EASTERN MEDITERRANEAN UNIVERSITY
MASTER OF TECHNOLOGY
COURSE POLICY SHEET

ITEC 560

Course Title	Neural Computations
Course Code	ITEC560
Type	Full Time
Semester	Spring
Category	Area Core
Workload	150 Hours
EMU Credit	(3,0,0) 3
Prerequisite	-
Language	English
Level	Graduate
Teaching Format	3 Hours Lecture
ECTS Credit	5
Course Web Site	http://staff.emu.edu.tr/ahmetrizaner/en/Pages/ITEC560.aspx

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Course Description

This course introduces the basic concepts and techniques of neural computation, and cover basic neural network architectures and learning algorithms, for applications in pattern recognition, image processing, and computer vision. This course also provides practical experience of designing and implementing a neural network for a real world application.

General Learning Outcomes

On successful completion of this course students should be able to:

- Describe what a neural network is;
- Describe the relation between real brains and simple artificial neural network models;
- Discuss the main factors involved in achieving good learning and generalization performance in neural network systems;
- Identify the main implementation issues for common neural network systems;
- Evaluate the practical considerations in applying neural networks to real classification problems.

Teaching Methodology / Classroom Procedures

- The course has three hours of lectures in a week.
- Only one make-up exam will be given for the missing exams.
- No make-up will be given for the project.
- Students are supposed to submit the assigned tasks on time.
- Course related materials will be posted on the course web site (http://staff.emu.edu.tr/ahmetrizaner/en/Pages/ITEC560.aspx).

Course Materials / Main References
Text Book: *Neural Networks and Learning Machines (3rd Edition), Simon S. Haykin, Upper Saddle River: Pearson Education, 2009, ISBN-13:978-0-13-147139-9.* ***Resource Books:*** 1. *Fundamentals of Neural Networks: Architectures, Algorithms And Applications, Laurene V. Fausett, Prentice-Hall, Inc. Upper Saddle River, 1994, ISBN:0-13-334186-0.* 2. *The Essence of Neural Networks (Essence of Computing), Robert Callan, Prentice Hall PTR, 1994, ISBN:013908732X.* ***Lecture Notes:*** Lecture notes are available on the course web site in PDF format.

Weekly Schedule / Summary of Topics	
Week 1	Introduction
Week 2	Perceptron
Week 3	Multilayer Perceptron
Week 4	Multilayer Perceptron
Week 5	Associative Memory Neural Network
Week 6	Iterative Associative Memory Neural Network
Week 7	Radial Basis Function (RBF) Networks
Week 8	Self-Organizing Future Maps
Week 9	Midterm Examinations
Week 10	Midterm Examinations
Week 11	Self-Organizing Future Maps
Week 12	Support Vector Machines
Week 13	Presentations
Week 14	Presentations
Week 15	Final Examinations
Week 16	Final Examinations
Week 17	Final Examinations

Requirements
• Some programming capability is essential. Some open-source neural network design software is available for download from various websites. Familiarity with MATLAB is also desirable. • Some basic mathematics using matrix algebra will be used in this course. There will be some review of the necessary material. • A small, focused project will be done over an approximately one month period at the end of the semester. Students will form groups of 1, 2 or 3 by self-organization. • The purpose of the project is to enable the students to get some hands-on experience in the design, implementation and evaluation of neural network algorithms by applying them to real-world problems. The project will be an implementation / examination of some particular aspect of a neural network

algorithm, or it will show the application of an algorithm on a particular problem.

- Projects will be presented to the class. The presentation will be approximately 10-15 minutes, with 5 minutes left over for question-and-answer from the class. Slides made in a commonly used format (i.e. PowerPoint) can be used.
- Each student is expected to attend all presentations.
- An electronic copy of the Project Presentation should also be submitted.
- A take home final exam will be given to the students at the end of the semester containing practical questions.
- You must download your Take Home Exam within the designated time period.
- You should submit a 1-2 page proposal that describes the problem you would like to tackle, objective of the study, proposed algorithms, hardware/software tools and data that you plan to utilize, and evaluation strategies that you plan to use.
- You should get prior approval before starting your project.
- You are free to use any programming language or toolbox but Matlab is strongly recommended.
- You can write the codes yourself or use any code that is available in the public domain. In case you use somebody else's code, you are required to properly cite its source and know the details of the algorithms that the code implements.
- Each student can have only one make-up exam. One who misses an exam should provide a medical report within 3 days after the missed exam. The make-up exam will be organized at the end of the term after the finals and will cover all the topics. No make-up exam will be given for any quiz or assignment.
- Once the grades are announced, the students have only one week to do objection about their grades.
- It is the students' responsibility to follow the announcement in the course web site.
- Students who do not pass the course and fail to attend the lectures regularly may be given NG grade.

	Method of Assessment		
Evaluation and Grading	**Assignments**	**Projects***	**Final Exam**
Percentage	35%	25 %	40 %

*Proposal %5, Documentation/Report %10, Presentation 10%.

Grading Criteria
Letter grades will be decided upon after calculating the averages at the end of the semester. Distribution of the averages will play a significant role in the evaluation of the Letter Grades.

Project Details
A small, focused project will be done over an approximately one month period at the end of the semester. Students will form groups of 1, 2 or 3 by self-organization. The purpose of the project is to enable the students to get some hands-on experience in the design, implementation and evaluation of neural network algorithms by applying them to real-world problems. The project will be an implementation / examination of some particular aspect of a neural network algorithm, or it will show the application of an algorithm on a particular problem. You can select data sets from the list of data resources available. You should submit a 1-2 page proposal that describes the problem you would like to tackle, objective of the study, proposed algorithms, hardware/software tools and data that you plan to utilize, and evaluation strategies that you plan to use. You should get prior approval before starting your project. You are free to use any programming language or toolbox but Matlab is strongly recommended. You can write the codes yourself or use any code that is available in the public domain. In case you use somebody else's code, you are required to properly cite its source and know the details of the algorithms that the code implements. You should submit a readable and well-organized report that provides proper motivation for the task, proper

citation and discussion of related literature, proper explanation of the details of the approach and implementation strategies, proper performance evaluation, and detailed discussion of the results. Highlight your contributions and conclusions. Also submit well-documented software with your report. The reports are expected to be 6-8 pages and must follow the IEEE Computer Society two-column format as described in their templates. Try to follow the format as closely as possible. It should be submitted as a pdf.

The Project Report should have the following format:

- Introduction: Describe your motivation for studying this topic, and any relevant background for this problem.
- Statement of Problem: a brief one-paragraph statement indicating what the problem is that you propose to implement or demonstrate. Contributions of the group members must be clearly stated in the report.
- Objectives: a brief statement of what you expect to achieve in relation to the Statement of Problem, e.g., a working algorithm, a demonstrated classification of data, model fitting, information discovery, etc.
- Technical Approach: outline of the methods for achieving the Objectives, including description of the data used.
- Results: substantiation and discussion of the results achieved, in comparison to the initial Objectives. Graphical presentations are frequently better than tables and sentences.
- Conclusions: Briefly summarize the important results and conclusions presented in the report. What are the most important points illustrated by your work? In what kind of problems the proposed solutions can be used.
- Appendices: pertinent supporting material, the other supporting materials such as code; and optional items, e.g., data, extra plots etc. should be submitted separately.

Projects will be presented to the class. The presentation will be approximately 10-15 minutes, with 5 minutes left over for question-and-answer from the class. Slides made in a commonly used format (i.e. PowerPoint) can be used. Each student is expected to attend all presentations. An electronic copy of the Project Presentation should also be submitted.

The presentation will be evaluated on the following items:

- Appearance of presentation.
- Organization of presentation.
- Description of project and stating the objectives.
- Relevant background material.
- Description of methodology.
- Description of implementation issues.
- Comments on the results.
- Duration of presentation.
- Individual performance.
- Response to questions / Question handing.

	Projects (25%)		
Evaluation and Grading	**Proposal**	**Documentation/Report**	**Presentation**
Percentage	5%	10 %	10 %