

Principles of Data Science Course Syllabus

1	Course title	Principles of Data Science
2	Course number	1915121
3	Credit hours	3
	Contact hours (theory, practical)	3
4	Prerequisites	None
5	Program title	Data Science
6	Program code	15
7	Awarding institution	The University of Jordan
8	School	King Abdullah II School for Information Technology
9	Department	Artificial Intelligence
10	Level of course	Undergraduate (UG)
11	Year of study and semester (s)	2023 - Autumn (1 st)
12	Final Qualification	BSc
13	Other department(s) involved in teaching the course	None
14	Language of Instruction	English
15	Teaching methodology	<input checked="" type="checkbox"/> Face-to-Face <input type="checkbox"/> Blended <input type="checkbox"/> Online
16	Electronic platform(s)	<input checked="" type="checkbox"/> Moodle <input checked="" type="checkbox"/> Microsoft Teams <input type="checkbox"/> Skype <input type="checkbox"/> Zoom <input checked="" type="checkbox"/> Others http://omar.alkadi.net/
17	Date of production/revision	8 October 2023

18 Course Coordinator:

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19 Other instructions:

- **Textbook:** Principles of Data Science by Sinan Ozdemir, 2016.
- **Programming environment:** Anaconda Python distribution ([version 3](#))

20 Course Description:

This course is designed to equip students with essential knowledge in data science principles. It covers the fundamental aspects of a data scientist's journey, including gathering data, analyzing it, constructing models, and effectively presenting results. The objective is to provide students with the foundational skills necessary for working with data and making well-informed decisions.

21 Course aims and outcomes:

A- Aims:

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

- Understand the basics of data science principles and methods.
- Explore the different steps in data science, understanding how they are interconnected.
- Learn ways to collect and analyze data, adapting methods to different situations.
- Develop practical data science skills using Python programming to solve real-world problems.
- Use data visualization to explore and explain findings clearly for effective representation.
- Apply data science practically, translating theory into useful insights using Python and problem-solving skills.
- Effectively communicate data science concepts to diverse audiences using impactful data visualization.

B- Intended \ Students Learning Outcomes (ILOs \ SOs):

Label	ABET Student Learning Outcomes (SOs)
SO1	Analyze a complex computing problem and to apply principles of computing and other relevant disciplines to identify solutions.
SO2	Design, implement, and evaluate a computing-based solution to meet a given set of computing requirements in the context of the program's discipline.
SO5	Function effectively as a member or leader of a team engaged in activities appropriate to the program's discipline.

On successfully completing the module, the students are expected to have gained good knowledge of:

Descriptor	Label	Course Intended Learning Outcomes Description (ILOs)
Knowledge	A	Understand the main concepts underpinning data science, including the principles and methodologies that form the foundation of the field. [SO1]
	B	Comprehend the distinct stages of the data science process, covering data collection, modeling, analysis, and the representation of model results. [SO1]
	C	Acquire knowledge about the strengths and limitations of diverse data processing methods. [SO1]
Skills	D	Develop skills in utilizing Python for data manipulation, analysis, and implementation of data science algorithms. [SO2]
	E	Apply data visualization for exploring datasets and effectively communicating findings derived from data science models. [SO2]
Competencies	F	Demonstrate a practical understanding of Data Science, showcasing the ability to translate theoretical knowledge into actionable insights using Python programming. [SO2]

	G	Showcase effective communication competencies in data science by presenting findings and insights while taking into account ethical considerations. [SO5]
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22 Topic Outline and Schedule:

Week	Lecture	Topic	ILO/SO	Evaluation Methods	References
1	1.1	Introduction to Data Science	A/SO1	Class discussions and participation	Moodle (http://elearning.ju.edu.jo) and MS Teams platform.
	1.2				
	1.3				
2	2.1	Data Types	B/SO1	Class discussions and participation + Assignment 1	Moodle (http://elearning.ju.edu.jo) and MS Teams platform.
	2.2				
	2.3				
3	3.1	Essential mathematics and statistics	A/SO1	Class discussions and participation	Moodle (http://elearning.ju.edu.jo) and MS Teams platform.
	3.2				
	3.3				
4	4.1	Python Programming – Imperative Programming	D/SO2	Class discussions and participation + Quiz 1	Moodle (http://elearning.ju.edu.jo) and MS Teams platform.
	4.2				
	4.3				
5	5.1	Python Programming – Strings, Files & Dictionaries	D/SO2	Class discussions and participation + Assignment 2	Moodle (http://elearning.ju.edu.jo) and MS Teams platform.
	5.2				
	5.3				
6	6.1	Python Programming – Functions	D/SO2	Class discussions and participation	Moodle (http://elearning.ju.edu.jo) and MS Teams platform.
	6.2				
	6.3				
7	7.1	Python Programming – NumPy Library	D/SO2	Class discussions and participation + Quiz 2	Moodle (http://elearning.ju.edu.jo) and MS Teams platform.
	7.2				
	7.3				
8	8.1	Introduction to Machine Learning	A/SO1	Class discussions and participation + Assignment 3	Moodle (http://elearning.ju.edu.jo) and MS Teams platform.
	8.2				
	8.3				
9	9.1	Extract, Transform & Load Process	D/SO2	Class discussions and participation + Midterm Exam	Moodle (http://elearning.ju.edu.jo) and MS Teams platform.
	9.2				
	9.3				
10	10.1	Data Engineering	D/SO2	Class discussions and participation	Moodle (http://elearning.ju.edu.jo) and MS Teams platform.
	10.2				
	10.3				
11	11.1	Data Visualization	E/SO2	Class discussions and participation + Assignment 4	Moodle (http://elearning.ju.edu.jo)
	11.2				
	11.3				

					edu.jo) and MS Teams platform.
12	12.1	Data Exploration	D/SO2	Class discussions and participation	Moodle (http://elearning.ju.edu.jo) and MS Teams platform.
	12.2				
	12.3				
13	13.1	Big Data	A/SO1	Class discussions and participation + Quiz 3	Moodle (http://elearning.ju.edu.jo) and MS Teams platform.
	13.2				
	13.3				
14	14.1	Data Classification – Kmeans vs Knn	F/SO2	Class discussions and participation	Moodle (http://elearning.ju.edu.jo) and MS Teams platform.
	14.2				
	14.3				
15	15.1	Ethical Considerations in Data Science	G/SO5	Class discussions and participation	Moodle (http://elearning.ju.edu.jo) and MS Teams platform.
	15.2				
	15.3				

23 Evaluation Methods:

Opportunities to demonstrate achievement of the ILOs are provided through the following assessment methods and requirements:

Evaluation Activity	Mark	Topic(s)	Period (Week)	Platform
Assignment 1	marks	Exploratory Data Analysis on a Dataset	Week 2	E-learning platform
Quiz 1	marks	Data Types + Essential math and statistics	Week 4	JUExams platform
Assignment 2	marks	Python Programming	Week 5	E-learning platform
Quiz 2	marks	Python Programming	Week 7	JUExams platform
Assignment 3	marks	Exploratory Data Analysis	Week 8	E-learning platform
Midterm exam	30 marks	-	Week 9	JUExams platform
Assignment 4	marks	Exploratory Data Analysis II	Week 11	E-learning platform
Quiz 3	marks	Exploratory Data Analysis	Week 13	JUExams platform

24 Course Requirements (e.g.: students should have a computer, internet connection, webcam, account on a specific software/platform...etc.):

PC/laptop, Python Anaconda environment.

25 Course Policies:

A- Attendance policies: Students are responsible for attending online lectures and downloading and viewing all material covered uploaded to the LMS (<http://elearning.ju.edu.jo>) and the subject webpage at (<http://omar.alkadi.net/2437-2>).

B- Absences from exams and submitting assignments on time: It is the students' responsibility to turn in their homework assignments to their instructors by the announced due date/time. Not attending exams without a valid excuse is not accepted.

C- Health and safety procedures: Students should adhere to the University of Jordan health and safety rules and procedures

D- Honesty policy regarding cheating, plagiarism, misbehavior: For more details on University regulations please visit <http://www.ju.edu.jo/rules/index.htm>

E- Grading policy: 50% semester work comprising of assignments, quizzes and programming project to be submitted at the end of the semester, and 50% for final exam.

F- Available university services that support achievement in the course: <http://elearning.ju.edu.jo>

26 References:

A- Required books, assigned reading and audio-visuals:

- *Principles of Data Science by Sinan Ozdemir, 2016.*

B- Recommended books, materials and media:

- Python Data Science Essentials, by Alberto Boschetti and Luca Massaron, 2018.
- Data Science: Concepts and Practice by Viyay Kotu, 2018.

27 Additional information:

For additional information, student can refer to the lecturers' website at <http://omar.alkadi.net/teaching>