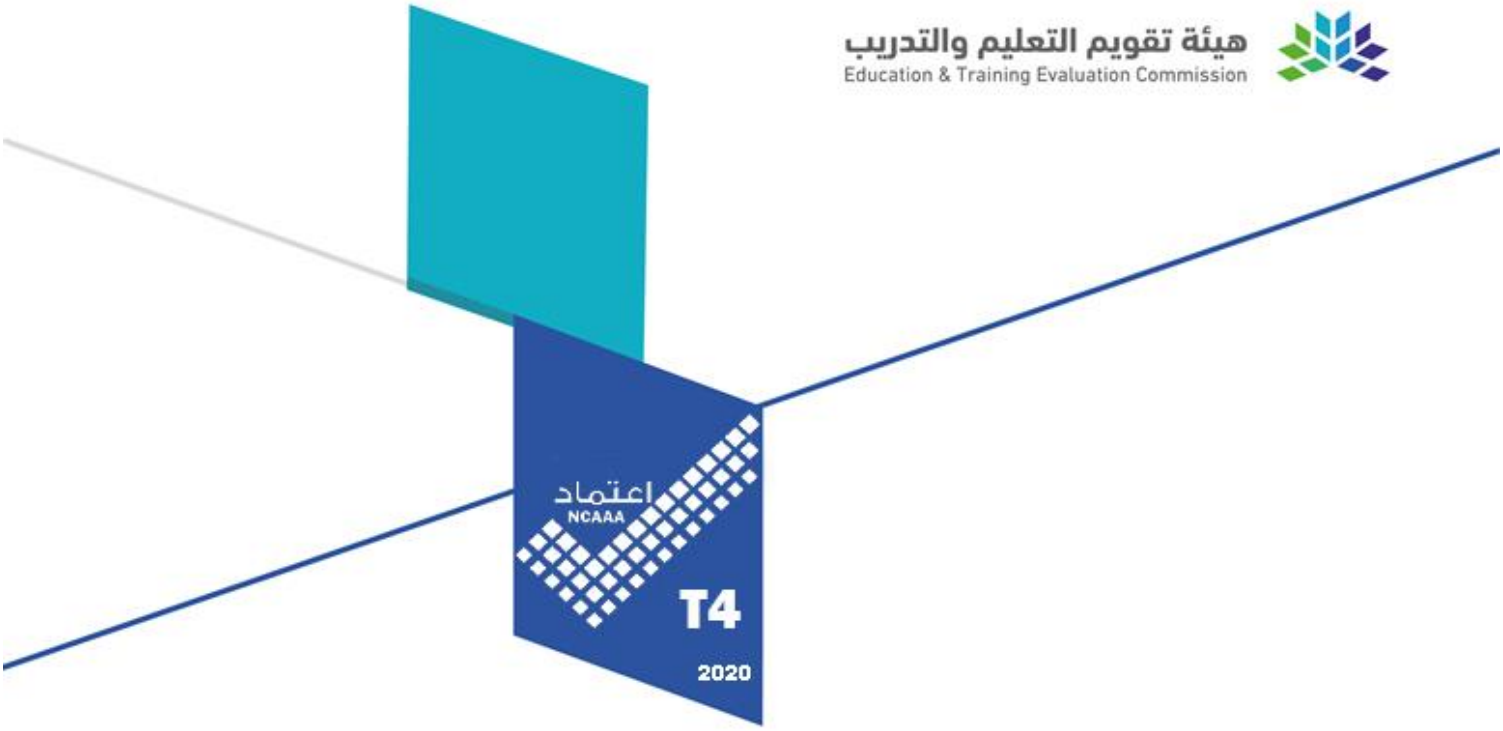

Course Specifications

Course Title:	**Machine Learning**
Course Code:	**CS 463**
Program:	**Computer Science**
Department:	**Computer Science**
College:	**College of Computer and Information Sciences**
Institution:	**Majmaah University**

Table of Contents

A. Course Identification

1. Credit hours:	3 (3+0+1)
2. Course type	
a.	University ☐ College ☑ Department ☐ Others ☐
b.	Required ☑ Elective ☐
3. Level/year at which this course is offered:	Level-9
4. Pre-requisites for this course (if any)**:**	CS 120
5. Co-requisites for this course (if any)**:**	

6. Mode of Instruction (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	**Traditional classroom**	44	100%
2	**Blended**		
3	**E-learning**		
4	**Distance learning**		
5	**Other**		

7. Contact Hours (based on academic semester)

No	Activity	Contact Hours
1	**Lecture**	33
2	**Laboratory/Studio**	11
3	**Tutorial**	
4	**Others** (specify)	
	Total	44

B. Course Objectives and Learning Outcomes

1. Course Description

The course objective is to study the theory and practice of constructing algorithms that learn (functions) from data. Machine learning is a field with goals overlapping with other disciplines such as statistics, algorithms, engineering, or optimization theory. It also has wide applications in a number of scientific areas such as finance, life sciences, social sciences, or medicine. Python or R Language will be used for implementation of machine learning algorithms.

2. Course Main Objective

1. To know the mathematical principles required for machine learning
2. To understand various classification algorithms
3. To understand different regression algorithms and neural networks

4. To use ensemble models to solve problems in machine learning
5. To understand practical aspects of machine learning

3. Course Learning Outcomes

	CLOs	Aligned PLOs
1	**Knowledge:**	
1.1		
1.2		
1.3		
1...		
2	**Skills :**	
	CLO1: To know the mathematical principles required for machine learning	S1
2.1	CLO2: To understand various classification algorithms	S2
2.2	CLO3: To understand different regression algorithms and neural networks	S2
2.3	CLO4: To use ensemble models to solve problems in machine learning	S2
2.4	CLO5: To understand practical aspects of machine learning	S2
3	**Competence:**	
3.1		
3.2		
3.3		
3...		

C. Course Content

No	List of Topics	Contact Hours
1	Introduction to Machine Learning and its applications	4
2	Supervised learning and Bayesian Decision theory	4
3	Parametric methods	4
4	Nonparametric methods	4
5	Dimensionality reduction	4
6	Clustering	4
7	Decision trees	4
8	Multilayer perceptrons -Neural Network	4
9	Kernel machines	4
10	Ensemble methods : Bagging, Boosting – Random Forests	4
11	Practical aspects in machine learning Data preprocessing-overfitting-accuracy estimation, parameter and model selection	4
Total		44

D. Teaching and Assessment

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

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
1.0	**Knowledge**		
1.1			
1.2			
2.0	**Skills**		
2.1	CLO2: To understand various classification algorithms	Classroom Teaching LAB teaching	Test Exam, Mid Exam ,Lab Assignment, Mid Exam, Final Exam, Project
2.2	CLO3: To understand different regression algorithms and neural networks	Classroom Teaching LAB teaching	Test Exam, Mid Exam ,Lab Assignment, Mid Exam, Final Exam, Project
2.3	CLO5: To understand practical aspects of machine learning	Classroom Teaching LAB teaching	Test Exam, Mid Exam ,Lab Assignment, Mid Exam, Final Exam, Project
3.0	**Competence**		
3.1	CLO1: To know the mathematical principles required for machine learning	Classroom Teaching	Test Exam, Mid Exam , , Mid Exam, Final Exam
3.2	CLO4: To use ensemble models to solve problems in machine learning	Classroom Teaching	Test Exam, Mid Exam , , Mid Exam, Final Exam
…			

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Quizzes/ Test	Week 4,12	20%
3	Mid Term	Week 6	20%
4	Project/ Lab Assignment	Every Week	20%
5	Final Exam	Week 12	40%
6			
7			
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 :

- Each student is allotted to an academic advisor for guidance and counselling.

- Available for a minimum of 4 hours per week/course, as communicated to the students.
- Student also contacts through social networking websites / D2L/ Email for advice and consultations

F. Learning Resources and Facilities

1.Learning Resources

Required Textbooks	Introduction to Machine Learning, Ethem Alpaydın, MIT Press, 3rd ed, 2014, ISBN: 978-0-262-02818-9
Essential References Materials	•**Jure Leskovek, Anand Rajaraman and Jeffrey Ullman. Mining of Massive Datasets. v2.1, Cambridge University Press. 2014.** •**Kevin P. Murphy. Machine Learning: A Probabilistic Perspective. ISBN 0262018020. 2013** *NINA ZUMEL, JOHN MOUNT, Practical Data Science with R, Manning Publications Co.,2014*
Electronic Materials	
Other Learning Materials	

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	Classrooms, laboratories
Technology Resources (AV, data show, Smart Board, software, etc.)	PC or Laptop with Windows/Linux, Smart Board, LCD Projector, Anaconda Framework, Python 3, Blackboard
Other Resources (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	Internet connection

G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Final Exam Answer Scripts Verification	Peer faculty members	Direct Review
Course Feedback	Students	Indirect course Survey

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	CS Council
Reference No.	
Date	