University of Tehran
School of Electrical and Computer Engineering

Course:	**8101242 –Neural Network**
Course type:	EE*: Com ☐ E ☐ P ☐ B ☐ Con ☐ D ☐ — CE*: SW ☐ HW ☐ IT ☐ — Credit: 1 Required ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ Elective ☐ ☐ ☐ ☐ ☒ ☐ ☐ ☐ ☐
Level:	Undergraduate ☐ Graduate ■
Co-requisite(s):	None.
Prerequisite(s):	None.
Prerequisite by topic:	Linear Algebra, Programming
Textbook(s):	[1] J.M. Zorada, Introduction to Artificial Neural Systems, West Group; First Edition , 1992. [2] L. Fausett, Fundamentals of Neural Networks, Pearson; First edition, 1993. [3] I. Goodfellow, Y. Bengio and A. Courville , Deep Learning, An MIT Press book, 2016. [4] Convolutional Neural Network(UFLDL Tutorial)/available online at July 2016: http://ufldl.stanford.edu/tutorial/supervised/ConvolutionalNeuralNetwork/ [5] Convolutional Neural Networks (LeNet)/ available online at July 2016: http://deeplearning.net/tutorial/lenet.html
Coordinator:	Kalhor, Professor, School of ECE
Goals:	To familiarize the audience with neural network and applications in classification, identification, competitive learning and prediction. Also, students will be familiar with deep learning and its applications.
Outcome:	Upon successful completion of the course, students will be able to 1. Get familiar with concepts and definitions of neural network 2. Design various classical neural network 3. Apply a neural network to classification and identification problems 4. Get familiar with concepts and definitions of deep learning 5. Get familiar with effective feature extraction by autoencoders and restricted Boltzmann machine 6. Design Convolutional neural network and deep belief network to image and signal classification
Topics:	1) Introduction to neural network 2) Simple neural network applications for classification

	3) Simple neural network applications for pattern recognition 4) Simple neural network applications for competitive problems 5) Multilayer perceptron neural networks 6) Neural network with radial basic function and development in neuro-fuzzy networks 7) Introduction to Autoencoders 8) Introduction to familiar with effective feature extraction by autoencoders and restricted Boltzmann machine 9) Convolutional neural network 10) Deep belief network
Computer usage:	MATLAB, TensorFlow ،Caffe and Torch
Assignments:	4 to 10 homework assignments
Projects:	1 project
Grading:	Assignments: 20 % Project: 20% Midterm exams: 25 % Final exam: 25 %
Further readings:	[1] O. Nelles, Nonlinear System Identification: From Classical Approaches to Neural Networks and Fuzzy Models, Springer, 2001. [2] M. Nielsen, Neural Networks and Deep Learning", Online book , available online at Jan2016: http://neuralnetworksanddeeplearning.com/index.html
Prepared by:	Kalhor, Professor, School of ECE
Date:	23 August 2017

*EE: Electrical Engineering		CE: Computer Engineering	
Com	Communications	SW	Software
E	Electronics	HW	Hardware
P	Power	IT	Information Technology
B	Bioelectronics		
Con	Control		
D	Digital System		