



## Course guide

# 300267 - ARASM - Augmented Reality & Smart Objects

Last modified: 05/07/2022

**Unit in charge:** Castelldefels School of Telecommunications and Aerospace Engineering  
**Teaching unit:** 701 - DAC - Department of Computer Architecture.

**Degree:** MASTER'S DEGREE IN APPLIED TELECOMMUNICATIONS AND ENGINEERING MANAGEMENT (MASTEAM)  
(Syllabus 2015). (Optional subject).

**Academic year:** 2022    **ECTS Credits:** 3.0    **Languages:** English

### LECTURER

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**Coordinating lecturer:** Royo Vallés, M. Dolores

**Others:** Royo Vallés, M. Dolores

### PRIOR SKILLS

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Solid computer programming skills

### DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

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**Generical:**

03 DIS. (ENG) Diseñar aplicaciones de alto valor añadido basadas en las Tecnologías de la Información y las Comunicaciones (TIC), aplicadas a cualquier ámbito de la sociedad.

06 RES. (ENG) Resolver problemas y mejorar procesos en cualquier ámbito social a partir de la aplicación de las TIC, integrando conocimientos de diversos ámbitos y aplicando ingeniería de alto nivel tecnológico.

**Transversal:**

03 TLG. THIRD LANGUAGE. Learning a third language, preferably English, to a degree of oral and written fluency that fits in with the future needs of the graduates of each course.

**Basic:**

CB6. (ENG) CB6 - Poseer y comprender conocimientos que aporten una base u oportunidad de ser originales en el desarrollo y/o aplicación de ideas, a menudo en un contexto de investigación.

CB9. (ENG) CB9 - Que los estudiantes sepan comunicar sus conclusiones y los conocimientos y razones últimas que las sustentan a públicos especializados y no especializados de un modo claro y sin ambigüedades.

### TEACHING METHODOLOGY

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The subject combines a small number of lectures, several guided lab sessions and an small project that combines Augmented reality and Smart Objects technologies

### LEARNING OBJECTIVES OF THE SUBJECT

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In this course, students will learn to:

1. What is and what does Augmented Reality consist of, as well as its applications.
2. To create intelligent objects with Arduino.
3. To program Augmented Reality applications for mobile platforms that use image processing and GPS location techniques.
3. To program Applications for mobile platforms that include information of intelligent objects.



## STUDY LOAD

Type	Hours	Percentage
Hours small group	27,0	36.00
Self study	48,0	64.00

**Total learning time:** 75 h

## CONTENTS

### Introduction

**Description:**

General introduction to the course:

1. Introduction to the content of the subject where are presented a detailed breakdown of what topics will be explored during the academic sessions: Augmented Reality and Smart Objects.
2. Materials and work tools: books, documents, programming frameworks
3. Course evaluation
4. Students have to answer a programming level test

**Full-or-part-time:** 2h

Laboratory classes: 2h

### Unity 3D framework

**Description:**

The work tool of this course is Unity 3D framework. Throughout the course you can see how this framework allows access to the sensors of mobile devices (GPS, camera ...) and how they can be used to create applications for mobile devices (Android), applications that can access smart objects and can combine virtual objects with the real world (Augmented Reality Applications)

**Full-or-part-time:** 6h

Practical classes: 2h 30m

Self study : 3h 30m

### Augmented Reality

**Description:**

This part of the course will teach you the basics of developing mobile applications using Augmented Reality technology. Through small guided projects, you'll learn practical techniques to rapidly and easily prototype applications for Android devices.

**Specific objectives:**

Objectives:

- . Students will learn the basics of Augmented Reality technology
- . Students will be able to prototype applications for Android devices that use this technology

**Related activities:**

Activities:

1. Augmented Reality Introduction
2. Unity 3D introduction. My first Augmented Reality app.
3. Augmented Reality based on GPS location
4. Theoretical assessment
5. Project

**Full-or-part-time:** 40h 20m

Laboratory classes: 13h 30m

Self study : 26h 50m



## Smart Objects

### Description:

This part of the course, through small guided projects, will teach how to design and build a smart object based on Arduino and CoAp protocol (server side), also the basics of developing mobile applications to access this smart object (client side).

### Specific objectives:

Objectives:

1. Students will learn how to build simple smart objects based on Arduino and CoAp communication protocol.
2. Students will learn to build prototype applications to get smart object's sensor values

### Related activities:

Activities:

1. Introduction to Smart Objects
2. Server side. Build a Arduino smart object based on CoAp protocol.
3. Client side. How to access to the smart object through an Android app

**Full-or-part-time:** 26h 40m

Laboratory classes: 9h

Self study : 17h 40m

## GRADING SYSTEM

Qualification System.

45% Augmented Reality and Smart Object evaluation concepts. Oral and written evaluation of the knowledge acquired regarding basic concepts of these technologies and what added value they can offer with respect to other technologies (web applications for example)

45% Project evaluation. Quality of the apps presented in terms of functionality, usability and complexity.

10% Subjective evaluation

## BIBLIOGRAPHY

### Basic:

- Tomás Sánchez López, Damith C. Ranasinghe, Mark Harrison, Duncan McFarlane. "Using Smart Objects to build the Internet Of things". IEEE internet computing. New York: IEEE Computer Society, 1997-.

- R. Azuma ; Y. Baillot ; R. Behringer ; S. Feiner ; S. Julier ; B. MacIntyre. "Recent Advances in Augmented Reality". IEEE computer graphics and applications. New York: IEEE, 1981.

### Complementary:

- Dimitris Chatzopoulos ; Carlos Bermejo ; Zhanpeng Huang ; Pan Hui. "Mobile Augmented Reality Survey: From Where We Are to Where We Go". IEEE Access [on line]. <https://ieeexplore.ieee.org/document/7912316/> [Consultation: 26/07/2022]. Available on:

<https://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=7912316>.- Thad Starner , Steve Mann , Bradley Rhodes , Jeffrey Levine , "Augmented Reality Through Wearable Computing". Presence: Teleoperators and Virtual Environments [on line]. [Consultation: 06/06/2018].

Available on : <https://www.cc.gatech.edu/fac/Thad.Starner/p/journal/augmented-reality-through-wearable-computing.pdf>.