



Subject: Ubiquitous computing and ambient intelligence (UCAMI)  
Code: 32433  
Institution: Escuela Politécnica Superior, Universidad Autónoma de Madrid  
Degree: Master's program in Research and Innovation in Information and Communications Technologies (i<sup>2</sup>-ICT)  
Level: Master  
Type: Elective [Human-Centered Software Development]  
ECTS: 6

## COURSE GUIDE: Ubiquitous Computing and Ambient Intelligence (UCAMI)

**Academic year:** 2016-2017

**Program:** Master's program in Research and Innovation in Information and Communication Technologies (i<sup>2</sup>-CIT)

**Center:** Escuela Politécnica Superior  
**University:** Universidad Autónoma de Madrid

**Last modified:** 2015/05/05  
**Status:** Approved 2015/05/14



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## 1. ASIGNATURA / COURSE (ID)

### Computación ubicua e inteligencia ambiental Ubiquitous Computing and Ambient Intelligence (UCAMI)

#### 1.1. Programa / program

Máster Universitario en Investigación e Innovación en Tecnologías de la Información y las Comunicaciones (i<sup>2</sup>-TIC)

Master in Research and Innovation in Information and Communication Technologies (i<sup>2</sup>-CIT) [Officially certified]

#### 1.2. Course code

32433

#### 1.3. Course areas

Languages and Information Systems

#### 1.4. Tipo de asignatura / Course type

Optativa [itinerario: Software centrado en el usuario]  
Elective [itinerary: Human-Centered Software Development]

#### 1.5. Semester

Second semester

#### 1.6. Credits

6 ETCS

#### 1.7. Language of instruction

The lecture notes are in English. The lectures are mostly in Spanish. Some of the lectures and seminars can be in English.



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## 1.8. Recommendations / Related subjects

No previous knowledge is required to follow the course.

Related subjects are:

- Interacción persona ordenador [Human-computer interaction]
- Redes sociales, colaboración en red [Social networks and collaboration on the Internet]
- Sistemas adaptativos y modelado de usuario [Adaptive systems and user modeling]

## 1.9. Lecturers

Add @uam.es to all email addresses below.

**Lectures and labs:**

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**Labs:**

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## 1.10. Objetivos de la asignatura / Course objectives

En esta asignatura se estudiarán los diferentes aspectos que abarca la computación ubicua y la inteligencia ambiental: tecnologías hardware utilizadas, sistemas software de soporte, computación móvil, interfaces de usuario, diseño y desarrollo de sistemas ubicuos, etc.

In this subject we will study the different aspects related to the ubiquitous computing and ambient intelligence: hardware technologies, software systems, mobile computing, user interfaces, design and development of ubiquitous systems, etc.

At the end of each unit, the student should be able to:

UNIT BY UNIT SPECIFIC OBJECTIVES	
<b>UNIT 1.- Introduction to ubiquitous computing and ambient intelligence</b>	
1.1.	Know the origins of the ubiquitous computing and ambient intelligence
1.2.	Recognize the challenges of ambient intelligence.
1.3.	Approach to the human-centered design for ambient intelligence.
<b>UNIT 2.- Technologies for ambient intelligence</b>	
2.1.	Identify the different technologies involved in ambient intelligence.
2.2.	Decide which one should be used for each different approach.
<b>UNIT 3.- Domains of application</b>	
3.1.	Know the different domains where ambient intelligence can be applied.
3.2.	Select among alternative solutions for each domain.
3.3.	Recognize the best way of interaction for a specific domain.
<b>UNIT 4.- Sensing, analyzing and influencing human behavior</b>	
4.1.	Understand how context is used in ubiquitous computing.
4.2.	Know different mechanisms to acquire context.
4.3.	Determine how to process the context.
<b>UNIT 5.- Advanced interfaces for ambient intelligence</b>	
5.1.	Know advanced modalities of interaction related to ambient intelligence.
5.2.	Apply these modalities to this area.

## 1.11. Course contents

### PART I

1. Introduction to ubiquitous computing and ambient



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- a. Origins of the ubiquitous computing and ambient intelligence
  - b. Challenges for the ambient intelligence
  - c. Human-centered design at ubiquitous computing
2. Technologies for ambient intelligence
    - a. Physical computing
    - b. Mobile computing
    - c. Interfaces for ambient intelligence
3. Domains of application
    - a. Ubiquitous classroom and mobile learning
    - b. Internet of things
    - c. Intelligent environments
    - d. Ambient intelligence and special needs
4. Sensing, analyzing and influencing human behavior
    - a. Context acquisition
    - b. Context-aware computing
    - c. Persuasive technologies
    - d. Urban computing
    - e. Social computing
5. Advanced interfaces for ambient intelligence
    - a. Virtual reality
    - b. Augmented reality
    - c. Mixed reality

## 1.12. Course bibliography

1. J.C. Augusto, M. Huch, A. Kameas and J. Maitland. Handbook of Ambient Assisted Living: Technology for Healthcare, Rehabilitation and Well-being (Ambient Intelligence and Smart Environments), 2012
2. Hideyuki Nakashima, Hamid Aghajan, Juan Carlos Augusto. Handbook of Ambient Intelligence and Smart Environments. 2009.
3. Werner Weber, Jan Rabaey, Emile H.L. Aarts. Ambient Intelligence. 2010.
4. Kevin Curran. Pervasive and Ubiquitous Technology Innovations for Ambient Intelligence Environments. 2012.
5. Krumm, J. (Ed.) Ubiquitous Computing Fundamentals. Chapman and Hall/CRC, 2009
6. Dourish, P. and Bell, G. Divining a Digital Future: Mess and Mythology in Ubiquitous Computing. The MIT Press (April 22, 2011)
7. Kuniavsky, M. Smart Things: Ubiquitous Computing User Experience Design. Morgan Kaufmann, 2010
8. Jones, M. and Marsden, Mobile Interaction Design. (Feb 13, 2006)



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9. Saffer, D. Designing Gestural Interfaces. O'Reilly Media; 1 edition (December 3, 2008)
10. Shepard, M. Sentient City: Ubiquitous Computing, Architecture, and the Future of Urban Space. The MIT Press (February 18, 2011)
11. Cook, D. and Das, S. Smart Environments: Technology, Protocols and Applications. Wiley-Interscience; 1 edition (November 2, 2004)

### 1.13. Coursework and evaluation

The course involves lectures, assignments, lab assignments and seminar presentations.

It is necessary to attend at least 80% of the classes and complete successfully the assignments.

In case of a fail grade in the ordinary exam period, in the extraordinary exam period, the student will be evaluated by new assignments.