

## 340605 - INAM-R2007 - Environmental Intelligence

Coordinating unit: 340 - EPSEVG - Vilanova i la Geltrú School of Engineering  
Teaching unit: 707 - ESAII - Department of Automatic Control  
Academic year: 2017  
Degree: MASTER'S DEGREE IN AUTOMATIC SYSTEMS AND INDUSTRIAL ELECTRONICS (Syllabus 2012).  
(Teaching unit Compulsory)  
ECTS credits: 5 Teaching languages: English

### Teaching staff

Coordinator: Catala Mallofre, Andreu

### Degree competences to which the subject contributes

#### Specific:

- cb8. CB8 - Students will be able to integrate knowledge and handle complexity and formulate judgments from a incomplete or limited information, including reflecting on social and ethical responsibilities linked to the application of their knowledge and judgments
- cb9. CB9 - Students can communicate their conclusions, knowledge and rationale underpinning these, to skilled and unskilled public in a clear and unambiguous way
- cc01. CC01 - Ability to research, design, develop and characterize advanced control systems that enable the dynamic system behave according to the operational performance requirements.
- cg01. (ENG) CG01 - Ability to research, design, develop and characterize the dynamics of complex systems that must be controlled to meet certain demanding operational performance at the operational level and security level, noticing some restrictions components and the possibility of failures in the control system
- CB7. CB7 - Students can apply their knowledge and their ability to solve problems in new or unfamiliar contexts within broader (or multidisciplinary) contexts related to their field of study
- CEV12. CEV12 - A Learn to design interactive systems in multidisciplinary teams applying the methodology and techniques of Design Centered in User (DCU).
- CEV11. CEV11 - Structure and integrate artificial intelligence techniques and Automatic Learning.
  
- CEV10. CEV10 - Identify solutions in smart environments through design and implementation of sensor networks and services environment.
- CEV02. CEV02 - Analyze and evaluate programming techniques of mobile devices.

#### Transversal:

- ct4. EFFECTIVE USE OF INFORMATION RESOURCES: Managing the acquisition, structuring, analysis and display of data and information in the chosen area of specialisation and critically assessing the results obtained.
- ct3. TEAMWORK: Being able to work in an interdisciplinary team, whether as a member or as a leader, with the aim of contributing to projects pragmatically and responsibly and making commitments in view of the resources that are available.
- CT1a. ENTREPRENEURSHIP AND INNOVATION: Being aware of and understanding how companies are organised and the principles that govern their activity, and being able to understand employment regulations and the relationships between planning, industrial and commercial strategies, quality and profit.

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### Teaching methodology

The subject will be conducted with the principles of Project Based Learning. An introductory lecture of each area will be presented by the professor. The students will work with their projects during the whole semester and they should defend their evolution in four different stages with public presentations. A final report should be delivered at the end of the course.

### Learning objectives of the subject

To know the basic characteristics of different types of sensor devices (infrared, radio frequency, ultrasonic, GPS, inertial sensors) in order to select the appropriate application on any Environmental Intelligence application.

To learn the terminology and basic techniques of Artificial Intelligence and its implementation in Environmental Intelligence scenarios.

To design systems able to capture and extract meaningful information from human behaviors in various environments (indoor, outdoor)

4. To understand the concept of ubiquitous computing as a new paradigm in the field of information technology.

5. To know the possibilities of Environmental Intelligence applications for assistive technologies and environmental control

### Study load

Total learning time: 125h	Hours large group:	15h	12.00%
	Hours medium group:	0h	0.00%
	Hours small group:	30h	24.00%
	Guided activities:	0h	0.00%
	Self study:	80h	64.00%

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### Content

<p>Introduction to Ambient Intelligence</p>	<p>Learning time: 18h Theory classes: 2h Practical classes: 7h Self study : 9h</p>
<p>Description: ? Ambient Intelligence and HCI ? General interaction framework. Norman?s model of interaction ? Rules and principles of HCI Design ? Sensation and perception. Cognitive engineering. ? Multimodal interaction</p>	
<p>Knowledge-based systems, computational intelligence</p>	<p>Learning time: 18h Theory classes: 2h Practical classes: 7h Self study : 9h</p>
<p>Description: Heuristics and non-heuristic search. Uncertainty information approach Learning systems: Neural Networks and Support Vector Machines</p>	
<p>Pervasive Computing</p>	<p>Learning time: 18h Theory classes: 2h Practical classes: 7h Self study : 9h</p>
<p>Description: ? Principles and technology overview. ? Architectures. Operating Systems. ? Location and context awareness. ? Embedded Intelligence. Smart objects ? Ubiquitous interfaces</p>	

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<p>Person centred Ambient Intelligence</p>	<p>Learning time: 18h Theory classes: 2h Practical classes: 7h Self study : 9h</p>
<p>Description: ? Principles and technologies of Ambient Intelligent design. ? Augmented reality ? Smart environments ? Wearable systems Specific objectives:</p>	
<p>Ambient intelligence applications</p>	<p>Learning time: 18h Theory classes: 2h Practical classes: 7h Self study : 9h</p>
<p>Description: ? Ambient intelligence services ? Ambient Assisted Living (AAL): requirements and solutions. ? Ethics in AAL: privacy, autonomy, integrity, reliability, e-inclusion, technology in the society ? Large scale ambient contexts (e.g., intelligent buildings, urban public spaces, smart cities)</p>	

### Qualification system

The assessment of this course will be mainly through an original project, preferably in groups of 2 students. On the evaluation of the project will be considered:

- ? The adequacy of the project in the context of the subject.
- ? The monitoring of the project in all its phases: problem statement, analysis of existing solutions, information gathering, solution design proposed, selection of physical devices and computing strategies, simulated or functional prototypes and finally, analysis of the impact of the system.
- ? Report writing and oral presentation of the project.

Each student will make total of 4 presentations agreeing the different project phases.

The evaluation will be based on the quality of the different presentations and the final report

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### Bibliography

#### Basic:

Bishop, Christopher M. Pattern recognition and machine learning. New York: Springer, 2006. ISBN 9780387310732.

Weber, Werner; Rabaey, Jan M; Aarts, Emile Aarts. Ambient Intelligence [Recurs electrònic] [on line]. Berlin, Heidelberg: Springer Berlin Heidelberg, 2005 [Consultation: 04/03/2016]. Available on: <<http://dx.doi.org/10.1007/b138670>>. ISBN 9783540271390.

MacKenzie, I. Scott. Human-computer interaction [Recurs electrònic] : an empirical research perspective [on line]. Amsterdam ; Boston: Morgan Kaufmann, 2013 [Consultation: 04/03/2016]. Available on: <<http://site.ebrary.com/lib/upcatalunya/detail.action?docID=10642632>>. ISBN 9780124071650.