental of Neural network Prentice Hall , First Edition.

Reference Books:

1. Bart Kosko, "Neural network and Fuzzy System" - Prentice Hall-1994.
2. J.Klin and T.A.Folger, "Fuzzy sets" University and information- Prentice Hall -1996.
3. J.M.Zurada, "Introduction to artificial neural systems"-Jaico Publication house,Delhi 1994.
4. VallusuRao and HayagvnaRao , "C++ Neural network and fuzzy logic"-BPB and Publication, New Delhi,1996.
5. Intelligent Systems and Control-http://nptel.ac.in/courses/108104049/16

Computer usage: YES

Professional component

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

Test Schedule

S. No.	Test	Tentative Date	Portions	Duration
1	Cycle Test-1	August 1st week	Session 1 to 14	2 Periods
2	Cycle Test-2	September 2nd week	Session 15 to 28	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 master the various fundamental concepts of fuzzy logic & artificial Neural networks This will help you to get sufficient knowledge Analyze and design the various intelligent control systems.	Correlates to program outcome		
	H	**M**	**L**
1. To understand the basic concept of fuzzy sets, fuzzy logic & defuzzification	d,h,j	a,b,c,e,f,g,l	k
2. To learn basics of Artificial Neural of theory and programming of Microprocessors	d,e,h,i,j	b,c,g,l	K
3. To analyze various techniques in feedback and feed forward Neural networks.	b,e,h,I,l	f	g.k
4. To Understand the principle of competitive neural networks and Adaptive resonance theory	b,e,I,k,l	c,f,h	g,j
5. To learn the architecture and algorithm of Cognitron, Neo cognitron The concepts of fuzzy associative memory and fuzzy systems.	a,d,e,	b,c,g	K,l

Draft Lecture Schedule

UNIT I	**FUNDAMENTALS OF FUZZY LOGIC**		
1.	Fuzzy set theory	NO	T1,R2
2.	Basic cincept of crisp sets and Fuzzy sets	NO	
3.	Complements- union- intersection	YES	
4.	Combination of operation	NO	
5.	General aggregation operation	NO	
6.	Fuzzy relations-compatibility relations	NO	
7.	Orderings- morphisms	YES	
8.	Fuzzy relational equations	NO	
9.	Fuzzy set and systems	NO	
UNIT IIARCHITECTURE OF NEURAL NETWORKS			
10.	Motivation for the development of natural networks, artificial neural networks (introduction)	NO	T2,R3
11.	Biological neural networks-area of applications, typical Architecture-setting weights	NO	
12.	Common activations functions	NO	
13.	Basic learning rules	NO	
14.	Mcculloch-Pitts neuron- Architecture, algorithm, applications	NO	
15.	Single layer net for pattern classification- Biases and thresholds	NO	
16.	Linear separability	NO	
17.	Hebb'srule- algorithm	NO	
18.	Perceptron - Convergence theorem-Delta rule	NO	
UNIT III	**BASIC NEURAL NETWORK TECHNIQUES**		
19.	Back propagation neural net:standard back propagation-architecture	NO	T2,R3
20.	Back propagation- algorithm	NO	
21.	Derivation of learning rules	NO	
22.	Number of hidden layers	NO	
23.	Associative, neural networks	NO	
24.	Hetro associative memory neural net	NO	
25.	Auto associative net	NO	

26.	Hopfield nets	NO	
27.	Boltzman machine	No	
28.	Boltzman machine	NO	
UNIT IV COMPETITIVE NEURAL NETWORKS			
29.	Neural network based on competition: fixed weight competitive nets	NO	
30.	Kohonen self organizing maps and applications	NO	
31.	Learning vector quantization	NO	
32.	Counter propagation nets	NO	
33.	Counter propagation nets and applications	NO	T2,R3

34.	Adaptive resonance theory: basic architecture and operation	NO	
35.	ART1 architecture	NO	
36.	ART1 algorithm, application and analysis	NO	
37.	ART2 architecture	NO	
38.	ART2 algorithm, application and analysis	NO	
UNIT V SPECIAL NEURAL NETWORKS			
39.	Cognitron, Architecture,	NO	
40.	Cognitron algorithm and application	NO	
41.	Neocognitron**,** Architecture	NO	
42.	Neocognitron algorithm and application	NO	T2,R2,R4
43.	Fuzzy associate memories	NO	
44.	Fuzzy system architecture	NO	
45.	Comparison of fuzzy and neural systems	No	

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

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.
- Small periodic quizzes, to enable you to assess your understanding of the concepts.
- Video Lectures

Evaluation Strategies

Cycle Test – I	-	5%
Cycle Test – II	-	5%
Model Test	-	10%
Assignment	-	5%
Attendance	-	5%
Final exam	-	70%

Prepared by: **Dated :**

Addendum

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

a) An ability to apply knowledge of mathematics, science, and engineering fundamentals.
b) An ability to identify, formulate, and solve engineering problems.
c) An ability to design a system, component, or process to meet the desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.
d) An ability to design and conduct experiments, as well as to analyze and interpret data.
e) An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.
f) An ability to apply reasoning informed by the knowledge of contemporary issues.
g) An ability to broaden the education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context.
h) An ability to understand professional and ethical responsibility and apply them in engineering practices.
i) An ability to function on multidisciplinary teams.
j) An ability to communicate effectively with the engineering community and with society at large.
k) An ability in understanding of the engineering and management principles and apply them in project and finance management as a leader and a member in a team.
l) An ability to recognize the need for,and an ability to engage in life-long learning.

Program Educational Objectives

PEO1: PREPARATION
Electrical Engineering Graduates are in position with the knowledge of Basic Sciences in general and Electrical Engineering in particular so as to impart the necessary skill to analyze and synthesize electrical circuits, algorithms and complex apparatus.

PEO2: CORE COMPETENCE
Electrical Engineering Graduates have competence to provide technical knowledge, skill and also to identify, comprehend and solve problems in industry, research and academics related to power, information and electronics hardware.

PEO3: PROFESSIONALISM
Electrical Engineering Graduates are successfully work in various Industrial and Government organizations, both at the National and International level, with professional competence and ethical administrative acumen so as to be able to handle critical situations and meet deadlines.

PEO4: SKILL

Electrical Engineering Graduates have better opportunity to become a future researchers/ scientists with good communication skills so that they may be both good team-members and leaders with innovative ideas for a sustainable development.

PEO5: ETHICS

Electrical Engineering Graduates are framed to improve their technical and intellectual capabilities through life-long learning process with ethical feeling so as to become good teachers, either in a class or to juniors in industry.

Course Teacher	Signature
Mr.K.Prassd	

Course Coordinator

(Mr.K.Prassd)

HOD/EEE

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