

SYLLABUS
for the discipline:

“EMBEDDED SYSTEMS I”

FACULTY OF AUTOMATION AND COMPUTERS

DOMAIN/SPECIALIZATION: MASTER AUTOMOTIVE EMBEDDED SOFTWARE

Year of studies: I

Semester: 1

| Course instructor: Tiponut Virgil Applications instructor: Popescu Sorin | | | | | |
|---|---------|------------|---------|------------|---------|
| Number of hours/week/Evaluation/Credits | | | | | |
| Course | Seminar | Laboratory | Project | Evaluation | Credits |
| 3 | - | 1 | - | E | 8 |

A. COURSE OBJECTIVES

Understanding the parameters, structure and the technology of development of embedded systems, with applications in automotive. The content of the course is mainly dedicated to the hardware component of an embedded system, with some references to the software component resident on the system. Methods, development and testing tools for embedded system are also presented. The theoretical knowledge are well improved by means of practical laboratory works. The course contributes to the skills 1 (20 %), 2 (20 %), 3 (30%), and 4 (30%) from the skills table.

B. COURSE SUBJECTS

The structure of an embedded system: Introductory notions and definitions, Data processor, Other hardware components, The software component (5). **The microprocessor and the microcontroller as a data processor:** The data processor implemented using a microprocessor, The architecture and the functionality of a microprocessor, The architecture of a microcontroller (4). **Interfaces for debugging and loading of software applications:** JTAG interface, BDM module, ISP and IAP programming (4). **Significative families of microcontrollers:** ARM-based microcontrollers, INTEL MCS 51 microcontrollers, TI MSP430 microcontrollers, AD microcontrollers (5). **Assembly language programming:** Addressing modes, Instruction types, The structure of an assembly language program (2). **The programming of microcontrollers in C/C++:** The typical structure of a program developed in C, Compilation, Linking editor, Mapping of the executable software in the target system (2). **Embedded operating system (EOS):** Special requirements for EOS, The structure of an EOS, Some examples of EOS (3). Techniques for software application development: Integrated Development Environment for simulation and debugging of software application, Development systems, Monitor programs, Boot loaders, Emulators (3).

C. APPLICATIONS SUBJECTS (laboratory, seminar, project)

- **The structure of a microcontroller-based development system:** the structure of a C167 microcontroller-based development board will be studied. The memory structure, the input/output ports and different type of peripherals included on board are the main subjects taken into account (4).

- **Development tools for a microcontroller-based embedded system:** some software development tools are discussed here (uVision IDE and a loader) (4).
- **Development of a software application using assembling language:** different modules included in an assembling language program are discussed here, based on a practical example; the development procedure of an assembling language program is also presented (3).
- **Development in C of a software application for an embedded system:** the structure of a typical C program is analyzed and the development procedure of a C program is also presented (3).

D. REFERENCES

1. Ken Arnold, Embedded Controller Hardware Design, LLH Technology Publishing, 2000
2. Michael Barr, Programming Systems in C and C++, O'Reilly, 1999
3. Qing Li and Carolyn Yao, Real Time Concepts for Embedded Systems, CMP Books © 2000
4. Phillip A. Laplante, Real-Time Systems Design and Analysis, IEEE Press, 1997
5. Jane W. S. Liu, Real Time Systems, Prentice Hall, New Jersey, 2000.

E. EVALUATION PROCEDURE

Oral examination, 20 minutes/student, 2 theoretical subjects and a small application, weights in the final mark: 50% the activity during the semester and 50% the exam result.

F. INTERNATIONAL COMPATIBILITY

The University of Texas at Austin, http://www.ece.utexas.edu/undergrad/embedded_systems.php

University of California, Irvine, <http://www.earnmydegree.com/online-education/online-degrees/university-of-california-irvine-/embedded-systems-architecture-course.html>

North Carolina State University, <http://www.ncsu.edu/>

Date: 05.10.2008

HEAD OF DEPARTMENT,

Prof. Dr. ing. Ioan Silea

COURSE INSTRUCTOR,

Prof. Dr.eng. Virgil Tiponut