

## DAMA700 Module Outline

### 1. GENERAL

<b>SCHOOL</b>	School of Science and Technology		
<b>PROGRAMME</b>	Data Science and Machine Learning		
<b>LEVEL OF STUDIES</b>	Level 7 of the Hellenic and European Qualifications Framework		
<b>MODULE CODE</b>	DAMA700	<b>SEMESTER</b>	3
<b>MODULE TITLE</b>	Applied Research and Development: Systems Practicum		
<b>INDEPENDENT TEACHING ACTIVITIES</b>		<b>HOURS</b>	<b>CREDITS</b>
<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 workload: 32-33 hours x 13 weeks		420	15 ECTS
<b>MODULE TYPE</b> <i>Compulsory/Elective/ Mandatory Optional</i>	Elective		
<b>PREREQUISITE MODULES</b>	None		
<b>LANGUAGE OF INSTRUCTION and EXAMINATIONS</b>	English		
<b>IS THE MODULE OFFERED TO ERASMUS STUDENTS</b>	Yes		
<b>MODULE WEBSITE (URL)</b>	The Module has a dedicated space in HOU's digital learning platform ( <a href="http://courses.eap.gr">http://courses.eap.gr</a> , <a href="http://study.eap.gr">http://study.eap.gr</a> ), which students and tutors can access using their credentials.		

### 2. LEARNING OUTCOMES

<p><b>Learning outcomes</b></p> <p><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></p> <p><i>Consult Appendix A</i></p> <ul style="list-style-type: none"> <li>• <i>Description of the level of learning outcomes for each qualifications cycle, according to the Qualifications Framework of the European Higher Education Area</i></li> <li>• <i>Descriptors for Levels 6, 7 &amp; 8 of the European Qualifications Framework for Lifelong Learning and Appendix B</i></li> <li>• <i>Guidelines for writing Learning Outcomes</i></li> </ul>
<p><b>Knowledge:</b></p> <p>Upon successful completion of the Module, students will be able to:</p> <ul style="list-style-type: none"> <li>- Describe the complete applied-research lifecycle—from problem formulation and literature review to experimental design, implementation, evaluation and dissemination—within the context of intelligent systems.</li> <li>- Explain the architecture of end-to-end machine-learning systems, including data ingestion, preprocessing, model training, validation, deployment and post-deployment monitoring.</li> <li>- Explain techniques for systematic hyper-parameter tuning, model selection and benchmarking under computational, time and resource constraints.</li> </ul> <p><b>Skills:</b></p> <p>Upon successful completion of the Module, students will be able to:</p> <ul style="list-style-type: none"> <li>- Implement a working prototype of a machine learning pipeline using appropriate tools, libraries, and platforms.</li> <li>- Evaluate system performance using defined metrics and identify areas for refinement.</li> <li>- Communicate technical work clearly through structured reports, code documentation, and presentations.</li> </ul>

**Competences:**

Upon successful completion of the Module, students will be able to:

- Analyze a domain-specific problem and formulate system-level research or development objectives.
- Design a solution architecture that integrates machine learning or deep learning components.
- Collaborate effectively in a team environment, integrating contributions and managing responsibilities.

**General Competences**

*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>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>   |   |

**The general skills that the students will acquire are:**

- Search for, analysis and synthesis of data and information, with the use of the necessary technology
- Adapting to new situations
- Decision-making
- Working independently
- Team work
- Project planning and management
- Working in an international environment
- Working in an interdisciplinary environment
- Production of new research ideas
- Project planning and management
- Showing social, professional and ethical responsibility and sensitivity to gender issues
- Production of free, creative and inductive thinking
- Criticism and self-criticism
- Production of free, creative and inductive thinking

**3. SYLLABUS**

**Purpose of Module**

This module offers students a hands-on opportunity to design, develop, and evaluate intelligent systems in a real-world or research-driven context. Building on prior knowledge of machine learning and deep learning, students will undertake a guided project that emphasizes applied research and systems integration. Projects may involve real datasets, interdisciplinary components, or collaboration with academic labs or industry partners. The module focuses on solving open-ended problems using advanced computational methods, system-level thinking, and iterative experimentation. Students will be expected to document their development process, evaluate their system’s performance, and communicate outcomes effectively. Through this practicum, learners gain critical experience in bridging the gap between theory and practice, managing uncertainty, and delivering functional, research-informed solutions. This module is ideal for students preparing for roles in applied AI, system prototyping, or R&D-focused careers.

**4. TEACHING and LEARNING METHODS - EVALUATION**

<b>DELIVERY</b> <i>Face-to-face, Distance learning, etc.</i>	- 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).
<b>USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY</b>	<u>During GCMs and teaching the following are used:</u> - Remote meetings tools (webex, Teams),

<p><i>Use of ICT in teaching, laboratory education, communication with students</i></p>	<p>- Presentation software (PowerPoint, educational video - animations etc.),          - Specialized software/databases for the subjects under study.          In addition, students use office automation tools, web browsers and e-reader for digital books.  <u>Communication with the students is supported by:</u>          - The digital platform of HOU (<a href="https://courses.eap.gr/login/index.php">https://courses.eap.gr/login/index.php</a> / <a href="https://study.eap.gr/login/index.php">https://study.eap.gr/login/index.php</a>) (course information, educational material posts, announcements, messages, examination results, user groups, discussion forums etc.).          - e-mail and messaging.</p>														
<p><b>TEACHING METHODS</b>  <i>The manner and methods of teaching are described in detail.</i>  <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>  <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" data-bbox="687 584 1353 891"> <thead> <tr> <th><b>Activity</b></th> <th><b>Semester Workload</b></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>1 Semester Assignments (x 60 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><b>Total Workload</b></td> <td><b>420</b></td> </tr> </tbody> </table>	<b>Activity</b>	<b>Semester Workload</b>	3 GCMS (x 4 hours)	12	2 Educational Activities (x 10 hours)	20	1 Semester Assignments (x 60 hours)	60	Individual Study time (25 hours x 13 weeks)	325	Final examination	3	<b>Total Workload</b>	<b>420</b>
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<p><b>STUDENT PERFORMANCE EVALUATION</b>  <i>Description of the evaluation procedure</i>  <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>  <i>Specifically-defined evaluation criteria are given, and if and where they are accessible to students.</i></p>	<p><b>Students' evaluation – Grade assessment of a Module:</b>          a. Two (2) presentation-based Educational Activities (P), which contribute equally to the final grade with a value of 5% each.          b. One (1) Semester Assignment (A) which contributes to the final grade with a value of 20%.          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.          c. Final or repeat exams (E) contribute to the final grade of the module by 70%.          The Final Grade of the module is calculated as follows (with 10 being the maximum Grade):  <math display="block">\text{Final Grade} = (P1 \times 5\%) + (P2 \times 5\%) + (A \times 20\%) + (E \times 70\%)</math>  <b>Language of evaluation:</b> English</p>														

## 5. INDICATIVE BIBLIOGRAPHY

- Recommended bibliography:

- Michael R. Berthold, Christian Borgelt, Frank Höppner and Frank Klawonn. (2010). Guide to Intelligent Data Analysis. How to Intelligently Make Sense of Real Data. Springer.
- A. Geron (2022). Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow, 3rd Edition, 3rd edition, O' Reilly Media.

- J. Leskovec, A. Rajaraman & J.D. Ullman (2020). Mining of Massive Datasets (3rd edition). Cambridge University Press

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

*Related scientific Journals:*

- Journal of Machine Learning Research (<http://www.jmlr.org>)
- Machine Learning (<https://www.springer.com/journal/10994>)