

## 29824 - Programmable Electronic Systems

### Información del Plan Docente

<b>Academic Year</b>	2016/17
<b>Academic center</b>	110 - Escuela de Ingeniería y Arquitectura 326 - Escuela Universitaria Politécnica de Teruel
<b>Degree</b>	440 - Bachelor's Degree in Electronic and Automatic Engineering 444 - Bachelor's Degree in Electronic and Automatic Engineering 330 - Complementos de formación Máster/Doctorado
<b>ECTS</b>	10.0
<b>Course</b>	XX
<b>Period</b>	Indeterminate
<b>Subject Type</b>	ENG/Complementos de Formación, Compulsory
<b>Module</b>	---

### **1.Basic info**

#### **1.1.Recommendations to take this course**

#### **1.2.Activities and key dates for the course**

### **2.Initiation**

#### **2.1.Learning outcomes that define the subject**

#### **2.2.Introduction**

### **3.Context and competences**

#### **3.1.Goals**

#### **3.2.Context and meaning of the subject in the degree**

#### **3.3.Competences**

#### **3.4.Importance of learning outcomes**

### **4.Evaluation**

### **5.Activities and resources**

#### **5.1.General methodological presentation**

- The course will be based on combining theoretical explanations with practical exercises and laboratory work.

- Lectures will provide theoretical background on fundamentals of microcontroller system design and embedded systems

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- Case studies and real applications will be worked out at the classroom
- The students will do laboratory work connecting different peripherals to a microcontroller evaluation board, and will program the hardware in assembly and C languages
- Individual and group assignments will be proposed
- Student participation is considered very important in order to acquire the learning outcomes and skills needed
- At the Escuela Universitaria Politécnica de Teruel the students will develop a course Project

### 5.2.Learning activities

#### **Classroom activities 4 ECTS (100 hours)**

##### **1) Course lectures (T1) (50 hours).**

Fundamentals of microcontroller system design, hardware, programming and embedded systems, mixing theoretical concepts and practical applications.

##### **2) Case studies (T2) (25 hours)**

Different case studies will be worked out at the classroom. Students are encouraged to prepare them in advance. Assignments could also be worked out in this part

##### **3) Laboratory work (T3) (25 hours).**

Five laboratory sessions will be carried out in the first semester, and four in the second one, consisting of hardware development and programming. Each session will be evaluated in the laboratory. Students have to prepare sessions in advance

#### **personal work: 6 ECTS (150 hours)**

##### **4) Assignments (T6) (50 hours)**

Individual and group assignments will be proposed

##### **5) Personal study (T7) (94 hours)**

Continuous study will be promoted among students. They can also attend tutorials to solve the specific problems they can face in the course

##### **6) Evaluation activities (T8) (6 hours)**

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Assessment will be based on coursework (laboratory work and assignments) and final examination

### 5.3.Program

#### I) Digital Electronic Systems

1. Architecture and blocks of a commercial microcontroller
2. Programming in Assembly and C
3. Inputs and Outputs
4. Peripherals and serial communications
5. Memory circuits and design of bus oriented systems
6. Design of complex digital electronics systems: uP/uC/DSP/FPGA

#### II) Embedded Systems

1. C development tools for embedded systems
2. Time management and specialized peripherals
3. Programming of discrete control systems
4. Programming of sampled control systems
5. Concurrent applications. Cyclic executives
6. Real-time kernels and priorities

Note. A more detailed program will be provided at the beginning of the course.

### 5.4.Planning and scheduling

Timetables for classroom and laboratory sessions will be published prior to the beginning of the course at the web of the EINA <https://eina.unizar.es/> and EUPT <https://eupt.unizar.es/>

A course timetable is also provided to the student, which includes a detailed description of the dates for submission <https://moodle2.unizar.es/add/>

### 5.5.Bibliography and recommended resources