

MASTER IN SCIENCES AND TECHNOLOGY

# ELECTRONIC EMBEDDED SYSTEMS

COURSE OUTLINE AND GUIDELINES

Academic Year 2015-2016

In partnership with

**INSA** | INSTITUT NATIONAL  
DES SCIENCES  
APPLIQUÉES  
ROUEN

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## COURSE STRUCTURE

The Master's Programme comprises:

**For students with a 4-year Bachelor's Degree minimum and with a specialisation in Electronic/ Instrumentation/ Electrical Engineering/ Automation:**

Semester 2 – Academic (on campus)  
 Semester 3 – Academic (on campus)  
 Semester 4 – Internship (company/laboratory)

**For students with a 3-year Bachelor's Degree OR with a 4-year Bachelor's Degree in another engineering stream OR having been refused admission to the second semester:**

Semester 1 – Academic (on campus)  
 Semester 2 – Academic (on campus)  
 Semester 3 – Academic (on campus)  
 Semester 4 – Internship (company/laboratory)

The first three academic semesters\* are offered between September 2014 and January 2016. Lectures, tutorials, lab work, practical work, projects, conferences and/or seminars make up the academic semesters. Evaluation, in the form of tests, quizzes, exams, etc. is conducted on a regular basis. Faculty members are from ESIGELEC and/or INSA Rouen, from partner companies and from partner universities in France or abroad.

*\* (2 semesters in the case of students granted direct entry into the second semester, beginning February 2015)*

The final semester is devoted to industrial or research experience, during which students must do a mandatory internship in a company or laboratory for a period of 4 months (min.) to 6 months (max.). While ESIGELEC and/or INSA Rouen provide assistance to find internships, students are expected to play an active part, as internships are not offered automatically. The students have up to a maximum of two years, after the final academic semester:

- to find and complete the internship
- to submit a professional thesis and make an oral presentation before a convened jury

*Failure to meet these requirements may result in the degree not being awarded.*

### The Student Status

Registered Student status & Enrolled Student status

The final semester comprises three stages, i.e. completing the internship, submitting the professional thesis and the oral presentation before a jury convened by ESIGELEC.

Students are considered *Registered Students* of ESIGELEC for a period of 6 months after the end of the last academic semester. During this time, students are expected to complete the three aforesaid stages. The *Registered Student* status will be extended if a student has started the internship but has not completed second/third stage. The *Registered Student* and the *Enrolled Student* status will cease to apply irrespective of whether or not the student has been awarded the Master's Degree by the jury of ESIGELEC and INSA Rouen, upon completion of the course.

## B

In the case of students not starting the internship in the six months following the end of the final academic semester, they will have to re-enrol and will be considered *Enrolled Students of ESIGELEC*. The *Registered Student* status will take effect again upon commencement of the internship and remain valid until such time the student has completed all three stages therein involved.

A student has a maximum period of two years to complete the three stages of the internship semester. The students' personal insurance must be valid for the entire period wherein he/she is considered a Registered Student or an Enrolled Student.

*Also refer Internship section.*

*For Stay Back procedure, please contact The Embassy of France in India.*

## PROGRAMME OBJECTIVES

The Master's Programme seeks to equip the students with the relevant knowledge, professional skills and practical experience in Electronics and Embedded Systems for industry or for research. They will learn how to design, develop and implement embedded systems in different sectors. Students will also acquire basic managerial skills.

The international environment at ESIGELEC allows students to discover new cultures and languages. Students must appear for the TCF or TEF certification exams in French (or TOEIC for French speaking students). The mandatory internship gives the students a hands-on experience in the work environment. Our graduates find job opportunities as developers, project managers, consultants or researchers in the field of electronic embedded systems.

## C

## ATTENDANCE POLICY

ESIGELEC views class attendance as the student's individual responsibility. Students are expected to comply with ESIGELEC's attendance policy throughout their study period. All lectures, tutorials, practical work, projects, conferences and seminars are mandatory. Attendance will be monitored by the faculty members at the beginning of each class and the attendance sheet will be maintained by the Studies Office of ESIGELEC.

### **Late entry into class:**

If a student is late by 10 or more minutes, he/she will be refused entry into the classroom and the faculty member will make a note in the attendance register.

### **Absence from class:**

A student who is absent for medical reasons must submit a medical certificate within 3 working days, in order for the absence to be excused.

Leave letters in the case of other accepted anticipated absences must be signed at least 8 days prior to the absence, by the Academic Coordinator of the Master's Programme, in order for the absence to be excused.

No other justifications of absence will be excused by ESIGELEC.

## D

### Penalty

Students will receive an oral warning after 5 occurrences (late entry or unjustified absence). A stern oral warning will be given after 10 instances. 20 such cases may lead to the student's dismissal from ESIGELEC.

Absence from examination:

- only students whose absence from an examination has been justified will be allowed to re-take an examination.
- students whose absence from an examination has not been justified will be marked 0/20 in the said examination.

### EVALUATION

Evaluation may include tests, quizzes, presentations or other formats as decided by the faculty members, who may also authorise the use of reference documents or calculators, if they deem it necessary. Each such test will be graded on a maximum mark of 20.

#### Scores & ECTS credits (European Credit Transfer System)

- The Master's Programme is divided into several weighted courses, all of which include one or more weighted modules. Each course represents a certain number of credits.
- The score of a module is the average of the weighted scores of the different evaluation processes conducted within the same module.
- The score of a course is the result of the weighted averages of all modules of the course.
- The final overall score of the student is the result of the weighted averages of all courses of the Master's Programme.
- The total number of ECTS credits of the Master's Programme is equal to the total of all the ECTS credits of its courses.
- One ECTS credit corresponds to about 25 hours of course work (lectures, tutorials, lab work, projects, practical work, evaluation, individual work).
- Students who are granted entry directly to the second semester, beginning September 2015, will automatically be awarded 30 ECTS credits, equivalent to the first semester of the Master's Programme.
- A statement of marks is sent to the students at the end of each academic semester and also after they are evaluated by the Jury of ESIGELEC and INSA Rouen.

## E

### FRAUD AND CHEATING

Students indulging in fraudulent practices/ cheating during an exam/ oral presentation/ project/ practical work will be marked 0/20.

Examples of plagiarism, fraud or cheating, include, but are not limited to:

- Duplication of another student's work during a written assignment / exam;
- Use of a reference document or calculator not authorized by the faculty member;
- Plagiarism (>20%) of reports, presentation, or computing programs, obtained by any means (book, magazine, other students, electronic files, Internet, work previously submitted in another course).

## F

### AWARDING THE MASTER'S DEGREE

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Each academic semester at ESIGELEC carries a total of 30 ECTS credits. The internship, professional thesis and oral presentation also carry a total of 30 ECTS credits. A student must obtain a minimum score of 10/20 in a course to be awarded the allocated ECTS credits of the course.

The Master's Degree is awarded if the student has obtained a minimum average score of 10/20 in each course, thereby obtaining the total number of 120 credits.

The jury of ESIGELEC and INSA Rouen for the Master's Degree comprises the President, the Academic Coordinator of the Master's Programme, faculty members of ESIGELEC and/or INSA Rouen, and representatives of the managing staff of ESIGELEC and/or INSA Rouen. This jury, chosen by the General Director of ESIGELEC, convenes up to a maximum of four times per year, i.e. April, July, September and December.

If students do not obtain the requisite number of ECTS credits in order to be awarded the Master's Degree, even after re-taking exams, they will receive only an attestation from ESIGELEC and INSA Rouen, mentioning the total number of ECTS credits obtained in the different courses in which they have obtained a minimum score of 10/20.

The Master in Sciences and Technology - Electronic Embedded Systems, awarded by ESIGELEC and INSA Rouen to the successful students, is accredited by the French Ministry of Higher Education and Research.

## G

### RETAKE EXAMS

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If a student has obtained less than 10/20 in one or more courses in the academic semesters at ESIGELEC, the student will be asked to retake one or more exams in one or more modules of the courses concerned, as advised by the Academic Coordinator of the Master's Programme (even if the final overall score of the student in the Master's Programme is greater than 10/20).

If a student does not obtain the 30 ECTS in the final semester (internship), the Academic Coordinator of the Master's Programme may:

- Instruct the student to redo a new internship, including submission of a professional thesis and an oral presentation, or;
- Instruct the student to submit a fresh report and/or redo the oral presentation, or;
- Deny the award of 30 ECTS, on the grounds of misconduct during the internship.

The scores obtained from exams retaken replace the previous scores obtained by the student in the modules concerned and a new average score will be calculated for the course(s) concerned.

If the student does not retake an exam as advised by the Academic Coordinator, the student will be marked 0/20 for the module.

The new average of the courses must be greater than 10/20 in order to obtain the requisite credits.

## COURSES &amp; ECTS CREDITS

SEMESTER	CREDITS	MODULES & COURSES	HOURS	WEIGHT
SEMESTER 1 (265 h) September 2014 - January 2015	6	<b>Electrical Engineering</b>		
		MSTSEE11: Binary Logic and Digital Functions	30	4
		MSTSEE12: Automation	20	2
	8	<b>Computer Science</b>		
		MSTIS02: Introduction to Object Oriented Programming with Java	40	5
		MSTIS03: Introduction to C Programming	25	3
	6	<b>Project</b>		
		MSTMP: Minor Project	60	6
SEMESTER 2 (372 h) February 2015 - July 2015	4	<b>Electronic</b>		
		MSTSEE13: Fundamentals of Electronics	30	4
	6	<b>Foreign Languages</b>		
		MSTENG1: English as a Foreign Language or MSTFRE1: French as a Foreign Language	60	6
	8	<b>Digital Systems</b>		
		MSTSEE21: Microprocessors	62	4
		MSTSEE22: VHDL and Logic Synthesis	40	2
		MSTSEE23: Communication Buses	30	2
12	<b>Embedded Software</b>			
	MSTSEE24: Real-Time Operating Systems	40	3	
	MSTSEE25: Embedded Linux	30	3	
	MSTSEE26: Embedded C Programming	40	3	
	MSTSEE27: Embedded Java	40	3	
6	<b>Instrumentation</b>			
	MSTSEE28: Virtual Instrumentation	30	3	
	MSTSEE29: Specific Instrumentation	30	3	
4	<b>Foreign Languages</b>			
	MSTFRE2: French as a Foreign Language or MSTENG2: English as a Foreign Language	30	4	
SEMESTER 3 (306 h) September 2015 - January 2016	6	<b>Embedded Communication</b>		
		MSTSEE31: MtoM Communication	30	4
		MSTSEE32: Smart Sensors	20	2
	9	<b>Embedded Electronics</b>		
		MSTSEE33: System on Chip	20	3
		MSTSEE34: DSP Processors	20	3
		MSTSEE35: Safety Systems	20	3
	8	<b>Management and Foreign Languages</b>		
		MSTCCAWT: Cross Cultural Awareness/ Working in a Team	36	3
		MSTOCC: Oral Communication and Coaching	14	1
	MSTFRE3: French as a Foreign Language or MSTENG3: English as a Foreign Language	40	4	
7	<b>Project Development and Management</b>			
	MSTPM: Project Management	26	2	
	MSTPRO: Project Development	80	5	
SEMESTER 4 February 2016 onwards	30	MSTINT: INTERNSHIP of 4 to 6 months		30



**Module Code:**  
MSTSEE11  
**Duration:** 30h

**Module Code:**  
MSTSEE12  
**Duration:** 20h

**Module Code:**  
MSTIS02  
**Duration:** 40h

## COURSE CURRICULUM AND SYLLABUS

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### Module

## Binary Logic and Digital Functions

### Objectives

At the end of this module, students will be able to:

- Analyse and design digital functions

### List of topics

- Number representation
  - Fundamentals of Boolean algebra
  - Construction of elementary gates
  - Circuits developed from combinatory logic (comparator, decoder and demultiplexer)
  - Introduction to sequential logic and its basic components (D, RS, RSH, and JK flip flop circuits) registers and counters
  - Designing and creating a sequential system
- 

### Module

## Automation

### Objectives

At the end of this module, students will:

- Acquire basic analytical skills and methods for automatic control engineering and the study of closed loops
- Learn about the elementary functions of industrial control systems
- Be familiar with the advantages of closed loop control
- Be able to quantify the performance of closed-loop linear control systems
- Be able to calculate the parameters of a PIC controller using various theories and experiments

### List of topics

- Industrial processes
  - Open and closed loop control
  - Performance of closed loop systems (accuracy, stability, rapidity)
  - Elementary compensators: proportional, integral, derivative (P, I, and D), and
  - Controllers (P, I, D)
- 

### Module

## Introduction to Object Oriented Programming with Java

### Objectives

At the end of this module, students will be able to:

- Write, test and set up a Java program and documentation from a given situation
- Use vocabulary relating to OO languages within the framework of Java
- Explain the design and set up for the life-cycle of a Java program / explain the design process and working of a Java program (what Bytecode is and the role of a JVM).



- Modify a class diagram (with 4 or 5 classes)
- Document code and create the Javadoc
- Respect Java writing code structures
- Use existing classes and packages
- Put into place exceptions handling
- Make modifications using Swing GUI
- Trigger ActionEvents
- Use basic Eclipse functions: editing, compiling, operating, importing and debugging

\* This course will also help students to improve their team-work skills and their understanding of technical documents

#### List of topics

- Fundamental tools and techniques
- Storing information, communicating information, making choices, creating repetitions
- Initiation to Object-Oriented programming
- From algorithms to writing functions, classes and objects, UML classes
- More tools and techniques
- Collecting objects (a fixed amount and undetermined amount), using it with UML
- Creating a graphical interface

#### Module Code:

MSTIS03

Duration: 25h

#### Module

## Introduction to C Programming

#### Objectives

At the end of this module, students will be able to write and develop a programme in C language, using:

- Functions: definitions, interests, prototypes
- 1 & 2 D arrays: syntax, use, parameters
- String functions: manipulating chains of characters
- Pointers: syntax, manipulation, using them correctly
- Structures: syntax, manipulation, establishing parameters
- Binary and text files: manipulation and relation to structures
- Dynamic allocation

#### List of topics

- Algorithms, processors, fundamentals, environment and variables
- Simplified architecture of a computer
- C Language: programming structure, declarations, control structures (if, switch, while, do while, for), entries / exits (printf, scanf, fflush role)
- Environment for development
- 1D arrays
- Review of general notions for arrays, functions, character chains, structures, pointers, dynamic allocation, files

**Module Code:**  
MSTMP  
**Duration:** 60h

## Module **Minor Project**

### Objectives

At the end of this project, students will:

- Familiarise themselves with a real-world situation similar to that of future professional environments
- Acquire skills to exercise their initiative and independence
- Improve their organizational, interpersonal and communication skills
- Learn to manage time

### List of topics

- Designing a product
  - Product testing
- 

**Module Code:**  
MSTSEE13  
**Duration:** 30h

## Module **Fundamentals of Electronics**

### Objectives

At the end of this module, students will be able to:

- Put together an electrical circuit in the form of a four-terminal network (transmit gain, input / output impedance)
- Transcribe a situation into a simulation diagram
- Choose the type of analysis (polarisation or time-frequency analysis)
- Identify function block diagrams
- Design a cabling schema from a given electric schema (using BNC connectors correctly)
- Measure voltage using oscilloscopes, multimeters and dB meters
- Create various wave forms, recognize them using an oscilloscope and change settings
- Measure input/output impedance
- Measure frequency response
- Interpret results of the aforementioned measurements
- Use Excel to plot graphs and schemas

### List of topics

- Electrical circuits
  - Simulation schema
  - Block diagrams
  - Cabling and electric schema
  - Measurement
  - Generation of various signals
  - Generation of plot graphs
-

**Module Code:**

MSTENG1

MSTENG2

MSTENG3

**Duration:**

Semester 1: 60 hours

Semester 2: 30 hours

Semester 3: 40 hours

**Module****English as a Foreign Language****Objectives**

Oral comprehension

- At the end of this module, students will be able to understand standard English used in everyday situations at work, school, etc.

Written comprehension

- At the end of this module, students will be able to understand texts written in standard English used in everyday situations such as at work, school, etc.

Oral expression

At the end of this module, students will be able to:

- Participate in a regular day-to-day conversation on familiar topics
- Ask and exchange information
- Prepare and give a short formal presentation

Written expression

- At the end of this module, students will be able to write short, clear and coherent texts on familiar/ everyday situations with basic grammar and vocabulary

**List of topics**

- Revision of grammar and vocabulary

**Assessment**

Test of English for International Communication (TOEIC)

**Module Code:**

MSTFRE1

MSTFRE2

MSTFRE3

**Duration:**

Semester 1: 60 hours

Semester 2: 30 hours

Semester 3: 40 hours

**Module****French as a Foreign Language****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 as 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

**Module Code:**  
MSTSEE21  
**Duration:** 62 hours

#### List of topics

Revision of grammar and vocabulary

#### Assessment

A1 level - TCF or TEF

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#### Module **Microprocessors**

##### Objectives

At the end of this module, students will be able to:

- Understand the architecture of microprocessors
- Program microprocessors
- Study the evolution of their architecture

##### List of topics

- Microprocessor architecture (ALU, control unit, registers, buses)
  - Data and processors (address decoding, synchronization)
  - Vital signals of processors (clocks, power supply, reset)
  - Microprocessor programming (languages, registers, addresses, instructions)
  - Execution time, routines, passing parameters
  - Principles and how exceptions/interruptions work
  - Inputs/outputs
  - Case study (MSP430)
- 

**Module Code:**  
MSTSEE22  
**Duration:** 40 hours

#### Module **VHDL and Logic Synthesis**

##### Objectives

At the end of this module, students will be able to:

- Program logic devices (PLD)
- Develop programs using VHDL language

##### List of topics

- Review of combinatory and sequential logic
  - The different families of programmable logic devices
  - Practice with synthesis tools (Xilinx or Altera targets, Quartus or ISE tools, Modelsim)
- 

**Module Code:**  
MSTSEE23  
**Duration:** 30 hours

#### Module **Communication Buses**

##### Objectives

At the end of this module, students will:

- Be able to use the most widely used communication buses in the field of embedded processors
- Understand technical specifications

**Module Code:**

MSTSEE24

**Duration:** 40 hours**List of topics**

- RS-485
  - I2C BUS, SPI BUS
  - CAN BUS
  - ARINC bus
- 

**Module****Real-Time Operating Systems****Objectives**

At the end of this module, the students will be able to:

- Understand why real-time executive is used in embedded systems
- Describe the four major categories of services provided by an executive
- Describe the necessary required materials to implement an executive in real-time
- Learn the various commercial aspects of executive suppliers
- Describe the role of scheduling, how it works and the major variations
- Calculate task times for simple situations
- List attribution rules for task priority
- Describe how the principle elements for synchronization are presented in executives
- Describe the characteristics and how an email inbox works
- Design and develop a simple multitasking application with MicroC/ OSI

**List of topics**

- Fundamentals of multitasking and real-time
  - A scheduler: its role and how it works
  - Why real-time executives are used in embedded systems
  - Necessary materials
  - Categories of executives and their markets
  - A real-time kernel: MicroC/OSII (Micro-Controller Operating Systems Version 2)
  - Memory management
  - Intertask communication and synchronization tools
  - Using MicroC/OSII and microcontrollers
- 

**Module Code:**

MSTSEE25

**Duration:** 30 hours**Module****Embedded Linux****Objectives**

At the end of the module, the students will be able to:

- Understand the possibilities and uses of the Linux kernel for an embedded IT project.
- Learn the principle software tools used in the Linux/Unix world and how to use them to develop.
- Write a device driver for specific Linux run material
- Combine tools to create advanced functions with a minimum of programming

**List of topics**

- Introduction to Linux:
  - How an OS fits in an embedded system.
  - History of Linux and Unix systems.
  - Linux compared to other embedded operating systems.

**Module Code:**

MSTSEE26

**Duration:** 40 hours

- Fundamental tools: command lines, shell scripts.
- Linux development tools.
- C programming with embedded systems.
- Linux drivers.
- Web connections and Remote Administration Tools (RATs).

**Module****Embedded C Programming****Objectives**

At the end of this module, students will:

- Be familiar with the C coding practices for embedded systems
- Be familiar with the elements and tools for embedded software validation
- Develop, write and test a C language program (as per design specifications) to be used with a microprocessor from a modelling tool like SART
- Analyse and enumerate the various phases of development for a software project: the V cycle

**List of topics**

- Specificities of C Language for embedded systems (variables, memory organization, physical address access, etc.)
- Programming methods
- Software analysis and validation tools and principles for embedded systems

**Module Code:**

MSTSEE27

**Duration:** 40 hours**Module****Embedded Java****Objectives**

At the end of this module, students will:

- Be familiar with a computer language which can be used to develop graphic applications under Windows for personal embedded systems like Pocket PCs

**List of topics**

- Java ME environment: interface and syntax
- Basics of programming in the Java ME environment

**Module Code:**

MSTSEE28

**Duration:** 30 hours**Module****Virtual Instrumentation****Objective**

At the end of this module, students will:

- Be familiar with the principles of virtual instrumentation through the use of LabVIEW software

**List of topics**

- Definition of virtual instrumentation compared with classical instrumentation
- Virtual instrumentation tools (hardware and software)

**Module Code:**  
MSTSEE29  
**Duration:** 30 hours

- Programming with LabVIEW software
- Advanced functions on LabVIEW (File management, Properties nodes, etc.)
- Network functions on LabVIEW (Databases, TCP, UDP, etc.)
- NI-Vision Toolkit
- Practice with real sensors

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**Module**  
**Specific Instrumentation**

**Objective**

At the end of this module, students will be able to:

- Manage the entire information sampling chain in an instrumentation-type embedded system

**List of topics**

- The measurement chain: physical signal to digital processing
- Sensors: types, technology
- Signal conditioning: transport, filtering, amplification
- Sampling: period, response time
- Information security: accuracy, lifetime, redundancy

**Module Code:**  
MSTSEE31  
**Duration:** 30 hours

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**Module**  
**MtoM Communication**

**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

**Module Code:**  
MSTSEE32  
**Duration:** 20 hours

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**Module**  
**Smart Sensors**

**Objectives**

At the end of this module, students will:

- Be familiar with the principles and the advantages of smart sensors through different applications

**List of topics**

- Sensors and interfacing circuits
- Applications of smart sensors
- Architecture and components of smart sensors
- Practice with smart sensors

**Module Code:**  
MSTSEE33  
**Duration:** 20 hours

**Module**  
**System on Chip**

**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 component
- 

**Module Code:**  
MSTSEE34  
**Duration:** 20 hours

**Module**  
**DSP Processors**

**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
  - TMS320C6xxx architecture
- 

**Module Code:**  
MSTSEE35  
**Duration:** 20 hours

**Module**  
**Safety Systems**

**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
-



**Module Code:**  
MSTCCAWT  
**Duration:** 36 hours

**Module**  
**Cross Cultural Awareness/ Working in a Team**

**Objectives**

At the end of the module, students will be able to:

- Understand the changing views and theories of leadership in history
- Understand the dynamics and roles of people in teams
- Understand the impact of different cultures on management styles
- Apply leadership theory in all aspects of life
- Use a range of tools / aide-mémoires to facilitate good leadership

The ability to demonstrate leadership is an important aspect of human development in general and in the employability of Master's students. This module will focus on:

- The theories of leadership and their practical application, together with practical tools for the graduate manager
- The application and analysis of leadership theories in the classroom
- A short "business game" to illustrate the challenges of leadership in a hierarchical environment
- The task and human factors of team membership and leadership through the use of the Belbin Team Styles instrument

**List of topics**

- Modern leadership models and their application
  - Maslow's hierarchy of needs and its role in management
  - The J Adair model and its use in work and in the student environment
  - Belbin team roles, student participation in the "test". The use of Belbin roles in student and work situations
  - The need for communication in leadership - business game to illustrate the difficulties of leadership
  - The influence of national cultures on leadership
  - The building and management of international, multi-discipline, remote and virtual teams
- 

**Module Code:**  
MSTOCC  
**Duration:** 14 hours

**Module**  
**Oral Communication and Coaching**

**Objectives**

Students will be able to practice their use of the English language in the context of oral presentations which they will be required to produce, for instance, at the end of the integration project and for the professional thesis.

**List of topics**

- Methods used to prepare an oral presentation
  - Simulations
-

**Module Code:**

MSTPM

**Duration:** 26 hours**Module****Project Management****Objectives**

At the end of this module students will be able to:

- Appreciate the need for project management as a recognised discipline
- Understand the complexity of a technical projects and the need for formal methods
- Appreciate the need to break up complex projects
- Appreciate the need for effective planning, monitoring and control mechanisms
- Understand the need for formal project management organisational structures
- Understand the importance and management of stakeholders in an international project
- Construct a project timeline and resource schedule using MS Project
- Use MS Project as a planning, controlling and reporting tool
- Understand the complexities and risks introduced by international and cross-organisational project teams
- Use formal leadership techniques to manage projects and project teams

**List of topics**

- Design, implementation and test of an application
  - Organization and planning of team work within project management framework
  - What are the needs to clearly establish goals and objectives for projects
  - Importance of recording and reviewing progress
- 

**Module Code:**

MSTPRO

**Duration:** 80 hours**Module****Project Development****Objectives**

Students will be able to:

- Exercise their initiative and independence
- 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

**List of topics**

The project includes the following stages:

- Constitution of the group
- Technical / feasibility studies
- Developing functional specifications and success strategies
- Development
- Test

**Remark:** The programme can be modified in keeping with the faculty member's prerogatives or organizational constraints.

## INTERNSHIP / PROFESSIONAL THESIS

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The internship will take place either in a company or in a research laboratory in a university. Students are encouraged to do their internship in France or in another European country, but may choose to do so elsewhere in the world too. The duration of the internship is of 4 (min.) to 6 months (max.). ESIGELEC and INSA Rouen provide assistance to students to find internships but they are expected to play an active part, as the internships are not offered automatically.

A professional thesis will have to be submitted upon completion of the internship and the students will have to make an oral presentation before a convened jury, at ESIGELEC (or remotely, upon special written request, authorised by the school).

An internship form, providing all required information must be filled and submitted to the Internship Department at ESIGELEC, as soon as the student has obtained an offer. The Head of the Internship Department and the Academic Coordinator of the Master's Programme will validate and approve the information (if relevant) by duly signing on the said form. ESIGELEC, the company / research laboratory and the student will then countersign an Internship Agreement issued at ESIGELEC. A copy of the agreement is retained by ESIGELEC, the company or research laboratory and the student.

A faculty member of ESIGELEC or INSA Rouen will be assigned the task of visiting or contacting the student at least once during the internship. In the event of questions regarding the internship, the preparation of the oral presentation and/or the professional thesis, the student may remain in contact either with the assigned faculty member or the Academic Coordinator of the Master's Programme, during the period of the internship or thereafter.

The topic of the professional thesis chosen by the student must be communicated to the Academic Coordinator of the Master's Programme for approval, within the first month of starting the internship.

The professional thesis must be submitted to ESIGELEC one month, at the latest, after completion of the internship. The oral presentation must be made before a Jury comprising of a President (from ESIGELEC or INSA Rouen), one faculty member from ESIGELEC or INSA Rouen and the industrial tutor (if possible), two months at the latest, after completion of the internship. The total duration of the oral presentation will be of 60 minutes (30 min. presentation + 15 min. Q&A + 15 min. deliberation among jury members).

A student has a maximum period of 2 years after the final academic semester, to find the internship, complete it, submit the professional thesis and conduct the oral presentation before a convened jury at ESIGELEC.

## THE STUDY BOARD

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The Board of Studies, whose members are representatives from industry, universities, INSA Rouen & ESIGELEC, oversees the course content and recommends changes when necessary.

The Board of Studies, which meets at least once a year, also ensures that the course content and laboratories are streamlined in keeping with the changing industry requirements. A meeting between the Academic Coordinator of the Master's Programme and all faculty members is convened at the end of each module, to assess the relevance of the content, equipment and issues which may have occurred while delivering the module.

A meeting is also convened every two months between the Academic Coordinator of the Master's Programme and the students to discuss academic and non-academic issues.

School of Engineering  
Supported by the Chamber of Commerce and Industry of Rouen

## **ESIGELEC**

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