

Pervasive Systems (offerta solo in inglese)

The reduced ability to identify new resources and the increasing demand for safety, quality and new services forces, in all technology fields, to identify a set of methods, criteria and solutions that improve the existing ones making them more efficient, independent and secure. It is in this scenario that ICT plays its role due to its ability to transform the inherent characteristics of each object/environment into programmed and adaptive objects and to "hide" - pervading the environment - from users' perception. The aim of the course is to describe, for different areas of interest, design techniques, criteria for the development and existing and future technologies in the field of pervasive systems, focusing the attention on the need to make the systems autonomous, both from the energy supply point of view and the ability to detect and tolerate failures (safety).

The class is in lecture format, practical lessons and a personal project for a total of 116 hours, divided into 54 hours for lectures, 32 hours of practical lessons and 30 hours for the personal project. Covered topics:

1. Introduction to pervasive systems architecture
 - a. Hardware Architecture
 - i. Microcontroller and processor for application specific applications
 - ii. Special purpose hardware devices
 - b. Sensors and actuators
 - c. Software architecture
 - i. Software for special purpose devices: applications and operating systems
 - d. Communication Architecture
 - i. Communication protocol for wired and wireless communication
 - ii. Fault toleration and self checking prosperities: hardware and software methods
2. Smart ambient
 - a. Wireless sensor network: definition, properties and design issues.
 - b. Wearable Computing: definition, properties and design issues.
 - c. Embedded systems: definition, properties and design issues.
3. Low Power and low Energy issues
 - a. Software Low-Energy strategies: models and optimization methods
 - b. Hardware Low-Energy strategies: models and optimization methods
4. Energy harvesting and self-power systems
5. Dependability and fault detection: problems and methods
 - a. Definition and methods
 - b. Hardware implementing hardware dependability
 - c. Software implementing hardware dependability
6. Hardware Programmable Architectures
 - a. VHDL: Introduction

Test Benching: introduction, metodologies