هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission
اعتماد
NCAAA
2024
TP-153

Course Specification
(Bachelor)

Course Title:	**Introduction to Data Science**
Course Code:	**DS1102**
Program:	**Bachelor of Data Science**
Department:	**Data Science**
College:	**Computing**
Institution:	**Umm Al-Qura University**
Version:	**1.4**
Last Revision Date:	**5 February 2025**

Table of Contents

A. General information about the course: 3

B. Course Learning Outcomes (CLOs), Teaching Strategies and Assessment Methods 4

C. Course Content 5

D. Students Assessment Activities 7

E. Learning Resources and Facilities 7

F. Assessment of Course Quality 7

G. Specification Approval 8

A. General information about the course:

1. Course Identification

1. Credit hours: (3)					
2. Course type					
A.	☐University	☐College	☒ Department	☐Track	☐Others
B.	☒ Required		☐Elective		
3. Level/year at which this course is offered: (1st Year/ Level 1)					
4. Course General Description:					
This course serves as an introductory exploration into the field of data science, focusing on the fundamental concepts, tools, and techniques used to analyze and interpret data. Students will learn how to collect, clean, analyze, and visualize data, while also gaining insights into the ethical considerations surrounding data usage. The course combines knowledge, preparing students for real-world data challenges.					
5. Pre-requirements for this course (if any):					
6. Co-requisites for this course (if any):					
7. Course Main Objective(s):					
1. Explain the importance of Data Science and be able to formulate a data problem statement that is clear and concise. 2. Understand the difference between Data Science and Data Engineering life cycles. 3. Recognize appropriate tools and technology to collect, process, transform, summarize, and visualize data. 4. Understand how we can use data science in different problems and fields. 5. Identify privacy issues and ethical considerations when uses individuals' data					

2. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	45	100%
	Blended		
2	E-learning		
3	Hybrid • Traditional classroom • E-learning		
4	Distance learning		

3. Contact Hours (based on the academic semester)

No	Activity	Contact Hours
1.	Lectures	45
2.	Laboratory/Studio	
3.	Field	
4.	Tutorial	
5.	Others (specify)	
Total		45

B. Course Learning Outcomes (CLOs), Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Code of PLOs aligned with the program	Teaching Strategies	Assessment Methods
1.0	**Knowledge and understanding**			
1.1	Apply methods and techniques for obtaining, organizing, exploring, and analyzing data.	**K1**	**Lectures Discussions**	**Participation Exams**
1.2	Analyze how data preparation, analysis, inferential statistics, modeling, and machine learning can be utilized in an integrated capacity.	**K1**	**Tutorials Discussions**	**Participation Project Exams**
2.0	**Skills**			
2.1	Analyze how data preparation, analysis, inferential statistics, modeling, and machine learning can be utilized in an integrated capacity.	**S3**	**Lectures Tutorials Discussions**	**Participation Project**
3.0	**Values, autonomy, and responsibility**			
3.1	Work in groups to discuss data science case studies problems and solutions.	**V3**	**Tutorials Discussions**	**Participation Project**
3.2	Assess and document personal learning progress and professional development through self-evaluations, reports, or presentation	**V3**	**Tutorials Discussions**	**Participation Project Exams**

C. Course Content

No	List of Topics	Contact Hours
1.	**Introduction to Data Science : Data-Analytic Thinking** • Importance of Data Science • Need for Data Science • What Is Data Science? • Data Science Process • Business Intelligence and Data Science • Prerequisites for a Data Scientis • Components of Data Science • Tools and Skills Needed	**3**
2.	**Con-Introduction to Data Science** • The Ubiquity of Data Opportunities • Data Science, Engineering, and Data-Driven Decision Making • Data Processing and "Big Data" • Data and Data Science Capability as a Strategic Asset • Data-Analytic Thinking	**3**
3.	**Data Engineering for Data Science** • What is Data Engineering? • Data Engineering Skills and Activities • Data Engineering Life Cycle • Data Engineering vs. Data Science • The Major Undercurrents Across the Data engineering Lifecycle	**3**
4.	**Designing Good Data Architecture** • What is Data Architecture? • Major Architecture Concepts and Components • Examples & Types of Data Architecture	**3**
5.	**Data Modeling and Analytics Techniques and Technologies** • Analytics for Data Science • Data Analytics Examples • Statistics • Databases Querying for Data Sciences • Data Warehousing • Regression Analysis • Data Science Methods and Machine Learning • Data Analytics and Text Mining • Answering Business Questions with These Techniques	**3**
6.	**Data Science Tasks and Techniques** • Co-occurrences and Associations: Finding Items That Go Together • Profiling: Finding Typical Behavior • Link Prediction and Social Recommendation • Data Reduction, Latent Information, and Movie Recommendation • Bias, Variance, and Ensemble Methods • Data-Driven Causal Explanation and a Viral Marketing Example	**3**

7.	**Platforms for Data Science (Data Science Tool: Python)** • Basics of Python for Data Science • Python Libraries: DataFrame Manipulation with pandas and NumPy • Exploration Data Analysis with Python • Python for Machine ML	**3**
8.	**Con- Platforms for Data Science (**Data Science Tool: R) • Reading and Getting Data into R • Ordered and Unordered Factors • Arrays and Matrices • Matrices • Lists and Data Frames • Statistical Models in R • Manipulating Objects • Data Distribution	**3**
9	**Con- Platforms for Data Science (Data Science Tool: MATLAB)** • Data Science Workflow with MATLAB • Importing Data • How Data is Stored . • How MATLAB Represents Data . • MATLAB Data Types • Automating the Import Process	**3**
10	**Con- Platforms for Data Science** • Data Science Visualizations Tools • Data Science and Cloud Tools • Data Science and Big Data Tools	**3**
11.	**Con- Platforms for Data Science (Data Science Tool: Powe BI)**	**3**
12.	**Data Science and Business Strategy** • Thinking Data-Analytically • Achieving and Sustaining Competitive Advantage with Data Science • Attracting and Nurturing Data Scientists and Their Teams • Be Ready to Accept Creative Ideas from Any Source • Be Ready to Evaluate Proposals for Data Science Projects • Examine Data Science Case Studies Case Study: Applying the Fundamental Concepts of Data Science to a	**3**
13.	**Human Factors and Data Science** • What Data Can't Do: Humans in the Loop • Privacy, Ethics, and Mining Data About Individuals Is There More to Data Science?	**3**
14.	Project Evaluation and Discussion of Results	
15.	Review, quizzes and midterm	**3**
	Total	**45**

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Participation and discussions	2-12	10%
2.	Project	2-13	25%
3.	Midterm Exam	6	25%
4.	Final exam	16-17	40%

*Assessment Activities (i.e., Written test, oral test, oral presentation, group project, essay, etc.).

E. Learning Resources and Facilities

1. References and Learning Resources

Essential References	Fundamentals of Data Science, 2021, 1st edition, by Sanjeev J. Wagh, Manisha S. Bhende, Anuradha D. Thakare. Chapman and Hall/CRC. ISBN: 9781138336186
Supportive References	Fundamentals of Data Engineering, 1st edition, 2022, by Joe Reis, Matt Housley. O'Reilly Media, Inc. ISBN: 9781098108304
Electronic Materials	
Other Learning Materials	

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	Classrooms
Technology equipment (projector, smart board, software)	Data show, Smart Board
Other equipment (depending on the nature of the specialty)	

F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	**Students**	**Indirect: Students' feedback**
Effectiveness of students' assessment	**Students**	**Indirect: Students' feedback**

Assessment Areas/Issues	Assessor	Assessment Methods
Quality of learning resources	Instructor and curriculum committee	Direct: CLO's and grades analysis
The extent to which CLOs have been achieved	Instructor and Quality Assurance committee	Indirect: Curriculum Review
Other		

Assessors (Students, Faculty, Program Leaders, Peer Reviewers, Others (specify)

Assessment Methods (Direct, Indirect)

G. Specification Approval

COUNCIL /COMMITTEE	
REFERENCE NO.	
DATE	