

DeCAIR Course Syllabus Form

Author(s)	Ramzi Saifan		
Author Organization Name(s)	The University of Jordan		
Work Package Number & Title	Work Package 6: Development of existing BSc programs in AIR		
Activity Number & Title	Activity 6.1: Designing and developing syllabi and content for the agreed upon courses in the new programs		
Work Package Leader	Jorge Casillas, University of Granada		
Due Date of Delivery	1/2/2022	Project Month	M14
Submission Date	11/4/2021	Project Month	M11

Revision History

Version	Date	Author	Description	Action *	Page(s)
1	11/4/2021	Ramzi Saifan	Original (base) document	C	1-5
2	9/12/2021	Ramzi Saifan	Update based on 27/11/2021 meeting	U	1-4
3	19/1/2022	Ramzi Saifan	Update based on the surveys feedback	U	1-4
4	26/2/2023	Gheith Abandah	Modifications for Term Spring 2023	U	1-4

(*) Action: C = Creation, I = Insert, U = Update, R = Replace, D = Delete

Disclaimer

This project has been co-funded by the Erasmus+ Program of the European Union.

You are free to share, copy and redistribute the material in any medium or format, as well as adapt, transform, and build upon the material for any purpose, even commercially, provided that you give appropriate credit to the project and the partnership, and indicate if any changes were made. You may do so in any reasonable manner, but not in any way that suggests the partnership, or the European Commission endorses you or your use. You may not apply legal terms or technological measures that legally restrict others from using the material in the same manner that you did.

Copyright © DeCAIR Consortium, 2021-2024

Email: DeCAIR@ju.edu.jo

Project Website: <http://DeCAIR.ju.edu.jo/>

The European Commission's support for the production of this publication does not constitute an endorsement of the contents, which reflect the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

Course title	Data Science Spring 2023										
Course number	0917546										
Credit hours (lecture and lab)	3 (3 + 0)										
ECTS (weekly contact and self-study load)	6 (3 + 3)										
Prerequisites/co-requisites by course number and name	AI and machine learning, 0917451										
Prerequisites by topic (other than the formal prerequisites above)	Students are assumed to have good background in mathematics, particularly, calculus, linear algebra, and statistics. Additionally, the students should have good programming skills using Python.										
Level and type (compulsory, elective)	Bachelor's elective course										
Year of study and semester	Fifth year										
Catalogue description	Definitions and applications; Market trends; Data analytics lifecycle; Data exploration and preprocessing; Data visualization; Theory, tools, and methods; Introduction to Big data management, warehousing, and processing. This course has practical assignments.										
Objectives	<ol style="list-style-type: none"> 1. Introduce students to the practical techniques used in data analytics including loading, cleaning, preparation, wrangling, visualization, and analysis. 2. Introduce students to the basic concepts and techniques in big data. 										
Intended learning outcomes	<p>Upon successful completion of this course, students will be able to:</p> <table border="1"> <thead> <tr> <th>No</th> <th>Intended learning Outcome (ILO)</th> <th>Program learning outcome (PLO)*</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Use Python and its specialized libraries to gain insight from data and solve problems.</td> <td>1</td> </tr> <tr> <td>2</td> <td>Know the main concepts and techniques used in handling big data and performing data analytics.</td> <td>7</td> </tr> </tbody> </table> <p>(*) The PLOs are listed in the appendix</p>		No	Intended learning Outcome (ILO)	Program learning outcome (PLO)*	1	Use Python and its specialized libraries to gain insight from data and solve problems.	1	2	Know the main concepts and techniques used in handling big data and performing data analytics.	7
No	Intended learning Outcome (ILO)	Program learning outcome (PLO)*									
1	Use Python and its specialized libraries to gain insight from data and solve problems.	1									
2	Know the main concepts and techniques used in handling big data and performing data analytics.	7									
Teaching and learning methods	<p>Development of ILOs is promoted through the following teaching and learning methods:</p> <ul style="list-style-type: none"> • Lectures will be in class. • The AI lab is open for the students to practice the practical aspects and solve the programming homework assignments. • The student attends the class presentations and participates in the discussions. 										

	<ul style="list-style-type: none"> The student joins the related online team/group and participates in its discussions. The student studies the reference material, including books and videos. The student solves the programming assignments in data science. 																																																
Learning material type	Textbook, class handouts, some instructor keynotes, selected YouTube videos, and access to a personal computer and the internet.																																																
Resources and references	<p>A- Required book(s), assigned reading and audio-visuals:</p> <ol style="list-style-type: none"> Wes McKinney, Python for Data Analysis: Data Wrangling with Pandas, NumPy, and Ipython, O'Reilly Media, 2nd Edition, 2018. Arshdeep Bahga and Vijay Madisetti, Big Data Analytics: A Hands-On Approach, 2019. Course web page: https://www.abandah.com/gheith/?page_id=3022 <p>B- Recommended book(s), material, and media:</p> <ol style="list-style-type: none"> Jake VanderPlas, A Whirlwind Tour of Python, O'Reilly Media, 2016. Joel Gurs, Data Science from Scratch, O'Reilly Media, 2015. Aurélien Géron, Hands-On Machine Learning with Scikit-Learn, Keras and TensorFlow: Concepts: Tools, and Techniques to Build Intelligent Systems, 3rd Edition, O'Reilly Media, Oct 2022. 																																																
Topic outline and schedule	<table border="1"> <thead> <tr> <th>Week</th> <th>Topic</th> <th>ILO</th> <th>Resources</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Course Introduction</td> <td>1</td> <td>3</td> </tr> <tr> <td>2+3</td> <td>Pandas Data Structures, Essential Functionality & Descriptive Statistics</td> <td>1</td> <td>1</td> </tr> <tr> <td>4+6</td> <td>Data Loading, Storage and File Formats</td> <td>1</td> <td>1</td> </tr> <tr> <td>6+7</td> <td>Data Cleaning and Preparation</td> <td>1</td> <td>1</td> </tr> <tr> <td>8</td> <td>Data Wrangling: Join, Combine and Reshape</td> <td>1</td> <td>1</td> </tr> <tr> <td>9+10</td> <td>Plotting and Visualization with Matplotlib and Seaborn</td> <td>1</td> <td>1</td> </tr> <tr> <td>11</td> <td>Data Aggregation and Group Operations</td> <td>1</td> <td>1</td> </tr> <tr> <td>12</td> <td>Time Series</td> <td>1</td> <td>1</td> </tr> <tr> <td>13</td> <td>Introduction to Big Data</td> <td>2</td> <td>2</td> </tr> <tr> <td>14</td> <td>Big Data Architectures and Patterns</td> <td>2</td> <td>2</td> </tr> <tr> <td>15</td> <td>MapReduce Patterns</td> <td>2</td> <td>2</td> </tr> </tbody> </table>	Week	Topic	ILO	Resources	1	Course Introduction	1	3	2+3	Pandas Data Structures, Essential Functionality & Descriptive Statistics	1	1	4+6	Data Loading, Storage and File Formats	1	1	6+7	Data Cleaning and Preparation	1	1	8	Data Wrangling: Join, Combine and Reshape	1	1	9+10	Plotting and Visualization with Matplotlib and Seaborn	1	1	11	Data Aggregation and Group Operations	1	1	12	Time Series	1	1	13	Introduction to Big Data	2	2	14	Big Data Architectures and Patterns	2	2	15	MapReduce Patterns	2	2
Week	Topic	ILO	Resources																																														
1	Course Introduction	1	3																																														
2+3	Pandas Data Structures, Essential Functionality & Descriptive Statistics	1	1																																														
4+6	Data Loading, Storage and File Formats	1	1																																														
6+7	Data Cleaning and Preparation	1	1																																														
8	Data Wrangling: Join, Combine and Reshape	1	1																																														
9+10	Plotting and Visualization with Matplotlib and Seaborn	1	1																																														
11	Data Aggregation and Group Operations	1	1																																														
12	Time Series	1	1																																														
13	Introduction to Big Data	2	2																																														
14	Big Data Architectures and Patterns	2	2																																														
15	MapReduce Patterns	2	2																																														
Evaluation tools	<p>Opportunities to demonstrate achievement of the ILOs are provided through the following assessment tools:</p> <table border="1"> <thead> <tr> <th>Assessment tool</th> <th>Mark</th> <th>Topic(s)</th> <th>Time</th> </tr> </thead> <tbody> <tr> <td>Quizzes and HW assignments</td> <td>20%</td> <td>Programming aspects</td> <td>W2-W14</td> </tr> <tr> <td>Midterm exam</td> <td>30%</td> <td>First 8 weeks</td> <td>W8</td> </tr> <tr> <td>Final exam</td> <td>50%</td> <td>All material</td> <td>W16</td> </tr> <tr> <td>Total</td> <td>100%</td> <td></td> <td></td> </tr> </tbody> </table>	Assessment tool	Mark	Topic(s)	Time	Quizzes and HW assignments	20%	Programming aspects	W2-W14	Midterm exam	30%	First 8 weeks	W8	Final exam	50%	All material	W16	Total	100%																														
Assessment tool	Mark	Topic(s)	Time																																														
Quizzes and HW assignments	20%	Programming aspects	W2-W14																																														
Midterm exam	30%	First 8 weeks	W8																																														
Final exam	50%	All material	W16																																														
Total	100%																																																

Student requirements	The student should have a computer and internet connection.
Course policies	<p>A- Attendance policies:</p> <ul style="list-style-type: none"> Attendance is required. Class attendance will be taken every class and the university polices will be enforced in this regard. <p>B- Absences from exams and not submitting assignments on time:</p> <ul style="list-style-type: none"> A makeup exam can be arranged for students with acceptable absence causes. Assignments submitted late, but before announcing or discussing the solution can be accepted with 25% penalty. The project report must be handed in in time. <p>C- Health and safety procedures:</p> <ul style="list-style-type: none"> All health and safety procedures of the university and the school should be followed. <p>D- Honesty policy regarding cheating, plagiarism, misbehavior:</p> <ul style="list-style-type: none"> Open-book exams All submitted work must be of the submitting student. Other text or code must be properly quoted with clear source specification. Cheating will not be tolerated. <p>E- Available university services that support achievement in the course:</p> <ul style="list-style-type: none"> Microsoft Teams team: Link AI Lab for practicing the practical aspects and solving the programming assignments. Program announcements Facebook page: Link
Additional information	None

Appendix

Learning Outcomes for the BSc in Computer Engineering

Students who successfully complete the BSc in Computer Engineering will be able to:

[1]	an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
[2]	an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors
[3]	an ability to communicate effectively with a range of audiences
[4]	an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts
[5]	an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives
[6]	an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions
[7]	an ability to acquire and apply new knowledge as needed, using appropriate learning strategies