

## COURSE OUTLINE

### GENERAL

<b>SCHOOL</b>	Sciences and Engineering		
<b>ACADEMIC UNIT</b>	Computer Science		
<b>LEVEL OF STUDIES</b>	1 <sup>st</sup> Cycle		
<b>COURSE CODE</b>	COMP-475	<b>SEMESTER</b>	Fall, Spring
<b>COURSE TITLE</b>	Internet of Things and Wearable Technologies		
<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>	
	2.5	6	
<i>Add rows if necessary. The organisation of teaching and the teaching methods used are described in detail at (d).</i>			
<b>COURSE TYPE</b> <i>general background, special background, specialised general knowledge, skills development</i>	Specialization		
<b>PREREQUISITE COURSES:</b>	COMP-212, COMP 358		
<b>LANGUAGE OF INSTRUCTION and EXAMINATIONS:</b>	English		
<b>IS THE COURSE OFFERED TO ERASMUS STUDENTS</b>			
<b>COURSE WEBSITE (URL)</b>			

### 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><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>After completion of the course students are expected to be able to:</p> <ul style="list-style-type: none"> <li>● Analyze operational principles of the Internet and IoT in modern networked environments.</li> <li>● Evaluate concepts, benefits, architectures, and implementation technologies of IoT and wearable computing systems.</li> <li>● Assess constraints and opportunities of wireless/mobile networks for IoT deployments.</li> <li>● Compare IoT infrastructure metrics with other cyber-physical paradigms in</li> </ul>

connected ecosystems.

- Critique fundamental architectures, models, services, and platforms in the IoT domain.
- Evaluate IoT standardization initiatives and propose frameworks for connected-world implementation.
- Analyze and address resource limitations in battery-powered IoT platforms, including operating systems, MAC protocols, and networking standards.
- Design and implement machine learning models for time-series classification of IMU sensor data in wearable computing scenarios.
- Assess cognitive IoT systems, agent-oriented architectures, and traffic schemes for network resource efficiency.
- Investigate cutting-edge industrial implementations in medical/ambient assisted living within smart spaces.

#### **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?*

*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*  
*Respect for difference and multiculturalism*  
*Respect for the natural environment*  
*Showing social, professional and ethical responsibility and sensitivity to gender issues*  
*Criticism and self-criticism*  
*Production of free, creative and inductive thinking*  
*.....*  
*Others...*  
*.....*

Search for, analysis and synthesis of data and information, with the use of the necessary technology  
Adapting to new situations  
Decision-making  
Working independently  
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Production of free, creative and inductive thinking

#### **SYLLABUS**

1. Introduction to Internet of Things: layers, protocols, packets, services, performance parameters of a packet network as well as applications such as web, Peer-to-peer, sensor networks, and multimedia.

2. Networked Systems and Internet of Things structure.
3. Internet Communication aspects: System Architecture of the Mobile Web based applications and services with the utilized protocols, Sockets and Client/Server structures and P2P existing architectures.
4. Resource Constraints in IoT Devices: Fundamentals of processing, memory, and energy limitations in IoT.
5. Overview of lean operating systems (e.g., TinyOS, Contiki, RIOT OS). MAC protocols for duty cycling and energy efficiency.
6. Networking protocols (mesh, point-to-point) and IEEE 802.15.4 standard.
7. IoT protocols in next generation systems (i.e. 5G+, 6G). Collaborative outsourcing in IoT systems. Edge AI: deploying lightweight AI models on resource-constrained IoT devices.
8. Cyber-Physical Systems: efficiency, and resource manipulation.

Wireless Sensor Network (WSN), life cycle, energy efficiency, lifetime of WSNs, energy conservation.

9. Internet of Things (IoT)
  - a. Internet of Things Standardisation i.e. Status, Requirements, Initiatives and Organisations and how a Connected World can be built;
  - b. Smart spaces, intelligent interfaces communication within social, environmental, user contexts and industrial examples, e.g. Smart Grid and automatic meter readings.
10. Design and implement ML models for time-series classification of IMU sensor data in wearable computing scenarios\*\*.
11. IoT and platform oriented integrations: Cloud platform paradigm for the IoT and the state-of-the-art notations currently used.
12. IoT and wearable devices: Case studies\*, e.g. sensor body-area-network and control of a smart home.

*-Including Emulation/Simulation experiments for certain network scenarios using Core packages by Oracle, NS-3 and other integrated packages*

*\*\* Students will be able to design and implement machine learning models for time-series classification using IMU (Inertial*

Measurement Unit) sensor data, with a focus on applications in wearable computing such as activity recognition, health monitoring, and exercise classification

## TEACHING and LEARNING METHODS - EVALUATION

<p style="text-align: center;"><b>DELIVERY</b> <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> <i>Use of ICT in teaching, laboratory education, communication with students</i></p>	<i>Use of ICT in teaching / Χρήση ΤΠΕ Communication with students / Επικοινωνία με Φοιτητές</i>															
<p style="text-align: center;"><b>TEACHING METHODS</b> <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>	<table border="1" style="width: 100%; text-align: center;"> <thead> <tr> <th style="text-align: left;"><b>Activity</b></th> <th style="text-align: left;"><b>Semester workload</b></th> </tr> </thead> <tbody> <tr> <td>Lectures</td> <td>35</td> </tr> <tr> <td>Preparation, homework, quizzes</td> <td>54</td> </tr> <tr> <td>Projects</td> <td>38</td> </tr> <tr> <td>Exam preparation</td> <td>21</td> </tr> <tr> <td>Final Exam</td> <td>2</td> </tr> <tr> <td><b>Course total</b></td> <td><b>150</b></td> </tr> </tbody> </table>		<b>Activity</b>	<b>Semester workload</b>	Lectures	35	Preparation, homework, quizzes	54	Projects	38	Exam preparation	21	Final Exam	2	<b>Course total</b>	<b>150</b>
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<p style="text-align: center;"><b>STUDENT PERFORMANCE EVALUATION</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> <ul style="list-style-type: none"> <li>- Tests/Quizzes</li> <li>- Design project</li> <li>- Homework</li> <li>- Project</li> <li>- Mid-Term</li> <li>- Final Exam</li> </ul> <p><b>**Assessment Breakdown:**</b></p> <ul style="list-style-type: none"> <li>- Mid-term Exam: 20%</li> <li>- Project(s)/ HW&amp;Qs/Laboratory Exercises: 15%</li> </ul>																

## ATTACHED BIBLIOGRAPHY

### Required Textbooks / Readings:

Title	Author(s)	Publisher	Year	ISBN
Internet of Things (IoT) in 5G Mobile Technologies	Constandinos X. Mavromoustakis, George Mastorakis, Jordi Mongay Batalla	Springer International Publishing AG	2016	ISBN-10: 3319309110 ISBN-13: 978-3319309118
Beyond the Internet of Things: Everything Interconnected	Jordi Mongay Batalla, George Mastorakis and Constandinos X. Mavromoustakis	Springer International Publishing AG	2017	ISBN-10: 3319507567 ISBN-13: 978-3319507569

### Recommended Textbooks / Readings:

Title	Author(s)	Publisher	Year	ISBN
Ambient assisted living and enhanced living environments: principles, technologies and control	Ciprian Dobre et al.	Butterworth-Heinemann	2016	9780128051955
Designing Connected Products: UX for the Consumer Internet of Things	Claire Rowland, et al.	O'Reilly Media	2016	ISBN-10: 1449372562 ISBN-13: 978-1449372569

\* Some additional material for the state-of-the-art in IoT and Wearable Technologies (published flagship papers/chapters and demonstrations etc.) will be provided to students.