



ΕΛΛΗΝΙΚΗ ΔΗΜΟΚΡΑΤΙΑ  
Α.ΔΙ.Π.  
ΑΡΧΗ ΔΙΑΣΦΑΛΙΣΗΣ & ΠΙΣΤΟΠΟΙΗΣΗΣ  
ΤΗΣ ΠΟΙΟΤΗΤΑΣ ΣΤΗΝ ΑΝΩΤΑΤΗ ΕΚΠΑΙΔΕΥΣΗ

HELLENIC REPUBLIC  
H.Q.A.  
HELLENIC QUALITY ASSURANCE  
AND ACCREDITATION AGENCY

ΤΕΧΝΟΛΟΓΙΚΟ ΕΚΠΑΙΔΕΥΤΙΚΟ ΙΔΡΥΜΑ ΑΝΑΤΟΛΙΚΗΣ ΜΑΚΕΔΟΝΙΑΣ ΚΑΙ ΘΡΑΚΗΣ  
ΜΟΝΑΔΑ ΔΙΑΣΦΑΛΙΣΗΣ ΤΗΣ ΠΟΙΟΤΗΤΑΣ ΤΕΙ ΑΜΘ

## Quality Assurance in Higher Education Course Data Collection Form

ΤΕΧΝΟΛΟΓΙΚΟ ΕΚΠΑΙΔΕΥΤΙΚΟ ΙΔΡΥΜΑ  
ΑΝΑΤΟΛΙΚΗΣ ΜΑΚΕΔΟΝΙΑΣ & ΘΡΑΚΗΣ  
ΑΓΙΟΣ ΛΟΥΚΑΣ,  
65404 ΚΑΒΑΛΑ

EASTERN MACEDONIA AND THRACE INSTITUTE  
OF TECHNOLOGY  
AGIOS LOUKAS  
65404 KAVALA

## COURSE OUTLINE

### 1. GENERAL

<b>SCHOOL</b>	School of Technological Applications		
<b>ACADEMIC UNIT</b>	Department of Electrical Engineering		
<b>DEGREE LEVEL</b>	Undergraduate		
<b>COURSE CODE</b>	ΣΤΝ8	<b>SEMESTER</b>	6 <sup>ο</sup>
<b>COURSE TITLE</b>	Sensor Networks automation		
<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		2	3
E-learning		2	
<b>COURSE TYPE</b> <i>general background, special background, specialised general knowledge, skills development</i>	Scientific Area		
<b>Required passed courses:</b>	Measurement systems		
<b>TEACHING AND EXAMS LANGUAGE:</b>	Greek / English		
<b>THE COURSE IS OFFERED TO ERASMUS STUDENTS:</b>	Yes		
<b>COURSE WEBPAGE (URL)</b>			

## 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 the students will be able to:</p> <ul style="list-style-type: none"> <li>• Describe and assess the role of sensors in the field of electrical and automation engineering. Moreover, to understand the usefulness of the sensor technology in various aspects of the modern economy and conventional life such as Medicine, Environment, Industry, etc.</li> <li>• Describe and classify the modern and innovative application fields of the sensor networks.</li> <li>• Identify, classify, and comparatively evaluate the modern implementation methods of the sensor networks (wired and wireless),</li> <li>• Describe, categorize and compare different types of modern data collection and data analysis systems.</li> </ul> <p>Keywords: sensors, wireless networks, data collection and analysis systems, data acquisition.</p>		
<p><b>General Competences</b></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 course aim?</i></p> <table style="width: 100%; border: none;"> <tr> <td style="width: 50%; vertical-align: top;"> <i>Search for, analysis and synthesis of data and information, with the use of the necessary technology</i>  <i>Adapting to new situations</i>  <i>Decision-making</i>  <i>Working independently</i>  <i>Team work</i>  <i>Working in an international environment</i>  <i>Working in an interdisciplinary environment</i>  <i>Production of new research ideas</i> </td> <td style="width: 50%; vertical-align: top;"> <i>Project planning and management</i>  <i>Respect for difference and multiculturalism</i>  <i>Respect for the natural environment</i>  <i>Showing social, professional and ethical responsibility and sensitivity to gender issues</i>  <i>Criticism and self-criticism</i>  <i>Production of free, creative and inductive thinking</i>  <i>.....</i>  <i>Others...</i>  <i>.....</i> </td> </tr> </table>	<i>Search for, analysis and synthesis of data and information, with the use of the necessary technology</i> <i>Adapting to new situations</i> <i>Decision-making</i> <i>Working independently</i> <i>Team work</i> <i>Working in an international environment</i> <i>Working in an interdisciplinary environment</i> <i>Production of new research ideas</i>	<i>Project planning and management</i> <i>Respect for difference and multiculturalism</i> <i>Respect for the natural environment</i> <i>Showing social, professional and ethical responsibility and sensitivity to gender issues</i> <i>Criticism and self-criticism</i> <i>Production of free, creative and inductive thinking</i> <i>.....</i> <i>Others...</i> <i>.....</i>
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<ul style="list-style-type: none"> <li>▪ Research, analysis and synthesis of data and information with the usage of the necessary technology</li> <li>▪ Decision-making</li> <li>▪ Autonomous work</li> <li>▪ Teamwork</li> <li>▪ Work in a scientific environment</li> <li>▪ Respect for the natural environment</li> <li>▪ Production of free, creative and inductive thinking</li> </ul>		

### 3. COURSE CONTENT

The course consists of six (6) sessions:	
<b>1</b>	<p><b>Introduction – Types of Sensors</b></p> <p>The first section covers:</p> <ul style="list-style-type: none"> <li>▪ The features and the basic components of a sensor</li> <li>▪ The types of sensors with respect to the measured physical quantity</li> <li>▪ The fundamental concepts of sensor systems</li> </ul>
<b>2</b>	<p><b>Smart sensors and protocols</b></p> <p>The second section covers the following topics</p> <ul style="list-style-type: none"> <li>▪ The basic functions of smart sensors</li> <li>▪ Communication buses and protocols</li> </ul>
<b>3</b>	<p><b>Data transmission protocols</b></p> <p>The third section covers</p> <ul style="list-style-type: none"> <li>▪ The basic data transmission protocols such as, RS-232, SPI, I2C, IEEE-488</li> <li>▪ The industrial automation protocols such as, RS-485, Ethernet, FieldBus</li> </ul>
<b>4</b>	<p><b>Wireless sensor networks</b></p> <p>The fourth section covers the following topics</p> <ul style="list-style-type: none"> <li>• Sensor network architecture and deployment</li> <li>• Medium Access Control protocol design</li> <li>• Routing protocols</li> <li>• QoS management</li> <li>• Localization</li> <li>• Efficient energy management</li> </ul>
<b>5</b>	<p><b>Data acquisition systems</b></p> <p>The fifth section presents the following topics</p> <ul style="list-style-type: none"> <li>• The synthesis of Data Acquisition and Control (DAC) systems,</li> <li>• The data processing and storage systems</li> <li>• The data display systems</li> </ul>
<b>6</b>	<p><b>Modern applications in sensor networks</b></p> <p>The last section presents the following topics</p> <ul style="list-style-type: none"> <li>• Fields of application of wireless sensor networks</li> <li>• Various implementations of innovative applications based on sensor networks. (terrestrial, underground, underwater)</li> </ul>

#### 4. TEACHING AND LEARNING METHODS – ASSESSMENT

<p style="text-align: center;"><b>TEACHING METHOD</b> <i>Face-to-face, Distance learning, etc.</i></p>	<ul style="list-style-type: none"> <li>• Face to face lectures in class</li> <li>• E-learning</li> </ul>												
<p style="text-align: center;"><b>UTILISATIONS OF INFORMATION AND COMMUNICATION TECHNOLOGIES</b> <i>Use of ICT in teaching, laboratory education, communication with students</i></p>	<p><b>Using ICT to Enhance Active Learning in the Classroom:</b></p> <ul style="list-style-type: none"> <li>• Use of electronic presentation with multimedia content,</li> <li>• Student support through the course webpage and the e-class platform,</li> <li>• Use the e-class forum, email and skype to communicate with students.</li> </ul>												
<p><i>The manner and methods of teaching are described in detail. 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>	<p><b>Lectures, practice, homework assignments / project, study.</b></p> <table border="1" data-bbox="691 846 1273 1249"> <thead> <tr> <th style="text-align: center;"><i>Activity</i></th> <th style="text-align: center;"><i>Semester workload (hours)</i></th> </tr> </thead> <tbody> <tr> <td>Lectures / E-learning</td> <td style="text-align: center;">26</td> </tr> <tr> <td>Homework assignments or project and report (individual or group)</td> <td style="text-align: center;">30</td> </tr> <tr> <td>Study and preparation for the exams</td> <td style="text-align: center;">30</td> </tr> <tr> <td>Visit a company / production plant / institution</td> <td style="text-align: center;">4</td> </tr> <tr> <td><b>Course Total</b></td> <td style="text-align: center;"><b>90</b></td> </tr> </tbody> </table>	<i>Activity</i>	<i>Semester workload (hours)</i>	Lectures / E-learning	26	Homework assignments or project and report (individual or group)	30	Study and preparation for the exams	30	Visit a company / production plant / institution	4	<b>Course Total</b>	<b>90</b>
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<p style="text-align: center;"><b>STUDENT ASSESSMENT</b> <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 are evaluated on the basis of both written and oral examinations, including personal reports and homework assignments on the work done in their practice session.</p> <ul style="list-style-type: none"> <li>▪ Homework assignments / project reports and presentations (40%)</li> <li>▪ Final written exam (60%)</li> </ul>												

## 5. RECCOMENDED READING

*- Suggested bibliography:*

- Elgar, Peter, and Peter Elgar. Sensors for measurement and control. TecQuipment., 1998.
- Zheng, Jun, and Abbas Jamalipour. Wireless sensor networks: a networking perspective. John Wiley & Sons, 2009.
- Karl, Holger, and Andreas Willig. Protocols and architectures for wireless sensor networks. John Wiley & Sons, 2007.
- Soloman, Sabrie. Sensors handbook. McGraw-Hill, Inc., 2009.

*- Related academic journals:*

- IEEE Sensors Journal
- IET Wireless Sensor Systems
- IEEE Transactions on Wireless Communications
- Wireless Sensor Network
- Ad Hoc & Sensor Wireless Networks
- International Journal of Distributed Sensor Networks
- Journal of Wireless Sensor Network