

## DeCAIR Course Syllabus Form

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

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Email: [DeCAIR@ju.edu.jo](mailto:DeCAIR@ju.edu.jo)

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

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<b>Course title</b>	Data Science Spring 2023										
<b>Course number</b>	0917546										
<b>Credit hours (lecture and lab)</b>	3 (3 + 0)										
<b>ECTS (weekly contact and self-study load)</b>	6 (3 + 3)										
<b>Prerequisites/co-requisites by course number and name</b>	AI and machine learning, 0917451										
<b>Prerequisites by topic (other than the formal prerequisites above)</b>	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.										
<b>Level and type (compulsory, elective)</b>	Bachelor's elective course										
<b>Year of study and semester</b>	Fifth year										
<b>Catalogue description</b>	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.										
<b>Objectives</b>	<ol style="list-style-type: none"> <li>1. Introduce students to the practical techniques used in data analytics including loading, cleaning, preparation, wrangling, visualization, and analysis.</li> <li>2. Introduce students to the basic concepts and techniques in big data.</li> </ol>										
<b>Intended learning outcomes</b>	<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
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<b>Teaching and learning methods</b>	<p>Development of ILOs is promoted through the following teaching and learning methods:</p> <ul style="list-style-type: none"> <li>• Lectures will be in class.</li> <li>• The AI lab is open for the students to practice the practical aspects and solve the programming homework assignments.</li> <li>• The student attends the class presentations and participates in the discussions.</li> </ul>										

	<ul style="list-style-type: none"> <li>The student joins the related online team/group and participates in its discussions.</li> <li>The student studies the reference material, including books and videos.</li> <li>The student solves the programming assignments in data science.</li> </ul>																																																
<b>Learning material type</b>	Textbook, class handouts, some instructor keynotes, selected YouTube videos, and access to a personal computer and the internet.																																																
<b>Resources and references</b>	<p>A- Required book(s), assigned reading and audio-visuals:</p> <ol style="list-style-type: none"> <li>Wes McKinney, Python for Data Analysis: Data Wrangling with Pandas, NumPy, and Ipython, O'Reilly Media, 2nd Edition, 2018.</li> <li>Arshdeep Bahga and Vijay Madisetti, Big Data Analytics: A Hands-On Approach, 2019.</li> <li>Course web page: <a href="https://www.abandah.com/gheith/?page_id=3022">https://www.abandah.com/gheith/?page_id=3022</a></li> </ol> <p>B- Recommended book(s), material, and media:</p> <ol style="list-style-type: none"> <li>Jake VanderPlas, A Whirlwind Tour of Python, O'Reilly Media, 2016.</li> <li>Joel Gurs, Data Science from Scratch, O'Reilly Media, 2015.</li> <li>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.</li> </ol>																																																
<b>Topic outline and schedule</b>	<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 &amp; 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
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<b>Evaluation tools</b>	<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><b>Total</b></td> <td><b>100%</b></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	<b>Total</b>	<b>100%</b>																														
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<b>Student requirements</b>	The student should have a computer and internet connection.
<b>Course policies</b>	<p>A- Attendance policies:</p> <ul style="list-style-type: none"> <li>• Attendance is required. Class attendance will be taken every class and the university polices will be enforced in this regard.</li> </ul> <p>B- Absences from exams and not submitting assignments on time:</p> <ul style="list-style-type: none"> <li>• A makeup exam can be arranged for students with acceptable absence causes.</li> <li>• Assignments submitted late, but before announcing or discussing the solution can be accepted with 25% penalty.</li> <li>• The project report must be handed in in time.</li> </ul> <p>C- Health and safety procedures:</p> <ul style="list-style-type: none"> <li>• All health and safety procedures of the university and the school should be followed.</li> </ul> <p>D- Honesty policy regarding cheating, plagiarism, misbehavior:</p> <ul style="list-style-type: none"> <li>• Open-book exams</li> <li>• All submitted work must be of the submitting student.</li> <li>• Other text or code must be properly quoted with clear source specification.</li> <li>• Cheating will not be tolerated.</li> </ul> <p>E- Available university services that support achievement in the course:</p> <ul style="list-style-type: none"> <li>• Microsoft Teams team: <a href="#">Link</a></li> <li>• AI Lab for practicing the practical aspects and solving the programming assignments.</li> <li>• Program announcements Facebook page: <a href="#">Link</a></li> </ul>
<b>Additional information</b>	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