

DeCAIR Course Syllabus Form

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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		
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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					

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

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Course title	Data Science									
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
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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. • The student joins the related online team/group and participates in its discussions. 									

	<ul style="list-style-type: none"> The student studies the reference material, including books and videos. The student solves the programming assignments in data science. The student carries out a term project for solving a problem using data science techniques. The student develops a professional report for the term report. The student presents the term project in class. 																																																				
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 at: ... <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, 2nd Edition, O'Reilly Media, Oct 2019. 																																																				
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></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</td> <td>Plotting and Visualization with Matplotlib and Seaborn</td> <td>1</td> <td>1</td> </tr> <tr> <td>5+6</td> <td>Data Loading, Storage and File Formats</td> <td>1</td> <td>1</td> </tr> <tr> <td>7+8</td> <td>Data Cleaning and Preparation</td> <td>1</td> <td>1</td> </tr> <tr> <td>9</td> <td>Data Wrangling: Join, Combine and Reshape</td> <td>1</td> <td>1</td> </tr> <tr> <td>10</td> <td>Data Aggregation and Group Operations</td> <td>1</td> <td>1</td> </tr> <tr> <td>11</td> <td>Time Series</td> <td>1</td> <td>1</td> </tr> <tr> <td>12</td> <td>Introduction to Big Data</td> <td>2</td> <td>2</td> </tr> <tr> <td>13</td> <td>Big Data Architectures and Patterns</td> <td>2</td> <td>2</td> </tr> <tr> <td>14</td> <td>MapReduce Patterns</td> <td>2</td> <td>2</td> </tr> <tr> <td>15</td> <td>Machine Learning Applications in Data Analytics</td> <td>1+2</td> <td>1</td> </tr> </tbody> </table>	Week	Topic	ILO	Resources	1	Course Introduction	1		2+3	Pandas Data Structures, Essential Functionality & Descriptive Statistics	1	1	4	Plotting and Visualization with Matplotlib and Seaborn	1	1	5+6	Data Loading, Storage and File Formats	1	1	7+8	Data Cleaning and Preparation	1	1	9	Data Wrangling: Join, Combine and Reshape	1	1	10	Data Aggregation and Group Operations	1	1	11	Time Series	1	1	12	Introduction to Big Data	2	2	13	Big Data Architectures and Patterns	2	2	14	MapReduce Patterns	2	2	15	Machine Learning Applications in Data Analytics	1+2	1
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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>Homework 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> </tbody> </table>	Assessment tool	Mark	Topic(s)	Time	Homework assignments	20%	Programming aspects	W2-W14	Midterm exam	30%	First 8 weeks	W8																																								
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	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 and Moodle course page AI Lab for practicing the practical aspects and solving the programming assignments. Program announcements Facebook group 			
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