



FIRST SEMESTER 2022-2023

COURSE HANDOUT (PART II)

Date: Aug 05, 2022

Course No: **MEL G622**

Course Title: **INTRODUCTION TO ARTIFICIAL NEURAL NETWORKS**

Instructor-in-Charge: **R.VENKATESWARAN**

Description : Fundamentals and definitions; Perceptrons, backpropagation and counterpropagation Networks; Statistical methods for network training; Hopfield nets; Associative memories; Optical neural networks; Applications of neural networks in speech processing, computer networks and visual processing

1. Course Description:

The course deals with an introduction and applications of artificial neural networks. It is mainly divided into four modules, wherein, the first module deals with the fundamental concepts of biological neurons and its artificial modeling. These concepts lay the basic foundations required for understanding any form of neural network. The second module will cover the models of artificial neural networks for supervised and un-supervised learning. The various types of learning mechanisms that are required for training the networks will be discussed. The third module will include the various network architectures for feed-forward and feedback networks. Finally, the fourth module deals with the various applications of artificial neural network in electrical engineering.

2. Scope and Objective:

To provide underlying concepts of artificial neural networks and its possible applications in electrical engineering. Lab components involve MATLAB exercises and project, which will provide students to gain hands-on experience along with the concepts gained in the class.

3. Prerequisites: There is no prerequisite for this course.

4. Textbook:

J. M. Zurada, *Introduction to Artificial Neural Systems*, Jaico Publishing House, Mumbai, India, 2012. ISBN: 81-7224-650-1.

Other Reference Books:

R1: K. Mehrotra, C. K. Mohan, and S. Ranka, *Elements of Artificial Neural Networks (2nd Edition)*, Penram International Publishing Private Limited Ltd, Mumbai, 2009. ISBN: 81-8797-220-3.



R2: MT Hagan, HB Demuth, MH Beale, O De Jesus, Neural Network Design, 2nd edition ebook.

R3: R. J. Schalkoff, Artificial Neural Networks, McGraw Hill Education, New York, USA, 2011.

ISBN 12-5900-237-3.

R4: B. Yegnanarayana, Artificial Neural Networks, Prentice Hall India Learning Private Limited publishers, Mumbai, India, 1998. ISBN 81-2031-253-8.

R5: MATLAB Online Tutorials.

Class lectures will be derived either from the text book or reference books and additional materials may be provided whenever necessary.

5. Course Plan:

Lecture No.	Topics to be covered	Learning Outcomes	Reference to Text Book
1	Overview of the course.		
2	Knowledge based systems, Pattern Classification, Machine Learning, and Artificial Neural Network.	Identify different branches involved in Artificial Intelligence	Chapter 1
3-4	Neurons and its significance. Mathematical modeling of neurons and its importance in the neural network.	Learn the anatomical and physiological functions of the biological neurons. Using these functions, mathematical modeling will be known.	Chapter 2
5-10	Supervised and unsupervised learning schemes: Hebbian learning, Perceptron-learning, Delta-learning, Winner take all, Outstar learning, Gradient descent algorithm, Widrow-Hoff, Correlation, Boltzmann.	Different types of supervised and unsupervised learning procedures will be known.	Chapter 2

11-19	Single-layer perceptron, Support vector Classification, Multi-layer perception, Back-propagation training, Radial Basis Function,	Different network architectures associated with supervised learning will be known.	Chapter 3,4,
20-30	Hopfield network, Competitive network, MAXNET, Adaptive Resonance Theory (ART), K-mean clustering algorithm, Counter-propagation network, Self-organizing map (SOM), Convolutional neural network.	Different network architectures associated with unsupervised learning will be known.	Chapter 5,7
31-34	Signal processing, Communication, Power and Control systems.	Different applications of neural networks	Chapter 8,

6. Evaluation Scheme:

Evaluation Component	Durations (Mins)	Weightage (%)	Marks (200)	Date, Time and Venue	Remarks
Mid Semester Test	90	20%	40	02/11 1.30 - 3.00PM	Closed Book
Quizzes/ Assignments	To be announced in the class	10%	20	To be announced	Closed Book
Labs	Regular	20%	40	As per Time table	Open Book
Project	To be announced in the class	20%	40	To be announced	Open book. Project Presentation/report
Comprehensive	180	30%	60	23/12 FN	Closed book



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7. Office Hours: Will be announced in the class.

8. Notices: All Notices regarding the course will be communicated through CMS/emails.

9. Malpractice Regulations:

The following regulations are supplementary to BITS-wide policies regarding malpractices. A mal-practice will include but not limited to:

- Submitting some other student's solution as one's own.
- Copying some other student's code or other forms of solution.
- Permitting some other student to see or copy or submits one's own solution.
- Or other equivalent forms of plagiarism wherein the student does not work out the solution and use some other solution or part thereof (such as downloading it from the LAN or the Web).

10. Make-up Policy:

- Prior permission of the Instructor-in-Charge is usually required
- A make-up test shall be granted only in genuine cases wherein the Instructor's judgment the student would be physically unable to appear for the test.
- Requests for make-up for the comprehensive examination under any circumstances can only be made to Dean, Instruction Division.
- A make-up may not be granted for any other evaluation components.

Academic Honesty and Integrity Policy: Academic honesty and integrity are to be maintained by all the students throughout the semester and no type of academic dishonesty is acceptable

Instructor-in-Charge

MEL G622
