Advanced Neural Networks (CSE 523, CSE448, EEE 432, ETE 432)

Objective: This course aims to introduce the concepts of learning in artificial neural networks. The similarity and dissimilarities between natural and artificial neural networks is discussed in this course. The main objective of this course is to give the ideas to the learners on how to use artificial neural networks in real life problems. More specifically it will address the questions of: which types of problems are more suitable for artificial neural networks and which type of artificial neural network should be used for what type of problem.

Teaching method: Because this course is heavily application oriented, every week there is a two hour theory class and after that there is a one hour tutorial/lab session conducted in the lab where the students will get to know how to apply the theories learned during the theoretical lecture hours with the aid of MATLAB NN toolbox.

Evaluation method: Students are evaluated based on their ability to apply knowledge acquired during the course through complete open book tests where computers are allowed during the examinations; however, any form of communication module is not allowed during the examination. You have to score more than 50% in the written examinations and more than 50% in course project to pass this course.

Academic Dishonesty: A student who cheats, plagiarizes, or furnishes false, misleading information in the course is subject to disciplinary action up to and including an F grade in the course and/or suspension/expulsion from the University.

Non-Discrimination Policy: The course and University policy prohibits discrimination on the basis of race, color, religion, sex, marital or parental status, national origin or ancestry, age, mental or physical disability, sexual orientation, military status.

Course information

Instructor Information: M. Ashraful AMIN, PhD **Email:** aminmdashraful@gmail.com **Web: www.cvcrbd.org** **Office Hours:** M: 1830~2130, **Room**: --- Or any other time by appointment	Theory Class : S: 18:00~19:50; Room: --- Tutorial Class: S: 20:00~20:50; Room: --- **Course web:** www.piaza.com **Textbook: 1. Neural Network Design by Martin T. Hagan** **2. Neural Network: A Comprehensive Foundation by S. Haykin**

Course load distribution:

Course Project	Written Examinations
Land Mark I—literature review----------10%	
Land Mark II—proposal----------05%	Biweekly Quiz----------15%
Land Mark III—Implementation----------10%	Midterm----------20%
Land Mark IV—Oral presentation ----------05%	Final----------35%
Total----------30%	**Total ----------70%**

Tentative Schedule

No.	Duration*	Topic of interest
01	180 min	Biological Neural Networks & Artificial Neural Networks, Strength of neural networks over other statistical learners
02	150 min	Pattern recognition example, Neuron Model and Network Architectures, Transfer functions, Activation functions
03	180 min	Perceptron Learning Rule, Two class example, Multiclass perceptrons,
04	150 min	Signal & Weight Vector space, Linear transforms and neural networks
05	180 min	Supervised Hebbian Learning, performance surface and optimum points, performance optimization
06	150 min	Widrow-Hoff Learning, ADALINE network, LMS algorithm, echo cancelation
07	120 min	Midterm Exam
08	180 min	Backpropagation, multi-layer network, chain-rule, sensitivity, network architecture, generalizations, momentum, learning rate, Levenberg- Marquardt algorithm
09	150 min	Associative learning, unsupervised learning, Kohonen rule, instar and outstar rule
10	180 min	Competitive network, Hamming network, self-organizing maps (SOM), Learning Vector Quantization (LVQ) , Probabilistic neural network
11	150 min	Grossberg Network, vision theory, more on vision simulation neural networks
12	150 min	Stability, recurrent network, Lyapunov and LaSalle's theorem, Hopfield network, convolution neural network
13	180 min	Project presentation
14	120 min	Final Exam

***150 min classes will begin with a 30 minutes Quiz**