

3rd YEAR IMACS_AE SPECIALITY SEMESTER 6

Introducing

Description

Évaluation

L'évaluation des acquis d'apprentissage est réalisée en continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

Practical info

Location(s)

 Toulouse

Introduction to networks

Introducing

Description

The course introduction provides a general overview of network applications and their communication needs, followed by an overview of networks and their interconnection within the Internet. The central part of the course presents and illustrates the fundamental concepts associated with network design: connectivity, resource sharing, switching, quality of service and architecture (including the concepts of service and protocol). These concepts are illustrated and explored in depth within the framework of standardized local area networks and their connection to the TCP/IP Internet. A case study on Ethernet local area networks connected to the Internet (networks used in the practical work rooms) punctuates the course. The concepts are illustrated in tutorials and practical work.

Objectives

This course focuses on computer networks (local area networks, wide area networks and the Internet) from the perspective of their main concepts: connectivity, addressing, resource sharing + loss models, switching / routing + desequencing models, quality of service, architecture / service / protocol, basic protocol mechanisms.

Necessary prerequisites

C Language, Operating System, Algorithms and Programming Courses

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Practical info

Location(s)

 Toulouse

C language and networks

Introducing

Description

The course is structured in two parts :

The first part presents the Socket Programming Interface (Socket API), the basic technology for coding a distributed application (particularly on) the Internet.

The second part consists of a programming project for a distributed client/server application on the Internet.

The objectives are assessed based on a project report and an assessment of student engagement during the practical sessions. An individual written exam may complete the validation of theoretical skills.

Objectives

At the end of this module:

- The student should have understood and be able to explain the fundamental concepts associated with programming distributed applications on the Internet via the Socket API
- The student should be able to use the Socket API to develop (in C language) a distributed client/server application on the Internet

Necessary prerequisites

Introduction to Operating Systems

Introduction to Computer Networks (3rd year IMACS)

C Language (3rd year IMACS)

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Practical info

Location(s)

 Toulouse

Databases

Introducing

Location(s)

 Toulouse

Description

The aim of this course is to study relational databases. The fundamental concepts of the relational model are studied. The emphasis is then placed on relational algebra and the SQL language for manipulating and querying databases.

Objectives

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

- The different data models, their advantages and limits
- What is DBMS (Database management system)
- The different concepts of the relational model
- Data integrity constraints
- Relational algebra and SQL languages

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Practical info

Assembly language

Introducing

Description

Definition and role of assembly language among programming tools.

Generic assembly language notions: data operations (arithmetic, logic), memory access (addressing modes), execution control (conditional processing).

Application to ARM architecture.

Subroutine calls and returns, role of the stack, interrupts, special case of ARM architecture.

Conventions for calling functions, passing arguments, return values, context preservation.

Development of mixed C-language and ARM-language applications

Objectives

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

- o Von Neuman model
- o Computation, storage, input-output circuits, control unit, interrupt mechanism, instruction-level pipeline execution
- o Instruction set and assembly language programming
 - o Elements of a development chain : compiler, assembler, linker, loader, debugger

The student should be able to:

- o Understand the principles of instruction set creation
 - o Develop an assembly language program on a microcontroller
- o Use cross-development tools

Necessary prerequisites

1st year Algorithms and Programming.

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Practical info

Location(s)

 Toulouse

Hardware architecture



ECTS



Hourly volume
55h

Introducing

functional description (processor, memory, caches).
- C language.

Description

- Description and programming in Arm and x86 assembly languages.
- Description and use of a standardized C compilation chain via scripts, as well as the use of associated debugging tools.
- Description and analysis of the main aspects of the software's lower layers (function calls, data storage, associated security aspects) at C and assembly language level.
- Description and optimization of the use of hardware resources, particularly memory.
- Description and analysis of hardware vulnerabilities.

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Practical info

Location(s)

Toulouse

Objectives

At the end of this module, students will be able to program in assembly language, identify and correct software problems (resource under-utilization, bugs) in C and assembly language, and identify potential hardware vulnerabilities.

Necessary prerequisites

- Knowledge of computer architecture and internal

Numerical culture and skills 2

Introducing

Description

The flow of Machine Learning
Data preparation
Machine Learning Terminology
Data types
Data visualization, quality and size
Reliability
Some activation functions
Model performance
Environmental impact

Objectives

At the end of this module, which follows the 2A module, the student will have consolidated his knowledge of the field of AI: accuracy, loss function, overfitting, batch size, visualization techniques... He will also have prepared and passed a PIX certification.

Necessary prerequisites

Basics of Python programming

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Practical info

Location(s)

 Toulouse

Electronics project

Introducing

Description

- * LTspice training (OP, AC, DC, Step, Sweep)
- * study of differential stage
- * common emitter stage study, active load, current sources
- * output stage design
- * transistor heating, heat sink sizing
- * optional routing, PCB construction of the Hifi amplifier studied and designed.

Objectives

The aim of this project is to design and build an audio amplifier using discrete transistors, with a power of around 20W, on a test plate. The power stages are studied (push-pull Darlington, etc...) as well as all the classic architecture of an operational amplifier (differential, active load...). The problem of output dynamics is clearly defined (blocking/saturation limit). The technology used is the bipolar transistor.

Necessary prerequisites

- * essential: good understanding of basic electrical laws
- * strongly recommended prerequisites: bipolar transistor, polarization, dynamic small signal circuits

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Practical info

Location(s)

 Toulouse

Telecommunication systems

Introducing

Description

Telecommunications systems: data rates, eye diagrams, transmission lines, baseband coding, analog and digital modulation, constellation diagrams, frames, multiplexing, channel access (FDMA, TDMA, CDMA), spread spectrum. The tutorials will go into greater depth on the concepts seen in class, and will focus on well-known applications of telecommunications systems (e.g. USB, Bluetooth, FM radio, etc.). Lab classes will address the design of analog and digital modulations

Objectives

At the end of this module, the student should have understood and be able to explain (main concepts) the operating principles of telecommunication systems. The student will be able to design the architecture of a telecommunication system: choice of the modulation, choice of the media access type, etc.

Necessary prerequisites

Signal Processing courses
Analog and digital electronics courses

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Practical info

Location(s)

 Toulouse

Random signals

Introducing

Description

- Introduction : deterministic signals and spectral characterization
- Probability theory and random signal
- Stochastic processes and random signals : first and second order characteristics, stationarity, ergodicity, discrete-time random signals
- Spectral analysis: Wiener-Kintchine Theorem
- Linear filtering

Objectives

Introduce the main concepts allowing a characterization of random signals. In particular, the main properties : stationarity, ergodicity, needed for a spectral characterization useful in electronics and automatic control, are specifically developed. The linear filtering of random signals concludes the course

Necessary prerequisites

Probability theory, random variable, Fourier Series, Fourier Transform, Linear invariant systems (Transfer function)

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Practical info

Location(s)

 Toulouse

Control of continuous linear systems

Introducing

Description

State-space control: specifications, observability-commandability, state feedback (pole placement), observers, algebraic methods (1- and 2-degree-of-freedom correctors).

Objectives

At the end of this module, the student should have understood and be able to explain (main concepts): the main methods for synthesizing state-space control laws for linear time-invariant systems

The basic principles of observer synthesis for linear time-invariant systems.

The student should be able to :

Define the major characteristics of the control law from the specifications

Design the control law in state space (pole placement)

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Practical info

Location(s)

 Toulouse

Necessary prerequisites

Linear algebra

Évaluation

Modeling and control of discrete-event systems

Introducing

Location(s)

 Toulouse

Description

Modeling and Control of Discrete Event Systems: modeling tools (finite state machines, Petri nets, Statecharts) and associated implementation techniques (PLC, FPGA, real-time target)

Objectives

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

- Basic principles of discrete-event system modeling tools (Finite State Machines, Statecharts, Petri nets),

- Different techniques for controlling a discrete-event system (FPGA, PLC, real-time target).

The student should be able to:

- model and implement the control of a discrete-event system

Évaluation

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Practical info

Business Game

Introducing

Description

Simulation of 5 years of company life (decision making in production, finance, marketing) using the SIMGEST business game.

Objectives

The student must have understood and be able to explain the interdependence of the company's functions (production, commercial, financial, human resources) through decision-making and analysis of the company's economic and financial results. He will have to understand how a company operates, construct financial statements, calculate costs, create simple management tools, optimize resources to make the company profitable, present an oral report of activities (in English)

Necessary prerequisites

financial management cours in 3A

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Practical info

Location(s)

 Toulouse

Company Finance

Introducing

Location(s)

 Toulouse

Description

Income statement, Cash flow, Balance sheet. Elements on costs. The break-even point. Taking inventory into account in financial statements. Debt financing. Company profitability.

Objectives

The student must have understood and be able to explain the company's financial summary documents as well as the basics of cost calculation in the industrial company.

Évaluation

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Practical info

Business Communication

Introducing

None

Description

Students will create a fictitious start-up in a market of their choice, conducting market analysis and identifying competitors. They will produce a GoFUND Me video and practice holding meetings and solving business challenges in English. The final presentation will be a “Shark Tank”-style competition, where students pitch their business idea to a panel of investors.

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Practical info

Location(s)

 Toulouse

Objectives

This course aims to equip students with essential business communication skills. Students will learn to understand a simple business plan and market research, conduct meetings, and use key business vocabulary. They will develop skills to describe graphs and create high-impact presentations. Students will also practice pitching to investors, introducing a company, and discussing social and environmental responsibility in the workplace.

Necessary prerequisites

Physical Education

Introducing

Description

Évaluation

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Practical info

Location(s)

 Toulouse

Professional Path Initiative 3rd Year

Introducing

Description

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Practical info

Location(s)

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Societal Openness Modules

Introducing

Description

- Openness to societal issues (Energy transition, Ecological transition, Digital society, Health global, Mobility and infrastructure)
- Themes with interdisciplinary approaches, mixing Sciences & Techniques and Human Sciences and Social or Thematic in SHS complementary to the base proposed by INSA Toulouse.

Each year, the Opening Modules Commission draws up the list of MOs which will be offered in the 2nd semester. Students then choose the MO they wish to experience via a wish phase on a dedicated application. Students are informed of the MO they will follow during the month of January.

- Offered in the 2nd semester of 3A, Monday afternoon from 2 p.m. to 4:45 p.m.
- Open to all specialty pre-orientations (PO)
- Duration: 30 hours student (NB: additional personal work of around 30 hours is expected)

Educational format:

- Active pedagogies
 - Face-to-face, hybrid or fully remote
 - ECIU+ Challenge Based Learning possibility
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Objectives

The Societal Openness Modules are courses open to the 5 societal issues addressed by INSA Toulouse, allowing complex situations to be understood and covering themes not covered in INSA courses.

Évaluation

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Practical info

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