



## Course Specifications

<b>Course Title:</b>	<b>Machine Learning</b>
<b>Course Code:</b>	<b>505PMAI-3</b>
<b>Program:</b>	<b>Professional Master of Artificial Intelligence</b>
<b>Department:</b>	<b>Computer Science</b>
<b>College:</b>	<b>Computer Science and information systems</b>
<b>Institution:</b>	<b>Najran University</b>

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## A. Course Identification

<b>1. Credit hours:</b> 3
<b>2. Course type</b>
a. University <input type="checkbox"/> College <input type="checkbox"/> Department <input checked="" type="checkbox"/> Others <input type="checkbox"/>
b. Required <input checked="" type="checkbox"/> Elective <input type="checkbox"/>
<b>3. Level/year at which this course is offered:</b> 3 <sup>rd</sup> level/ 1 <sup>st</sup> year
<b>4. Pre-requisites for this course (if any):</b>
<b>5. Co-requisites for this course (if any):</b> NA

### 6. Mode of Instruction (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	50	100%
2	Blended		
3	E-learning		
4	Distance learning		
5	Other		

### 7. Contact Hours (based on academic semester)

No	Activity	Contact Hours
1	Lecture	30
2	Laboratory/Studio	20
3	Tutorial	
4	Others (specify)	
	<b>Total</b>	<b>50</b>

## B. Course Objectives and Learning Outcomes

### 1. Course Description:

This course covers the theory and practice of machine learning from a variety of perspectives. It explores topics such supervised learning: regression, Bayesian, decision trees, ensemble Learning and random forests, neural networks, support vector machines, k-nearest neighbor. Unsupervised learning: clustering, k-means, hierarchical clustering, association mining, dimensionality reduction, principal components analysis, topic modeling. Reinforcement Learning, and Learning Theory. In the practical part, students will use one of the programming languages such as Python to implement the aspects of the course and create an application in field of machine learning.

### 2. Course Main Objective

The main objective of this course is to provide an in-depth understanding of the principles, techniques, and applications of machine learning.

### 3. Course Learning Outcomes

CLOs		Aligned PLOs
<b>1</b>	<b>Knowledge and Understanding</b>	
1.1	describe the key concepts of machine learning and its role in solving real problems;	K1
1.2	explain different machine learning techniques and their practical implementations	K1, k2
1.3		
1...		
<b>2</b>	<b>Skills</b>	
2.1	apply machine learning techniques to a wide range of problems, including complex problem solving.	S1, S4
2.2	Evaluate the applicability of different machine learning techniques	S2
2.3	develop appropriate machine learning solution for solving real problems	S2, S4
2.4		
2.5		
<b>3</b>	<b>Competences:</b>	
3.1	Communicate clearly and effectively using the technical language of the field	C2
3.2		
3.3		
3...		

### C. Course Content

No	List of Topics	Contact Hours
1	Introduction	3
2	Supervised learning	3
3	Regression	3
4	Bayesian classifier	3
5	Decision Tree Learning	3
6	Neural Networks	8
7	Deep Learning	3
8	Support Vector Machine	3
9	SVM and VC-Dimension	3
10	Unsupervised learning	3
11	K-means and EM	3
12	Clustering	3
13	PCA Learning	3
14	singular value decomposition	3
15	Reinforcement Learning	3
<b>Total</b>		<b>50</b>

## D. Teaching and Assessment

### 1. Alignment of Course Learning Outcomes with Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
<b>1.0</b>	<b>Knowledge and Understanding</b>		
1.1	describe the key concepts of machine learning and its role in solving real problems;	<ul style="list-style-type: none"> <li>• Giving Lectures in PPT, recalling the lecture through asking Questions. Clarifying doubts on Lecture.</li> <li>• Discussions of real life problems, among teacher, students</li> </ul>	Quiz Theory Assignments Midterm Examination Final Examination
1.2	explain different machine learning techniques and their practical implementations		
...			
<b>2.0</b>	<b>Skills</b>		
2.1	apply machine learning techniques to a wide range of problems, including complex problem solving.	<ul style="list-style-type: none"> <li>• Giving Lectures in PPT, recalling the lecture through asking Questions. Clarifying doubts on Lecture.</li> <li>• Conducting a discussion of real life problems, among teacher, students</li> <li>• Cooperative learning among the students.</li> <li>• Encourage students to browse different journals, seminars or websites at their leisure time to have a better understanding about the course</li> </ul>	Quiz Lab Assignments Midterm Examination Final Examination,
2.2	Evaluate the applicability of different machine learning techniques		Quiz, Theory Assignments Final Examination
2.3	design and implement appropriate machine learning solution for solving real problems		Midterm Examination Min-project Final Examination
2.4			
2.5			
<b>3.0</b>	<b>Competences</b>		
3.1	Communicate clearly and effectively using the technical language of the field		Mini-Project presentation
3.2			
...			

### 2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Quiz1	3 <sup>rd</sup> week	5%
2	Midterm 1	6 <sup>th</sup> week	20%
3	Mini-Project	9 <sup>th</sup> week	15%
4	Lab Assignments	2 <sup>nd</sup> , 4 <sup>th</sup> , 7 <sup>th</sup> , 10 <sup>th</sup> week	15%
5	Quiz2	10 <sup>th</sup> week	5%
7	Final Exam	12 <sup>th</sup> or 13 <sup>th</sup> week	40%
8			

\*Assessment task (i.e., written test, oral test, oral presentation, group project, essay, etc.)

## E. Student Academic Counseling and Support

**Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice :**

- Weekly office hours
- Pre-booked Appointments
- Additional office hours prior exams
- Weekly academic advising hours

## F. Learning Resources and Facilities

### 1. Learning Resources

<b>Required Textbooks</b>	<ul style="list-style-type: none"> <li>• Ethem Alpaydin, Introduction to Machine Learning, fourth edition, 2020</li> </ul>
<b>Essential References Materials</b>	<ul style="list-style-type: none"> <li>• Machine Learning - A Probabilistic Perspective, by Kevin P. Murphy, second edition, 2012</li> <li>• Bishop, C. Pattern Recognition and Machine Learning. Berlin: Springer-Verlag, 2006</li> </ul>
<b>Electronic Materials</b>	
<b>Other Learning Materials</b>	

### 2. Facilities Required

Item	Resources
<b>Accommodation</b> (Classrooms, laboratories, demonstration rooms/labs, etc.)	Room B-59 Laboratory B-113L
<b>Technology Resources</b> (AV, data show, Smart Board, software, etc.)	Data show, PCs.
<b>Other Resources</b> (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	<ul style="list-style-type: none"> <li>• Printer is important in the lab to print reports and some snapshots.</li> <li>• Projector and PC for the lab instructor is required</li> </ul>

## G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Online course survey	Students	Indirect
course learning outcomes achievement survey	Students	Indirect
achievement of course	instructor	Direct

Evaluation Areas/Issues	Evaluators	Evaluation Methods
learning outcomes		

**Evaluation areas** (e.g., Effectiveness of teaching and assessment, Extent of achievement of course learning outcomes, Quality of learning resources, etc.)

**Evaluators** (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify))

**Assessment Methods** (Direct, Indirect)

## H. Specification Approval Data

Council / Committee	Computer Science Departmental Council
Reference No.	14440203-0185-00002
Date	1st Sep, 2022