# **EX83: Embedded Systems and Real-Time Programming**

## **Course Overview:**

The aim of this course is to consider the design and implementation of embedded systems and in particular to introduce the Real-time operating system. Both hardware and software, to define and characterize embedded systems and to study these aspects of real-time systems in the context of real-world case examples.

16-bit and 32-bit microcontrollers are used in the development of the course because modern applications offered by manufactures are powerful, plug and play systems with high speed CPU, enough internal memory and a complete set of multifunctional peripheral devices. At the same time, these devices are simple enough to be understood by students in not too much time and the knowledge learned is easily exported to more complex devices.

One of the aims looked for in the laboratory is that students build their interfaces and device drivers from the beginning. To do so, they use open source tools, wire-wrapping technique to build prototypes.

## **Pre-Requisite:**

A course on Microprocessor and 'C' Programming

## **Course Educational Objectives (CEO):**

CEO 1	To teach characteristics, design and real time applications of embedded systems
	(ES) and to impart an overall vision of the controllers, computational units and
	expansion methods of the controller capacities.
CEO 2	To enable the students to analyze and synthesize basic support and interface
	circuits and to introduce current technology used to implement ESs.
CEO 3	To introduce design with a unified view of software and hardware, to develop
	embedded applications using real-time operating system and applying specific
	programming techniques that improve efficiency, reliability and reusability
CEO 4	To help the students practice the design methodology of embedded systems for
	medium complexity applications and to demonstrate basic techniques of
	implementation of signal processing algorithms on ESs.

#### **Evaluation System:**

- Theory Examination: 100 marks
- Oral Examination: 25 marks
- Term Work: 25 marks
- Total: 150 marks

#### **Recommended Books:**

• Rajkamal, Embedded Systems - Architecture, Programming and Design, Tata McGraw Hill, Second edition, 2009

- Shibu K V, Introduction to Embedded Systems, Tata Mc Graw Hill, 2009
- Sriram Iyer and Pankaj Gupta, Embedded Realtime Systems Programming, Tata McGraw Hill, first edition, 2003
- Embedded Microcomputer Systems -Jonathan W. Valvano Thomson
- An Embedded Software Primer David E. Simon Pearson Education
- Embedded real time system, Dr. K.V.K.Prasad, Dreamtech Press.