

## COURSE OUTLINE

### (1) GENERAL

SCHOOL			
ACADEMIC UNIT	Interdisciplinary Graduate Programme in the BRAIN and MIND sciences		
LEVEL OF STUDIES	7		
COURSE CODE	B&M-R-136	SEMESTER	depending on availability
COURSE TITLE	Robotics		
INDEPENDENT TEACHING ACTIVITIES		WEEKLY TEACHING HOURS	CREDITS
<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>			
laboratory exercises		6	9-27
<i>Add rows if necessary. The organisation of teaching and the teaching methods used are described in detail at (d).</i>			
COURSE TYPE	Special background, skills development		
<i>general background, special background, specialised general knowledge, skills development</i>			
PREREQUISITE COURSES:	B&M -103 Introduction to Computational Neuroscience  Also recommended: B&M -232 Introduction to Statistics and Programming in Matlab CS-475 Autonomous Robotic Navigation CS-590.75 Biomimetic Robotics  Depending on the project, the requirements regarding the student's mathematical and computational background are specified.		
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	English		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	YES		
COURSE WEBSITE (URL)	<a href="https://elearn.uoc.gr/course/view.php?id=4460">https://elearn.uoc.gr/course/view.php?id=4460</a>		

### (2) LEARNING OUTCOMES

<p><b>Learning outcomes</b></p> <p><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"> <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>Upon completion of the laboratory internship, the student will be able to:</p> <ul style="list-style-type: none"> <li>• Reproduce current knowledge and theories in the field of Robotics</li> <li>• Apply analytical approaches described in the literature</li> <li>• Design and develop new methods for analyzing experimental data</li> <li>• Critically evaluate original literature relevant to the subject of their research internship</li> </ul>

- Write a research paper presenting the research hypothesis, results, and their connection to the current literature
- Collaborate harmoniously with the laboratory team and contribute responsibly to the research work carried out in the lab
- Communicate clearly and accurately to both specialist and non-specialist audiences conclusions and knowledge that may result from original research or professional experience

If the laboratory internship constitutes a Master's thesis, the student will additionally be able to:

- Provide comprehensive answers to research questions in the field of the internship
- Formulate original and innovative research questions in the field of Robotics
- Approach research questions in the context of the thesis with creativity and thoroughness
- Produce new knowledge independently
- Formulate new hypotheses and design comprehensive approaches for their examination
- Defend, before a specialized audience, their research results and their implications

### 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 course 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>.....</i>
<i>Production of new research ideas</i>	<i>Others...</i>
	<i>.....</i>

- 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
- 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
- Criticism and self-criticism
- Production of free, creative and inductive thinking

### (3) SYLLABUS

The aim of this course is an in-depth study of selected topics in the field of Robotics. The course seeks to equip participants with the tools necessary for conducting research and preparing a research project in Robotics. The selection of thematic areas is determined each time based on current trends in the international literature, as well as the specific research interests of the instructor and students.

The general areas from which the specific thematic topics of the course are chosen include:

- Kinematics, dynamics, sensor-based control, and autonomous navigation of robotic systems
- Robotic arms, wheeled mobile robots, humanoid robots, biologically inspired robots for unstructured terrains, aerial and underwater robots
- Modelling of robotic systems using analytical and computational methods
- Design of robotic systems with CAD software
- Implementation of robotic systems and their components, using—where required—3D printing techniques
- Design and implementation of robotic control systems based on microcontrollers, active and robotic vision systems, and other types of sensors

- Cognitive and biologically inspired robotics
- Statistical models and mechanisms of robotic learning

#### (4) TEACHING and LEARNING METHODS - EVALUATION

<p style="text-align: center;"><b>DELIVERY</b></p> <p><i>Face-to-face, Distance learning, etc.</i></p>	Face-to-face	
<p style="text-align: center;"><b>USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY</b></p> <p><i>Use of ICT in teaching, laboratory education, communication with students</i></p>	Use of shared analysis codes. Use of publisher databases/electronic repositories of scientific articles	
<p style="text-align: center;"><b>TEACHING METHODS</b></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>	<b>Activity</b>	<b>Semester workload</b>
	Study and analysis of bibliography	50-150
	project	100-300
	essay writing	25-75
	non-directed study	50-150
	<b>Course total</b>	<b>225-675</b>
<p style="text-align: center;"><b>STUDENT PERFORMANCE EVALUATION</b></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>Evaluation Language: English</p> <p>Evaluation Criteria: The student's dedication to conducting the study, autonomy and independence, critical review and analysis of the literature, progress over time, and the quality of the report are evaluated.</p> <p>Evaluation criteria are outlined in the study guide and communicated to students at the beginning of the course.</p>	

#### (5) ATTACHED BIBLIOGRAPHY

<p><b>- Suggested bibliography:</b> Scientific articles published in reputable conferences and scientific journals in the field of the research interests of the Computational Vision and Robotics Laboratory, relevant to the subject of the assigned project.</p>
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