

## COURSE OUTLINE

### (1) GENERAL

<b>SCHOOL</b>	ENGINEERING		
<b>ACADEMIC UNIT</b>	ELECTRICAL AND COMPUTER ENGINEERING DEPT.		
<b>LEVEL OF STUDIES</b>	Undergraduate		
<b>COURSE CODE</b>	<b>ECE_TEL920</b>	<b>SEMESTER</b>	<b>9</b>
<b>COURSE TITLE</b>	Wireless 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	3		
Projects/ Practice exercises			
Laboratory	1		
<i>Add rows if necessary. The organisation of teaching and the teaching methods used are described in detail at (4).</i>	4	5	
<b>COURSE TYPE</b> <i>general background, special background, specialised, general knowledge, skills development</i>	Specialised ( Signals Telecommunications and Networks)		
<b>PREREQUISITE COURSES:</b>	No. Students are advised to have already attended the courses: Computer Networks, Wireless Networks		
<b>LANGUAGE OF INSTRUCTION and EXAMINATIONS:</b>	Greek		
<b>IS THE COURSE OFFERED TO ERASMUS STUDENTS</b>	No		
<b>COURSE WEBSITE (URL)</b>	<a href="https://www.ece.uop.gr/">https://www.ece.uop.gr/</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 successful completion of the course, students will have achieved the following outcome in the field of:</p> <p><b>Knowledge</b></p> <ul style="list-style-type: none"> <li>✓ <i>Understand the basic concepts of Wireless Sensor Networks.</i></li> <li>✓ <i>Understand and understand the operation of Sensor Network Wireless Systems</i></li> <li>✓ <i>Understand the particular problems and solutions at different levels (physical, data, network, transport) of Wireless Sensor Networks.</i></li> <li>✓ <i>Identify the devices and interactions of each level.</i></li> </ul>
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- ✓ To study the way protocols work together and implement structures on which applications run and / or communicate.
- ✓ To study in detail the characteristics and the ways of implementation of specific network protocols and their application in Wireless Sensor Networks.

**Skills**

- ✓ Coverage analysis and node development planning
- ✓ Defining appropriate data diffusion protocols and link cost models.
- ✓ Original sensor networks using commercial data
- ✓ Defining appropriate media and radio access protocols.
- ✓ Determining the performance of sensor networks and detecting problems
- ✓ Recognize modern problems and/or new challenges in the subject matter of WSN.

**Competences**

- ✓ Independently propose and implement solutions to problems of Wireless Sensor Networks.
- ✓ Communicate effectively with specialists and non-specialists.
- ✓ Deal with complex problems in Wireless Sensor Networks both systematically and creatively.
- ✓ Use the software tools, so that based on the correct interpretation of the traffic statistics,
- ✓ Utilize software tools for WSN analysis and data interpretation.
- ✓ Work and cooperate with their counterparts as a team to address common technical problems.
- ✓ Develop new skills at a higher level.

**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, analyze and synthesize data and information using the necessary technologies.
- ✓ Develop ability to work in independently
- ✓ Teamwork
- ✓ Producing free, creative and inductive thinking

**(3) SYLLABUS**

**Theory Lectures:**

Lectures 1-2: Introduction to adhocds - level analysis - standard applications

Lectures 3-4: HW platforms, sensors technology, physical layer

Lecture 5-6: MAC, synchronization

Lecture 6-7: Routing, cross-layer techniques

Lecture 8-9: Network topology - topology discovery - localization

Lecture 10-11: Deployment methodologies

Lecture 12-13: Energy issues and resource management

**Laboratory exercises**

Utilization of laboratory exercises using open, free network simulator. Students should perform a series of exercises using computer network simulation software. Specifically, free computer network simulator software (eg NS2) will be used to understand the operation of protocols, mechanisms, and algorithms presented in lectures.

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

<p><b>DELIVERY</b></p> <p><i>Face-to-face, Distance learning, etc.</i></p>	<p>✓ Face-to-face</p>													
<p><b>USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY</b></p> <p><i>Use of ICT in teaching, laboratory education, communication with students</i></p>	<p>✓ Slides (ppt) for the teaching of the theoretical part, which have been posted since the beginning of the semester in the e-Class.</p> <p>✓ Laboratory guides for the laboratory part (one for each laboratory exercise), which have been posted from the beginning of the semester in the e-Class.</p> <p>✓ Support of learning process through the e-Class platform (for notification of the course operating regulations, for distribution of slides, supplementary material, announcements, links and bibliography, for the conduct of the examination of the laboratory part, etc.).</p> <p>✓ Preparation of laboratory exercises</p>													
<p><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>	<table border="1"> <thead> <tr> <th data-bbox="635 1556 1129 1664"><b>Activity</b></th> <th data-bbox="1129 1556 1295 1664"><b>Semester workload</b></th> </tr> </thead> <tbody> <tr> <td data-bbox="635 1664 1129 1733">Lectures</td> <td data-bbox="1129 1664 1295 1733">39</td> </tr> <tr> <td data-bbox="635 1733 1129 1803">tutoring exercises</td> <td data-bbox="1129 1733 1295 1803">20</td> </tr> <tr> <td data-bbox="635 1803 1129 1872">Independent study</td> <td data-bbox="1129 1803 1295 1872">30</td> </tr> <tr> <td data-bbox="635 1872 1129 1942">Lab exercises</td> <td data-bbox="1129 1872 1295 1942">36</td> </tr> <tr> <td data-bbox="635 1942 1129 2049"><b>Course Total</b></td> <td data-bbox="1129 1942 1295 2049"><b>125 hours (5 ECTS)</b></td> </tr> </tbody> </table>		<b>Activity</b>	<b>Semester workload</b>	Lectures	39	tutoring exercises	20	Independent study	30	Lab exercises	36	<b>Course Total</b>	<b>125 hours (5 ECTS)</b>
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STUDENT EVALUATION	PERFORMANCE
<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><b>A. Theoretical Part Assessment: (60%)</b></p> <p>I. Written final exam that includes:</p> <p>II. Written works that include:</p> <p style="padding-left: 40px;">a. Understanding research</p> <p style="padding-left: 40px;">b. Bibliographic works</p> <p>The assignments are prepared by groups of students and count positively in the final grade.</p> <p><b>B. Laboratory Part Assessment: (40%)</b></p> <p>i. Oral examination during laboratory exercises</p> <p>ii. Intermediate exam (progress) that includes:</p> <p>iii. Written final exam</p> <p>Remarks:</p> <ul style="list-style-type: none"> <li>✓ The final grade results from the weighting of the theory and laboratory grades with weights of 60% and 40%, respectively.</li> <li>✓ The evaluation is done in the Greek language.</li> <li>✓ The evaluation process and evaluation criteria are published on the course's website in the e-Class.</li> </ul>

## (5) ATTACHED BIBLIOGRAPHY

- Suggested bibliography:

1. Holger Karl & Andreas Willig, " Protocols And Architectures for Wireless Sensor Networks" , John Wiley, 2005.
2. Feng Zhao & Leonidas J. Guibas, "Wireless Sensor Networks- An Information Processing Approach", Elsevier, 2007.
3. Kazem Sohraby, Daniel Minoli, & Taieb Znati, "Wireless Sensor Networks- Technology, Protocols, And Applications", John Wiley, 2007.
4. Anna Hac, "Wireless Sensor Network Designs", John Wiley, 2003
5. Δουληγέρης, Χ., Μητρόπουλος, Σ., 2015. Πληροφοριακά συστήματα στο διαδίκτυο. [ηλεκτρ. βιβλ.] Αθήνα: Σύνδεσμος Ελληνικών Ακαδημαϊκών Βιβλιοθηκών
6. Learning Internet of Things Paperback – January 27, 2015, by Peter Wahe <http://choonsiong.com/public/books/Learning%20Internet%20of%20Things.pdf>