EXCHANGE PROGRAM

COURSE OUTLINE
Semester 3 (September -January)

ELECTRONIC EMBEDDED SYSTEMS (ENGLISH-TAUGHT)

ACADEMIC YEAR - 2023-2024

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THE EXCHANGE PROGRAM

A student exchange program is one that you will undertake during the course of study that you are already pursuing. This study period in another university abroad will allow you to leverage and enhance your skills in an international environment.

Course delivery will almost definitely differ from what you are used to in your university, it is therefore important that you take a close look at this course outline, in order that you understand what to expect during the semester / year at ESIGELEC. We encourage you to pay attention to the information provided to you on each module and to go through all the other points this document covers, like attendance, evaluation, support services, etc.

This document is key to making your experience at ESIGELEC a successful one.

A SEMESTER 3 (SEPTEMBER - JANUARY)

SNAPSHOT – COURSES, MODULES, DURATION, WEIGHT & ECTS CREDITS

Courses	Modules	Duration (hours)	Weight	ECTS Credits
Semester 3: 30 Credits / 334 hours				
Embedded Communication	MtoM Communication	30	4	10
	Python Programming & Image Treatments	30	3	
	Android Programming	30	3	
Embedded Electronics	System on Chip	20	2	6
	DSP Processors	20	2	
	Safety Systems	20	2	
Communication & Language 3	Oral Communication & Presentation Skills	14	1	5
	French as a Foreign Language OR English as a Foreign Language	60	4	
Project Development & Management	Project Management	30	2	9
	R&D Project	80	7	
Total Credits				**30**
Semester 4: Internship of 4 to 6 months				

All modules are delivered face-to-face, on campus, with all required safety measures. However, modules may be delivered partially or totally online and/or through distance mode.

B COURSE CURRICULUM & SYLLABUS

MtoM Communication
Module Code: MSTSEE31   **Duration: 30h**

Objectives

At the end of this module, students will:
- Be familiar with the principles of communication between machines, needing no human action

List of topics

- Sensors and servers
- Cellular networks
- Applications
- Protocols of MtoM communication

Python Programming & Image Treatments
Module Code: MSTSEE36   **Duration: 30h**

Objectives

The Python language is today, one of the most useful programming tool for engineers and is used in several applicative areas including embedded systems. The objective of this elective is to understand the environment, the tools and the scope of this language.

List of topics

- Python Development Environment
  - Python distribution and their installation
  - Python as a script language
  - Python as a programming language
  - Interactive Python (Jupiter-notebook)
  - Comparison with other programming languages
  - Installing important libraries (PIP)

- Python Basics
  - The first program
  - Docstrings
  - Blocks and indentation
  - First Control structures
- Simple data types and expressions
  - Boolean
  - Integer
  - Float
  - Complex numbers
  - Strings
  - Bytes
- More data types
  - Lists
  - Tuples
  - Sets
  - Dictionaries
  - Strings
  - Numpy
  - Arrays
- Control structures
  - Loops
  - Alternatives
  - Exceptions
- Comprehension and slicing
- Object oriented Python
  - Class definition
  - Class instantiation
  - Generators and iterators
- Files
  - Files
  - Serialization
  - Important file formats
- Specialized topics (optional)
  - Writing and installing your own libraries
  - Regular expressions

Android Programming

Module Code: MSTSEE32   **Duration: 30h**

Objectives

At the end of this module, students will be able to:
- Understand the challenges and possibilities of mobile platforms
- Use the Android development environment
- Create a user interface
- Develop communication applications
- Develop an application using persistent data
- Develop a multimedia application
- Develop an application that works with Googlemaps
- Make and publish an Android application

List of topics

- Embedded applications, possibilities, Android SDK
- Using views, creating advanced user interfaces
- Intent classes
- Persistent data
- Multimedia
- Geolocalisation
- Publishing Embedded applications, possibilities, Android SDK
- Using views, creating advanced user interfaces
- Intent classes
- Persistent data
- Multimedia
- Geolocalisation
- Publishing

System on Chip
Module Code: MSTSEE33   **Duration: 20h**

Objectives

At the end of this module, students will understand and be able to implement a complete embedded system on a chip (SoC)

List of topics

- Main components of SoC systems
- Related embedded solutions on chips
- Defining an intellectual property tool
- Integration of a solution
- Xilinx Spartan or Microsemi SmartFusion components

DSP Processors
Module Code: MSTSEE34   **Duration: 20h**

Objectives

At the end of this module, students will:
- Be familiar with the main DSP (digital signal processing) algorithms and their impact on DSP architecture

List of topics

- Sampling, convolution
- Linear filtering
- Fourier transforms
- STM32F407VG ARM based processor

Safety Systems

Module Code: MSTSEE35   **Duration: 20h**

Objectives

At the end of this module, students will:
- Understand the role EMC phenomena play in the field of embedded systems, by studying automotive examples

List of topics

- EMC (Electromagnetic Compatibility) issues for electronics
- Cause and effect
- Prevention and solutions
- The automotive field: an overview

Oral Communication & Presenting Skills

Module Code: MSTOCPS   **Duration: 14h**

Objectives

At the end of this module students will:
- Have a clear model of what constitutes successful and unsuccessful presentations
- Have practiced giving formal presentations in English.
- Be more aware of their own downfalls when presenting

List of topics

- Methods for putting together an oral presentation
- Practice

Project Management

Module Code: MSTPM   **Duration: 30h**

Objectives

At the end of this module students will be able to:
- Appreciate the need for project management including formal methods, as a recognised discipline
- Appreciate the need for effective planning, control and delivery mechanisms
- Understand the complexities of different types of computing projects and some of the methods used to manage them
- Apply some of the skills and knowledge learned in any future project (including during other module(s) of this course, and, in particular, documentation for development project)

List of topics

- What is a project? The need for PM, formal methods
- Managing large, complex, international projects
- Un peu de franglais (PM culture and language in English and in French)
- Management of projects, project life cycle, roles of the project manager and stakeholders
- Stakeholder management, scope, creep
- Work planning, project breakdown structures and estimating
- Resource planning, estimating, management
- Risk identification, analysis, management
- PERT and Gantt charts, their use and shortcomings
- PM planning tools (including practical sessions with MS Project)
- Change control, documentation, configuration management
- Project control, quality, documentation, delivery management
- Project closure; maintenance projects
- Types of computing projects and risks; computing PM methods
- Cost-benefit analysis and project accounting may be touched upon, but are not in the scope of this course

Research & Development Project
Module Code: MSTPRDP   **Duration: 80h**

Objectives

At the end of this module students will be able to:
- Improve their organizational skills (within a team, facing deadlines) and manage their time
- Improve their communication skills
- Work in a real-world situation close to their future professional environments
- Filter and identify relevant online information according to a targeted subject
- Constitute a bibliographical study
- Develop functional specifications and success strategies
- Estimate the workload of each identified task
- Analyse their production capacity
- Design and build computer applications with current standards and new opportunities
- Integrate research approaches
- Evaluate the quality level for a developed application
- Present their work and justify the outcome

List of topics

- State of the art practices
- Technical / feasibility studies
- Research methodologies and approaches
- Information processing
- Experimental results and evaluation

French as a Foreign Language
Module Code: MSTFRE1, MSTFRE2, MSTFRE3   Duration: 180h

Objectives

At the end of this module students will be able to:
- Oral comprehension
  - Understand standard French used in everyday situations at work, school, etc.
- Written comprehension
  - Understand texts written in standard French used in everyday situations such at work, school, etc.
- Oral expression
  - Participate in a regular day-to-day conversation on familiar topics
  - Ask and exchange information
  - Prepare and give a short formal presentation
- Written expression
  - Write short, clear and coherent texts on familiar / everyday situations with basic grammar and vocabulary

List of topics

- Revision of grammar and vocabulary
- Preparation for the Test of French Language (TCF or TEF)

English as a Foreign Language
Module Code: MSTENG1 MSTENG2 MSTENG3   Duration: 180h

Objectives

At the end of this module students will be able to:
- Oral comprehension
  - Understand standard English used in everyday situations at work, school, etc.
- Written comprehension
  - Understand texts written in standard English used in everyday situations such at work, school, etc.
- Oral expression
  - Participate in a regular day-to-day conversation on familiar topics
  - Ask and exchange information
  - Prepare and give a short formal presentation
- Written expression
  - Write short, clear and coherent texts on familiar / everyday situations with basic grammar and vocabulary

List of topics

- Revision of grammar and vocabulary
- Preparation for the Test of English for International Communication (TOEIC)