

Embedded Systems

Credits: 4 Semester 3 Compulsory: No

Format	Lectures 20 h	Examples 12 h	Private study 68 h
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Lectures: A. Turetta (UG)

Objectives:

This course presents the fundamentals of embedded systems from both the architectural point of view and the basics of programming, with particular attention to sensing and actuating devices.

Contents:

The following topics are treated:

General overview of existing families of micro-controllers, DSPs, FPGAs, ASICs

Basics of developing for embedded systems: coding, compiling, linking, downloading, executing.

Different kinds of memory devices and memory organization.

On-chip and off-chip peripherals units and basic I/O operations: ADC, DAC, PWM, Parallel port, Counters, Timers.

Buses and communication channels.

Interrupt-driven programming.

Fundamentals of real-time programming for embedded systems.

Practical Work: Exercises will be set, which will involve design and implementation and testing of real-time code for micro-controllers.

Abilities

After completing this course, the students will be able to:

Understand why embedded systems are different.

Identify and quantify the main requirements for a given application in terms of resources (memory, computational power, bus speed, I/O channels, ...).

Read and understand the user manuals of alternative architectures and select the right one for a given application.

Identify the peripheral units most suitable for the application and program their functioning.

Design event-driven projects and real-time applications for micro-controllers.

Code, compile, link, download, debug and execute programs for micro-controllers.

Assessment: 30% continuous assessment, 70% from end of semester examination.

Recommended texts:

- Q. Li, C. Yao, *Real-Time Concepts for Embedded Systems*, CMP Books, 2003.
(ISBN:1578201241).

Further readings:

D. E. Simon, *An Embedded Software Primer*, Addison-Wesley Professional, 1999. (ISBN: 020161569X)

A. S. Berger, *Embedded Systems Design: An Introduction to Processes, Tools and Techniques*, CMP Books, 2001. (ISBN: 1578200733).