

## COURSE OUTLINE

### (1) GENERAL

<b>SCHOOL</b>	School of Engineering		
<b>ACADEMIC UNIT</b>	Department of Computer Engineering & Informatics		
<b>LEVEL OF STUDIES</b>	Undergraduate		
<b>COURSE CODE</b>	<b>CEID_NE520</b>	<b>SEMESTER</b>	<b>Spring Semester</b>
<b>COURSE TITLE</b>	ALGORITHMIC FOUNDATIONS OF SENSOR NETWORKS		
<b>INDEPENDENT TEACHING ACTIVITIES</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>	<b>WEEKLY TEACHING HOURS</b>	<b>CREDITS</b>	
LECTURES, TUTORIALS, EXERCISE	2(L),2(T),1(E)	5	
<i>Add rows if necessary. The organisation of teaching and the teaching methods used are described in detail at (d).</i>	total	5	
<b>COURSE TYPE</b> <i>general background, special background, specialised general knowledge, skills development</i>	<ul style="list-style-type: none"> <li>• specialised general knowledge</li> <li>• skills development</li> </ul>		
<b>PREREQUISITE COURSES:</b>	Recommended prerequisite knowledge from the following courses: COMPUTER NETWORKS INTRODUCTION TO ALGORITHMS		
<b>LANGUAGE OF INSTRUCTION and EXAMINATIONS:</b>	INSTRUCTION AND EXAMINATION: GREEK (IN ENGLISH IF THERE ARE ERASMUS STUDENTS) LECTURE SLIDES: ENGLISH		
<b>IS THE COURSE OFFERED TO ERASMUS STUDENTS</b>	Yes (English)		
<b>COURSE WEBSITE (URL)</b>	<a href="https://www.ceid.upatras.gr/webpages/courses/sensornets/index.html">https://www.ceid.upatras.gr/webpages/courses/sensornets/index.html</a>		

### (2) LEARNING OUTCOMES

<p><b>Learning outcomes</b> <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>Consult Appendix A</p> <ul style="list-style-type: none"> <li>• Description of the level of learning outcomes for each qualifications cycle, according to the Qualifications Framework of the European Higher Education Area</li> <li>• Descriptors for Levels 6, 7 &amp; 8 of the European Qualifications Framework for Lifelong Learning and Appendix B</li> <li>• Guidelines for writing Learning Outcomes</li> </ul> <p>After the successful completion of the course, the student is familiar with abstract models for sensor networks (spatial-time models of sensor deployment and topologies, interactions, energy models, mobility models, etc.) and has advanced knowledge in the design and analysis of efficient algorithms and protocols for important problems (data routing, energy optimization, localization and mobility, avoiding obstacles, etc.).</p> <p>The skills of students in the study of experimental algorithms, simulation issues, and application development environments are also improved at an advanced level.</p> <p>Finally, students will be able to handle key challenges for distributed computation and undertake the development of new protocols, models and algorithmic techniques, to address critical issues of other distributed systems as well (such as relevant ad hoc mobile networks).</p> <p><b>General Competences</b> <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;"></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>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>Respect for the natural environment</i>							
	<i>Showing social, professional and ethical responsibility and</i>							

<i>Decision-making</i>	<i>sensitivity to gender issues</i>
<i>Working independently</i>	<i>Criticism and self-criticism</i>
<i>Team work</i>	<i>Production of free, creative and inductive thinking</i>
<i>Working in an international environment</i>	.....
<i>Working in an interdisciplinary environment</i>	<i>Others...</i>
<i>Production of new research ideas</i>	.....

- Search for, analysis and synthesis of data and information, with the use of the necessary technology
- Adapting to new situations
- Working independently
- Team work
- Working in an interdisciplinary environment
- Production of new research ideas

### (3) SYLLABUS

- Introduction to technological issues and typical applications
- Basic algorithmic performance properties (correctness, efficiency, fault tolerance)
- Sensor network models (stochastic spatial models, interactions, energy, mobility etc.)
- Sensor deployment methods, distributions, and topologies
- Algorithms for data propagation, energy optimization and power consumption control schemes
- Methods for localization and mobility detection tracking, Object avoidance algorithms, Mobility management issues
- Application development environments, simulation topics, and experimental algorithms.

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

<b>DELIVERY</b> <i>Face-to-face, Distance learning, etc.</i>	Face-to-face	
<b>USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY</b> <i>Use of ICT in teaching, laboratory education, communication with students</i>	Lecture slides, email communication, e-class platform, official forum, course website, progress.upatras.gr	
<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>	<b>Activity</b>	<b>Semester workload</b>
	Lectures	26
	Project on real hardware and software	30
	study and analysis of bibliography	20
	non-directed study	25
	Tutorials	26
	laboratory practice	13
	Course total	<b>140</b>
<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,</i>	The evaluation of the student is performed through: 1. Study of a research paper from the state of the art and write up of a synthetic summary 2. Oral examination on the syllabus 3. Project in real hardware and written report	

*essay/report, oral examination, public presentation, laboratory work, clinical examination of patient, art interpretation, other*

*Specifically-defined evaluation criteria are given, and if and where they are accessible to students.*

**(5) ATTACHED BIBLIOGRAPHY**

**α) Books:**

- B. Krishnamachari, Networking Wireless Sensors, Cambridge University Press, 2006.
- S. Nikolettseas and Jose Rolim, "Theoretical Aspects of Distributed Computing in Sensor Networks", Springer Verlag, 2011.

**β) Research papers are given from both recent and relevant state of the art.**