COMMUNICATION ENGINEERING AND ELECTRONIC TECHNOLOGIES

(Lecce - Università degli Studi)

Teaching ELECTRONICS FOR SIGNAL PROCESSING

GenCod A004576

Owner professor Paolo VISCONTI

Teaching in italian ELECTRONICS FOR SIGNAL PROCESSING

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SSD code ING-INF/01

Reference course COMMUNICATION ENGINEERING AND ELECTRONIC

Course type Laurea Magistrale

Credits 6.0

Teaching hours Ore-Attivita-frontale: 54.0

For enrolled in 2016/2017

Taught in 2017/2018

Course year 2

Language INGLESE

Curriculum PERCORSO COMUNE

Location Lecce

Semester Secondo-Semestre

Exam type Orale

Assessment Voto-Finale

Course timetable https://easyroom.unisalento.it/Orario

BRIEF COURSE DESCRIPTION

Overview

This course embraces themes of sensing and transduction, signal acquisition, design of analog/digital circuital blocks, analysis of embedded systems and an overview on rapid prototyping solutions for advanced electronic design. These are vital subjects for any system which extracts signals from the real world and processes the information digitally. The course comprises information on signals, sensor and transducer principles, related applications, embedded electronic design for signal acquisition and finally design and testing, by using a specific software, of an electronic acquisition board managed by a microcontroller.

Course Contents

- Introduction: sensors, transducers, processing devices and smart units.
- Block scheme of channel for signal and information acquisition and processing.
- Physical principles of sensors and transducers. Fundamental concepts: sensitivity, resolution, accuracy, linearity, offset, gain, signal-to-noise ratio, standard deviation, measurement error.
- Sensors: strain gauge, piezo-electric sensors, temperature sensors, light and radiation sensors, accelerometers, proximity sensors, magnetic field sensors, sensors of displacement, angle, speed, level, force, pressure, flow rate. Industrial and automotive applications of commecial sensors.
- Electronic sensing circuits, new generation intelligent (smart) sensors.
- Digital to analogue converters – internal structure and design. Analogue to digital converters - principal methods.
- Internal scheme, operation and programming of a microcontroller (PIC).
- Proteus software for the design and simulation of smart boards for signals acquisition/processing.

REQUIREMENTS

Knowledge in analog and digital electronic, C++ programming.

COURSE AIMS	**Learning Outcomes** After the course the student should be able to: * Understand the principles of operation of commonly used sensors, transducers, and instruments. * Define technical specifications and to select sensors and transducers for a given application. * Understand terminologies associated with instrumentation systems (e.g., range, sensitivity, dynamic response, calibration, hysteresis, error, accuracy, precision, data uncertainty, mean and standard deviation). * Use data acquisition software and hardware to collect and analyze data from a physical system. * Analyze and understand the operation of computerized instrumentation systems for industrial processes using multiple sensors, electronic interfaces, data acquisition boards based on microcontrollers. * Use commercial software for the design and simulation of electronic boards managed by a microcontroller * Gain experience in developing computerized instrumentation systems for industrial processes using multiple sensors, interface electronics, data acquisition smart boards. * Acquire an experience in designing an electronic acquisition system of physical quantities.
TEACHING METHODOLOGY	The course consists of lectures by using the slides provided to the students and laboratory activities related to the design and simulation of electronic solutions by the Proteus software. Also the teacher makes available on the website in addition to the slides of the lessons, further handouts to facilitate the understanding of the topics and the designing of the electronics systems. The final exam consists of an oral question on the theoretical topics of the course and in the presentation of a project realized by the student with the Proteus software.
ASSESSMENT TYPE	**Examination:** oral and project discussion related to Proteus software. The exam consists of an oral examination related the theoretical and practical contents of the course. In addition, the student has to present a circuital project realized with Proteus software and discuss its contents showing operation modes of designed electronic board managed by a microcontroller and related simulation results (maximum overall duration: two hours).
OTHER USEFUL INFORMATION	**Office Hours:** By appointment; contact the instructor by email or at the end of class meetings.

FULL SYLLABUS

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REFERENCE TEXT BOOKS

Teaching materials: teacher handouts.