

SECURITY COURSES

Embedded Computer Architecture	6 credits	72h
Engineering methods	5 credits	71h
Dependability	7 credits	58h
Human Resources Management and Group Work	6 credits	75h
Projet interdisciplinaire		
Mineure	6 credits	

Embedded Computer Architecture

 **ECTS**
6 credits **Component**
INSTITUT
NATIONAL
DES SCIENCES
APPLIQUEES
TOULOUSE **Number of
hours**
72h

Presentation

Description

Programme (detailed contents):

The Learning Unit is composed of three topics related to embedded computer architecture.

- The first one is about network and middleware used for embedded systems. This part introduces the main concepts on fieldbus and middlewares with CAN (Controller Area Network), industrial Ethernet Industrial, AFDX (Avionic Full DupleX Switched Ethernet) as examples and expose network architecture for connected devices (based on IPv6 and IEEE 802.15.4).

- The second part deals with operating systems used for embedded systems and the constraints induced (portability, memory management, cross-compiler, drivers, scheduling, etc.). Linux and FreeRTOS are used during labwork to illustrate these concepts.

- The objective of the third part is to bring skills to size and evaluate an embedded computer architecture. An overview of different computer architectures for embedded systems (micro-controller, multi-processors, many-core, fpga, gpu, etc) is given, then methods and metrics to evaluate performances (energy consumption, computation capacity, etc.) are presented. A labwork is conducted to confront students with problematics to size an embedded computer architecture in order to fit the needs of an embedded system.

Organisation:

Each topic is introduced by lectures to tackle theoretical aspects. The practical application is done during lab works and illustrates each topic on a shared embedded computer architecture.

An integrated project is coordinated with other Learning Units of SEC to bring into use the skills and knowledges of students on embedded computer architectures to implement a complete embedded system.

Objectives

At the end of this module, the student will have understood and be able to explain:

- Main concepts and specificities of networks used in embedded systems for automotive, avionic and connected devices.
- Specificities of embedded operating systems and main services (scheduling, memory management, privileges, etc.).
- Advantages and drawbacks of different embedded computer architecture (micro-controller, multi-processors, many-core, fpga, gpu, etc.).
- Which components impact the performances of an embedded computer architecture and which methods can optimize them.

The student will be able:

- To choose a networking technology to fit the needs of an embedded system.
- To set up a network for an embedded system.
- To deploy an operating system for embedded systems.
- To implement operating-system-specific drivers.
- To compare performances of embedded computer architectures.
- To choose an embedded computer architecture to fit the needs of embedded applications.

Place

➤ Toulouse

Useful info

Contacts

Education manager

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Engineering methods



ECTS
5 credits



Component
INSTITUT
NATIONAL
DES SCIENCES
APPLIQUEES
TOULOUSE



Number of
hours
71h

Presentation

Description

The goal of this UF is to introduce the main principles of systems engineering and software engineering. A first course introduces the concepts, methods and tools, to define and control the process development of a critical embedded system.

A second course focuses on the agile management of engineering processes in a project of development of a critical embedded system.

A MOOC allows the student to synthesize all the notions of this UF and to reinforce some.

All method, tools and good practices presented in the UF will be used in a transversal project of development of a critical embedded system.

Organisation

4 parts with lectures, on line lectures, paper work and lab works, a transversal project.

Objectives

At the end of this module, the student will have understood and be able to explain (main concepts):

Main principles of systems engineering and software engineering: concepts, methods and tools, to define and control the process development of a critical embedded system.

The student will be able to:

- apply these general competences to computer based embedded systems

explain different methods and chose the best adapted to develop a specific application.

Useful info

Contacts

Education manager

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Place

➤ Toulouse

Dependability

 **ECTS**
7 credits

 **Component**
INSTITUT
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DES SCIENCES
APPLIQUEES
TOULOUSE

 **Number of
hours**
58h

Presentation

Synchronous programming

Temporal models

Diagnostic

Description

Programme (detailed contents):

The purpose of this UF is to introduce the main principles of dependability (SDF): the basic concepts and the main methods and techniques to get it

A MOOC allows the student to synthesise all the notions of this UF and to reinforce some.

A first course gives a general introduction to the Dependability specifying terminology, attributes, resources, ...

All methods, tools and good practices presented in the UF will be used during a transversal project of development of a critical embedded system.

Specific courses allow you to go a little further in this panorama mainly illustrating the means - Prevention through modeling -

following the timed synchronous and asynchronous paradigms - Elimination of faults through the static verification of sequential programs and diagnostics.

Objectives

At the end of this module, the student will have understood and be able to explain (main concepts):

Organisation:

5 parts, each including lectures, tutorials and lab work

the basic concepts of dependability and main methods and techniques for obtaining and validation of the safety.

Introduction to dependability

Program Verification

The student will be able to:

- apply these general competences to computer based embedded systems

explain different methods and chose the best adapted to develop a specific application.

Pre-requisites

Discrete event systems - linear continuous systems (modelling and control) - System design : software design and programming - fuzzy logic - neural networks

Useful info

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Place

➤ Toulouse

Human Resources Management and Group Work

 **ECTS**
6 credits

 **Component**
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APPLIQUEES
TOULOUSE

 **Number of
hours**
75h

Presentation

Place

Objectives

➤ Toulouse

At the end of this module, the student will have understood and be able to explain (main concepts) :

Human Resource Management

Aims and organisation of a Human Resources position, job analysis and forecasting, recruiting, work motivation, skills, salary, training, career management, conflict mitigation, work contract

Social Psychology

Groups, what they are, their influences and dynamics

The student will be able to analyse a group situation

Pre-requisites

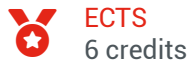
None

Useful info

Projet interdisciplinaire

Useful info

Mineure



ECTS
6 credits

Useful info