

COURSE OUTLINE

(1) GENERAL

SCHOOL	Science and Technology		
ACADEMIC UNIT	Science and Technology		
PROGRAMME OF STUDIES	MSc in Data Science		
LEVEL OF STUDIES	Postgraduate		
COURSE CODE	DSC06	SEMESTER	2
COURSE TITLE	Exploratory Data Analysis and Visualization		
COURSE TYPE <i>Elective, compulsory</i>	Elective		
INSTRUCTOR(S)	Dr D. Karapiperis		
INDEPENDENT TEACHING ACTIVITIES <i>if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits</i>	WEEKLY TEACHING HOURS	CREDITS	
Theory	3	6	
<i>Add rows if necessary. The organisation of teaching and the teaching methods used are described in detail at (d).</i>			
COURSE TYPE <i>general background, special background, specialised general knowledge, skills development</i>	Special background		
PREREQUISITE COURSES:	-		
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	English		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes		
COURSE WEBSITE (URL)	https://www.ihu.gr/ucips/course-information/ict-essentials		

(2) LEARNING OUTCOMES

<p>Learning outcomes <i>The course learning outcomes, specific knowledge, skills and competences of an appropriate level, which the students will acquire with the successful completion of the course are described.</i></p> <p><i>Consult Appendix A</i></p> <ul style="list-style-type: none"> • Description of the level of learning outcomes for each qualifications cycle, according to the Qualifications Framework of the European Higher Education Area • Descriptors for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and Appendix B • Guidelines for writing Learning Outcomes 									
<ul style="list-style-type: none"> • Understand the essential exploratory techniques for summarizing data • Understand and use the plotting systems in Python and/or R • Understand basic principles of constructing data graphics • Understand and use common multivariate statistical techniques to visualize high-dimensional data 									
<p>General Competences <i>Taking into consideration the general competences that the degree-holder must acquire (as these appear in the Diploma Supplement and appear below), at which of the following does the course aim?</i></p> <table style="width: 100%; border: none;"> <tr> <td style="width: 50%; border: none;"><i>Search for, analysis and synthesis of data and information, with the use of the necessary technology</i></td> <td style="width: 50%; border: none;"><i>Project planning and management</i></td> </tr> <tr> <td style="border: none;"><i>Adapting to new situations</i></td> <td style="border: none;"><i>Respect for difference and multiculturalism</i></td> </tr> <tr> <td style="border: none;"><i>Decision-making</i></td> <td style="border: none;"><i>Respect for the natural environment</i></td> </tr> <tr> <td style="border: none;"></td> <td style="border: none;"><i>Showing social, professional and ethical responsibility and</i></td> </tr> </table>		<i>Search for, analysis and synthesis of data and information, with the use of the necessary technology</i>	<i>Project planning and management</i>	<i>Adapting to new situations</i>	<i>Respect for difference and multiculturalism</i>	<i>Decision-making</i>	<i>Respect for the natural environment</i>		<i>Showing social, professional and ethical responsibility and</i>
<i>Search for, analysis and synthesis of data and information, with the use of the necessary technology</i>	<i>Project planning and management</i>								
<i>Adapting to new situations</i>	<i>Respect for difference and multiculturalism</i>								
<i>Decision-making</i>	<i>Respect for the natural environment</i>								
	<i>Showing social, professional and ethical responsibility and</i>								

<i>Working independently</i> <i>Team work</i> <i>Working in an international environment</i> <i>Working in an interdisciplinary environment</i> <i>Production of new research ideas</i>	<i>sensitivity to gender issues</i> <i>Criticism and self-criticism</i> <i>Production of free, creative and inductive thinking</i> <i>.....</i> <i>Others...</i> <i>.....</i>
<ul style="list-style-type: none"> • Search, analysis and synthesis of data and information, using the necessary technologies • Teamwork • Promotion of free, creative, and inductive thinking 	

(3) SYLLABUS

<ul style="list-style-type: none"> • Fundamentals of data visualization • Constructing data graphics • Analytic graphics • Visualizing high dimensional data • Statistical methods for exploratory analysis • Essential exploratory techniques for summarizing data • Dimensionality Reduction • Perception of discrete and continuous variables • Dynamic graphics • Model visualization

(4) TEACHING and LEARNING METHODS - EVALUATION

DELIVERY <i>Face-to-face, Distance learning, etc.</i>	Hybrid: Face to face and synchronous distance learning													
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY <i>Use of ICT in teaching, laboratory education, communication with students</i>	<p>Use of ICT in Teaching</p> <p>During the educational process, various machine learning and programming tools are used, along with the material available at the e-learning platform.</p> <p>The hybrid teaching method involves synchronous learning with the support of the videoconferencing tool Zoom.</p> <p>Students are taught a variety of tools related to the course content and material.</p> <p>Use of ICT in Communication with students</p> <ul style="list-style-type: none"> • The course material (slides, scientific articles, exercises, etc.) is posted on the course page at the e-learn platform (Moodle). • Use of Moodle Forums announcements. • Live video meetings via Zoom/Teams. • Contact via email. 													
TEACHING METHODS <i>The manner and methods of teaching are described in detail.</i> <i>Lectures, recitation, seminars, laboratory practice, fieldwork, study and analysis of bibliography, tutorials, placements, clinical practice, art workshop, interactive teaching, educational visits, project, essay writing, artistic creativity, etc.</i> <i>The student's study hours for each learning activity are given as well as the hours of non-directed study according to the principles of the ECTS</i>	<table border="1"> <thead> <tr> <th style="text-align: center;"><i>Activity</i></th> <th style="text-align: center;"><i>Semester workload</i></th> </tr> </thead> <tbody> <tr> <td>Lectures</td> <td style="text-align: center;">30 hrs.</td> </tr> <tr> <td>Projects</td> <td style="text-align: center;">20 hrs.</td> </tr> <tr> <td>Exams</td> <td style="text-align: center;">2 hrs.</td> </tr> <tr> <td>Non-Directed Study</td> <td style="text-align: center;">98 hrs.</td> </tr> <tr> <td>Course total</td> <td style="text-align: center;">150 hrs.</td> </tr> </tbody> </table>		<i>Activity</i>	<i>Semester workload</i>	Lectures	30 hrs.	Projects	20 hrs.	Exams	2 hrs.	Non-Directed Study	98 hrs.	Course total	150 hrs.
<i>Activity</i>	<i>Semester workload</i>													
Lectures	30 hrs.													
Projects	20 hrs.													
Exams	2 hrs.													
Non-Directed Study	98 hrs.													
Course total	150 hrs.													
STUDENT PERFORMANCE EVALUATION	Language of Evaluation: English													

<p><i>Description of the evaluation procedure</i></p> <p><i>Language of evaluation, methods of evaluation, summative or conclusive, multiple choice questionnaires, short-answer questions, open-ended questions, problem solving, written work, essay/report, oral examination, public presentation, laboratory work, clinical examination of patient, art interpretation, other</i></p> <p><i>Specifically-defined evaluation criteria are given, and if and where they are accessible to students</i></p>	<p>Evaluation Procedure:</p> <ul style="list-style-type: none"> ● Written Exams (70%). Methods of evaluation: <ul style="list-style-type: none"> ○ Open-ended questions ○ Problem solving ○ Multiple choice questions (on lab material) ● Projects (30%): <ul style="list-style-type: none"> ○ The students should achieve a passing grade to participate in the written exams. <p>The evaluation procedure is announced to the students during the first lecture and is also accessible at the e-learn platform throughout the entire semester.</p>
<p>STUDENT OBLIGATIONS</p> <p><i>Compulsory attendance of lectures, labs, recitations, compulsory participation in midterms, exams, compulsory delivery of homework, projects, etc.</i></p>	<ul style="list-style-type: none"> ● Compulsory attendance of lectures ● Compulsory participation in the exams ● Compulsory delivery of projects

(5) ATTACHED BIBLIOGRAPHY

<ol style="list-style-type: none"> 1. Unwin, A. (2015), Graphical data analysis with R, CRC Press. 2. W.L. Martinez, A.R. Martinez, J. Solka (2010), Exploratory Data Analysis with MATLAB, 2nd Ed., CRC Press. 3. D.C. Hoaglin, F. Mosteller, J.W. Tukey (2000), Understanding Robust and Exploratory Data Analysis, 1st Ed., Wiley. 4. J. W. Tukey (1977), Exploratory Data Analysis, Pearson
