HASAN KALYONCU UNIVERSITY
Faculty of Engineering
Course Description Form

COURSE: Machine Learning				
CODE: CENG420	**SEMESTER:** FALL OR SPRING			
LANGUAGE: ENGLISH	**TYPE:** ELECTIVE			
PRE-REQUISITES: CENG112, MATH251 **CO-REQUISITES:**	**THEORY**	**PRACTICAL**	**CREDIT**	**ECTS**
WEEKLY HOURS:	3	0	3	5

CONTENT OF THE COURSE:

Introduction to PRML, basics and mathematical concepts; Pattern Recognition basics; Probabilities and probabilistic Distributions; learning linear Models for Regression and Classification; computational neural networks models and Kernel Methods; Graphical and Mixture Models and EM; hybrid and combined Models; modelling sampling methods

OBJECTIVE OF THE COURSE:

The course is designed to provide a comprehensive exposure to methods and issues in machine learning and pattern recognition. Students will also gain hands on practical experience through programming lab works, assignments and projects.

WEEKLY SCHEDULE	
Week	**Topics**
1	Introduction Pattern Recognition basics Pattern Recognition versus machine learning
2	Mathematical preliminaries, probabilities and distributions
3	Maximum likelihood and Bayesian parameter estimation
4	Linear Models for Regression;
5	Linear Models for Classification;
6	Applications and case study on regression and classification
7	Neural Networks;
8	Kernel Methods;
9	Midterm I
10	Graphical Models;
11	Mixture Models and EM;
12	Sampling Methods
13	Combining Models;
14	Project presentation

TEXTBOOK: Bishop, C., 2006. Pattern Recognition and Machine Learning, Springer.
REFERENCE BOOKS:
Duda, O. R., Hart, E. R., Stork, D. G., 2000. Pattern Classification, 2nd Edition, Wiley.

EVALUATION SYSTEM:		
IN-TERM STUDIES	**QUANTITY**	**PERCENTAGE (%)**
Midterm Exam	2	25
Project	1	25
Laboratory works	0	0
Quiz	3	10
Final Exam	1	40
TOTAL	7	100
CONTRIBUTION OF INTERM STUDIES TO OVERALL GRADE	6	60
CONTRIBUTION OF FINAL EXAMINATION TO OVERALL GRADE	1	40
TOTAL	7	100

COURSE CATEGORY:	PERCENTAGE (%)
Mathematics and Basic Sciences	35
Engineering	30
Engineering Design	35
Social Sciences	0

TABLE OF ECTS / WORKLOAD:			
Activities	**QUANTITY**	**Duration (Hour)**	**Total Workload**
Course Duration	13	3	39
Hours for off-the-classroom study (Pre-study, practice)	14	5	70
Laboratory works			
Mid-term	2	2	4
Final examination	1	2	2
Project	1	25	25
Quiz	3	3	9
Total Work Load			**149**
Total Work Load / 30			**4.97**
ECTS Credit of the Course			**5**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
LO1	2	2	1	1	1	1	0	1	0	0	0
LO2	2	3	3	3	1	1	1	1	0	1	0
LO3	2	3	2	2	1	1	2	3	2	0	2
LO4	2	3	3	3	2	3	2	3	2	1	1
LO5	1	3	3	3	2	2	1	1	1	1	1
PO: Program Outcomes	LO: Learning Outcomes Values: 0: None	1: Low	2: Medium	3: High										

INSTRUCTOR(S):	Dr. Abdul Hafiz ABDULHAFIZ
FORM PREPARATION DATE:	22/05/2019

LEARNING OUTCOMES OF THE COURSE:	PROGRAM OUTCOMES:
LO1: The ability to design a suitable pattern recognition and machine learning solution method for a certain prqctical problem **LO2:** The ability to analyze and compare the performance of two different pattern recognition and machine learning methods **LO3:** The bility to solve bigger problems by combinign outputs of different pattern and machine learning recognition methods **LO4:** The ability to understand the theoretical concepts pattern recognition methods **LO5:** The ability to utilise and modify a pattern recognition method to solve a new problem.	**PO1:** Adequate knowledge in mathematics, science and engineering subjects pertaining to the relevant discipline; ability to use theoretical and applied knowledge in these areas in complex engineering problems. **PO2:** Ability to identify, formulate, and solve complex engineering problems; ability to select and apply proper analysis and modeling methods for this purpose. **PO3:** Ability to design a complex system, process, device or product under realistic constraints and conditions, in such a way as to meet the desired result; ability to apply modern design methods for this purpose. **PO4:** Ability to devise, select, and use modern techniques and tools needed for analyzing and solving complex problems encountered in engineering practice; ability to employ information technologies effectively. **PO5:** Ability to design and conduct experiments, gather data, analyze and interpret results for investigating complex engineering problems or discipline specific research questions. **PO6:** Ability to work efficiently in intra-disciplinary and multi-disciplinary teams; ability to work individually. **PO7:** Ability to communicate effectively in Turkish, both orally and in writing; knowledge of a minimum of one foreign language; ability to write effective reports and comprehend written reports, prepare design and production reports, make effective presentations, and give and receive clear and intelligible instructions. **PO8:** Recognition of the need for lifelong learning; ability to access information, to follow developments in science and technology, and to continue to educate him/herself. **PO9:** Consciousness to behave according to ethical principles and professional and ethical responsibility; knowledge on standards used in engineering practice. **PO10:** Knowledge about business life practices such as project management, risk management, and change management; awareness in entrepreneurship, innovation; knowledge about sustainable development. **PO11:** Knowledge about the global and social effects of engineering practices on health, environment, and

	safety, and contemporary issues of the century reflected into the field of engineering; awareness of the legal consequences of engineering solutions.