

DAMA503 Module Outline

1. GENERAL

SCHOOL	School of Science and Technology		
PROGRAMME	Data Science and Machine Learning		
LEVEL OF STUDIES	Level 7 of the Hellenic and European Qualifications Framework		
MODULE CODE	DAMA503	SEMESTER	1
MODULE TITLE	Programming, Databases and Algorithms		
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>		HOURS	CREDITS
Weekly workload: 32-33 hours x 13 weeks		420	15 ECTS
MODULE TYPE <i>Compulsory/Elective/ Mandatory Optional</i>	Compulsory		
PREREQUISITE MODULES	None		
LANGUAGE OF INSTRUCTION and EXAMINATIONS	English		
IS THE MODULE OFFERED TO ERASMUS STUDENTS	Yes		
MODULE WEBSITE (URL)	The Module has a dedicated space in HOU's digital learning platform (http://courses.eap.gr , http://study.eap.gr), which students and tutors can access using their credentials.		

2. LEARNING OUTCOMES

<p>Learning outcomes <i>The learning outcomes, specific knowledge, skills and competences of an appropriate level, which the students will acquire with the successful completion of the Module are described.</i> <i>Consult Appendix A</i></p> <ul style="list-style-type: none"> • <i>Description of the level of learning outcomes for each qualifications cycle, according to the Qualifications Framework of the European Higher Education Area</i> • <i>Descriptors for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and Appendix B</i> • <i>Guidelines for writing Learning Outcomes</i>
<p>Knowledge: Upon successful completion of the Module, students will be able to:</p> <ul style="list-style-type: none"> - Understand and explain the role basic data structures play in data science tasks. <p>Skills: Upon successful completion of the Module, students will be able to:</p> <ul style="list-style-type: none"> - Perform analysis of data structures in terms of their time and space complexity - Use the appropriate data structures and algorithms to address data science tasks - Apply recursion to the proper contexts - Design databases to store structured data - Filter data from structured databases using SQL - Handle unstructured data using NoSQL databases - User version control systems to develop data science projects - Integrate software management tools into the development process <p>Competences: Upon successful completion of the Module, students will be able to:</p>

<ul style="list-style-type: none"> - Evaluate different data structures and algorithms for data science tasks - Evaluate data stores in terms of the ability to store structured and unstructured data - Evaluate software development tools 																
<p>General Competences</p> <p><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 Module aim?</i></p> <table border="0"> <tr> <td><i>Search for, analysis and synthesis of data and information, with the use of the necessary technology</i></td> <td><i>Project planning and management</i></td> </tr> <tr> <td><i>Adapting to new situations</i></td> <td><i>Respect for difference and multiculturalism</i></td> </tr> <tr> <td><i>Decision-making</i></td> <td><i>Respect for the natural environment</i></td> </tr> <tr> <td><i>Working independently</i></td> <td><i>Showing social, professional and ethical responsibility and sensitivity to gender issues</i></td> </tr> <tr> <td><i>Team work</i></td> <td><i>Criticism and self-criticism</i></td> </tr> <tr> <td><i>Working in an international environment</i></td> <td><i>Production of free, creative and inductive thinking</i></td> </tr> <tr> <td><i>Working in an interdisciplinary environment</i></td> <td></td> </tr> <tr> <td><i>Production of new research ideas</i></td> <td></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>Working independently</i>	<i>Showing social, professional and ethical responsibility and sensitivity to gender issues</i>	<i>Team work</i>	<i>Criticism and self-criticism</i>	<i>Working in an international environment</i>	<i>Production of free, creative and inductive thinking</i>	<i>Working in an interdisciplinary environment</i>		<i>Production of new research ideas</i>	
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<p>The general skills that the students will acquire are:</p> <ul style="list-style-type: none"> - Search for, analysis and synthesis of data and information, with the use of the necessary technology - Adapting to new situations - Decision-making - Working independently - Project planning and management - Showing social, professional and ethical responsibility and sensitivity to gender issues - Production of free, creative and inductive thinking 																

3. SYLLABUS

<p>Purpose of Module</p> <p>The goal of this module is to help students comprehend foundational concepts to prepare them appropriately for specialized knowledge on data science and machine learning in subsequent modules. It attempts to function as a bridge between introductory and more advanced data science courses of the program. The module starts with a presentation of fundamental algorithms and data structures and their role in the context of data science tasks. Algorithms (searching, sorting, recursion, graph algorithms) and Data structures (stacks, queues, linked lists, trees, hash tables, sparse matrices) will be presented in terms of their complexity. Next, the topic of database systems will be discussed to show students how to understand, query and manipulate structured data (tables, keys, normalization, SQL). This section will also cover NoSQL databases. The module continues with offering the practical skills for collaborative and maintainable coding in the context of data science projects that make use of databases, data structures and algorithms. The module completes with practical examples of applications of Data Science that aims to function as a bridge to more advanced concepts.</p>
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4. TEACHING and LEARNING METHODS - EVALUATION

<p>DELIVERY</p> <p><i>Face-to-face, Distance learning, etc.</i></p>	<ul style="list-style-type: none"> - Distance teaching and learning with three (3) Group Counseling Meetings (GCMs) of 4-hour duration during the academic semester on weekends. - Personal communication and feedback (advisory role of Adjunct Faculty).
<p>USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY</p> <p><i>Use of ICT in teaching, laboratory education, communication with students</i></p>	<p><u>During GCMs and teaching the following are used:</u></p> <ul style="list-style-type: none"> - Remote meetings tools (webex, Teams), - Presentation software (PowerPoint, educational video - animations etc.), - Specialized software/databases for the subjects under study. <p>In addition, students use office automation tools, web browsers and e-reader for digital books.</p> <p><u>Communication with the students is supported by:</u></p> <ul style="list-style-type: none"> - The digital platform of HOU (https://courses.eap.gr/login/index.php / https://study.eap.gr/login/index.php) (course information,

	educational material posts, announcements, messages, examination results, user groups, discussion forums etc.). - e-mail and messaging.														
<p>TEACHING METHODS</p> <p><i>The manner and methods of teaching are described in detail.</i></p> <p><i>Lectures, 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></p> <p><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></p>	<table border="1"> <thead> <tr> <th>Activity</th> <th>Semester Workload</th> </tr> </thead> <tbody> <tr> <td>3 GCMS (x 4 hours)</td> <td>12</td> </tr> <tr> <td>2 Educational Activities (x 10 hours)</td> <td>20</td> </tr> <tr> <td>2 Semester Assignments (x 30 hours)</td> <td>60</td> </tr> <tr> <td>Individual Study time (25 hours x 13 weeks)</td> <td>325</td> </tr> <tr> <td>Final examination</td> <td>3</td> </tr> <tr> <td>Total Workload</td> <td>420</td> </tr> </tbody> </table>	Activity	Semester Workload	3 GCMS (x 4 hours)	12	2 Educational Activities (x 10 hours)	20	2 Semester Assignments (x 30 hours)	60	Individual Study time (25 hours x 13 weeks)	325	Final examination	3	Total Workload	420
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<p>STUDENT PERFORMANCE EVALUATION</p> <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>Students' evaluation – Grade assessment of a Module:</p> <p>a. Two (2) multiple-choice (quiz) Educational Activities (Q), which contribute equally to the final grade with a value of 5% each.</p> <p>b. Two (2) Semester Assignments (A) which contribute equally to the final grade with a value of 10% each.</p> <p>The scoring of educational activities and assignments is activated only if the student succeeds an overall score equal to or above the base (≥50%) in the final or repeat exams.</p> <p>c. Final or repeat exams (E) contribute to the final grade of the module by 70%.</p> <p>The Final Grade of the module is calculated as follows (with 10 being the maximum Grade):</p> <p>Final Grade = (Q1 x 5%) + (Q2 x 5%) + (A1 x 10%) + (A2 x 10%) + (E x 70%)</p> <p>Language of evaluation: English</p>														

5. INDICATIVE BIBLIOGRAPHY

- Recommended bibliography:

- Thomas H Cormen , Charles E Leiserson , Ronald L Rivest , Clifford Stein: Introduction to Algorithms, 3rd Edition (Mit Press).
- Jon Kleinberg, Eva Tardos: Algorithm Design
- Joel Grus, Data Science from Scratch: First Principles in Python
- Al Sweigart: Automate the Boring Stuff with Python
- Cathy Tanimura: SQL for Data Analysis: Advanced Techniques for Transforming Data into Insights

Additional digital (and multimedia) material will be made available online.