I3MAIF11 (6 ECTS credits)
C language, Numerical Analysis and Computer Networks
Objectives :

The teaching unit consists of three distinct parts: C language, Numerical analysis and Computer networks.
C Language
At the end of this module:
- students will have acquired the fundamental notions and functioning of the C programming language, including in particular the proximity to hardware
- the student will be able to write simple programs illustrating algorithmic problems, but also more complex programs requiring a good knowledge of specific notions (pointers, bit-operators, structures, etc.).
Numerical analysis
- to acquire some concepts of numerical analysis, scientific computing and numerical optimisation.
- use the C language to illustrate some of these topics.
Computer Networks
At the end of this module:
- the student will have acquired and be able to explain the main concepts associated with computer networks: LAN, WAN and Internet (TCP/IP);
- the student will be able to identify: the features of the main distributed applications, the different kinds of connectivity and addressing schemes, the solutions of resource sharing and their consequences on transfer performance, and finally the concepts of service, protocol, architecture and quality of service. A good theoretical knowledge of services and functions of protocols and the architecture of the Ethernet LAN and of the Internet will be required.
Description :

C Language
Usual notions of programming languages (variables, types, control structures, loops) are presented as well as notions more specifically associated with the C language (bit operators, generalized use of pointers, function parameters, input/outputs functions, etc.).
Organisation: lectures 6h15, tutorials 6h15, Labs 5h30, Exam 1h15
Numerical analysis
Arithmetic and Errors, Linear Systems, Solution of non-linear equations, Numerical Approximation of Ordinary Differential Equations, Least-Square Technique, gradient method
Computer Networks
The first part of the course introduces features and requirements of the main network applications. The second part details fundamental concepts associated with network design: connectivity, bandwidth sharing, switching, QoS and architecture. The third part presents the local area network architecture with a study of the Ethernet network. Illustrations of these concepts are done in lectures and labs**.**
Organisation: lectures 15h, tutorials 1h15, 1 practical lab 2h45, Exam 1h15
Assessment :

C language
How do you assess that the objectives have been reached ?
Written exam
How does your assessment system help the student to reach the objectives ?
An online tool helps students to understand and validate all concepts and review what they have not understood.
Numerical analysis
How do you assess that the objectives have been reached ?
- one written examination (1h30)
- a practical examination (2h15)
How does your assessment system help the student to reach the objectives ?
Computer Networks
How do you assess that the objectives have been reached ?
Written exam and lab reports
How does your assessment system help the student to reach the objectives ?
The studied cases and the exam questions require a grasp of the main concepts. The written elaboration of the answers allows evaluating this understanding.
Assessment method : Written exam, Report
Number of hours : 38.75h (lectures), 16.25h (tutorials), 19.25h (lab work), 50h (Personal work)
Prerequisites :

Basic Analysis and Linear Algebra
Unit of study coordinator : Christophe CHASSOT
Mode of study : Initial training
Semester : 1
Bibliography :
Langage C
Le Langage C / B.W.Kernigham, D.M.Ritchie. Masson.
Du langage C au C++, T. Monteil, V. Nicomette, S. Hernando, F. Pompignac.
Réseaux Informatiques
Computer Networks (4d ed.). A Tanenbaum, Prentice Hall, 2003. ISDN : -
Computer Networks : A System Approach (4d ed.). L Peterson, BS Davie, Morgan Kaufmann Publishers Inc, 2007. ISDN : -
Computer Networking: A Top Down Approach Featuring the Internet (5d ed.). JF Kurose, KW Ross, Addison Wesley, To appear in 2010. ISD.

I3MAPH11 (5 ECTS credits)
Experimental physics and stochastic modelling
Objectives :
At the end of this module, the student will have understood and be able to explain (main concepts) :

Operation of the different sensors used during the lab practicals. They will know how to use them in order to solve a problem. They should view the results critically.
Stochastic modelling of measurements, confidence intervals, statistical tests, linear models.
The student will be able to analyse and quantify the various components in measurement errors, to build a statistical model from observations in order to confirm or invalidate hypotheses concerning the problem at hand, and to plan experiments in simple cases.
Description :
Programme (detailed contents) :
Experimental section :

5 lab practicals (7h30) chosen from the following:
Temperature sensors, Vacuum technologies, Lasers, Extensometers, Thin films, Optical Measurement.
Each practical deals with different sensors, how do they work, how to use them, how to analyse the results ?
Statistics section :

Stochastic modelling of measurements: systematic error, random error, confidence intervals.
Comparison of two series of measurements.
Linear models: least-square adjustment, prediction intervals, model validation, model selection, Fisher test.
Introduction to planning of experiments: factorial design, estimation of the main effects and of the interaction effects between factors.
Organisation: Handouts of lecture notes; each lecture topic is developed in tutorial or lab-work with analysis of data from an industrial situation or from physical measurements. Lab-work is done with the open-source software R.
Main difficulties for students:
To use what they have learnt to be able to do more than just reproduce an exercise or an experiment.
Assessment :
How do you assess that the objectives have been reached ?
For the experimental part, a lab-work exam
+ Written test

Assessment method : Written exam, Lab work
Number of hours : 8.75h (lectures), 7.5h (tutorials), 40h (lab work), 25h (Personal work)
Prerequisites :
I2AIMT40 Probability in IMAC
Unit of study coordinator : David VIGNOLLES
Mode of study : Initial training
Semester : 1
Bibliography :
F. Dress Probabilités Statistique, Dunod 1997
K. Protassov : Analyse statistique des données expérimentales, EDP Sciences, 2002
JM Azais et JM Bardet Le modèle linéaire par l'exemple, Dunod, 2005.
G. Asch, Les capteurs en instrumentation industrielle, Dunod , ISBN 2 10 005777 4

I3MAEL11 (3 ECTS credits)
More advanced electronic circuits
Objectives :
At the end of this module, the student will have understood and be able to explain (main concepts) :

- The electrical characteristics of diodes and transistors.
- The concept of static biasing and the principle of small-signal behaviour around the bias point.
- The different amplification classes for transistors-based circuits.
- The concepts of low- and high-frequency modelling in order to design advanced functional circuits.

The student will be able to:
- Design and build a bias circuit for a given function.
- Extract the equivalent small-signal schematic suited for low- or high-frequency signal analysis.
- Recognize and implement basic circuits such as differential amplification, current generators and mirrors.
- Know how to use an electrical circuit simulator, the models of active components as well as their limitations.
- Know how to build an amplifier and filter with a view to integration.
- Design circuits especially adapted to sensors.
- Design a power amplifying stage taking into account the power dissipation

Description :
Programme (detailed contents) :

Electrical characteristics of diodes and transistors (MOSFETs, JFETs and bipolar transistors). Biasing circuits and corresponding amplifying classes. Models of active components and equivalent small-signal electrical schemes for LF and/or HF signal analysis. Main functions and associated circuitry (current generation, current mirrors, differential amplifiers, etc.). Amplifying, filtering and impedance adaptation. Implementation of models in an electrical circuit simulator.
Organisation:
Lectures, tutorials
Handouts of lecture and tutorial notes will be provided
Assessment :
2 short specific exams (each of 1h)
1 synthetic ending exam (duration 3h)
Assessment method : Written exam
Number of hours : 16h (lectures), 16h (tutorials), 4h (lab work), 28h (Personal work)
Prerequisites :
Fundamentals of electricity, Kirchhoff's laws, Thévenin and Norton's and superposition theorems, voltage and current sources. Fourier's and Laplace's transforms.
Unit of study coordinator : Patrick TOUNSI
Mode of study : Initial training
Semester : 1

I3MAAU11 (6 ECTS credits)
Control and computer architecture
Objectives :
At the end of this module, the student will have understood and be able to explain (main concepts) :

- The basic principles of the main modelling tools (Finite State Machines, State-charts, Petri Nets
- Several techniques for the control of discrete event systems (FPGA, PLC, microcontroller)
- The architecture and the operation of a processor
- The different models for linear time-invariant continuous systems. In particular the methods of analysis of stability and main structural properties like controllability and observability.

The student will be able to:
- design and to build the control of a discrete event system
- explain the operation of a processor from the "fetch" of an instruction to the management of the cache memory
- derive a model for a linear time-invariant system: differential equation, transfer function or state-space description and study the stability or structural properties like controllability or observability.

Description :
Programme (detailed contents) :

3 parts:
1. Modelling and control of discrete event systems: modelling tools (finite state machines, Petri nets, State-charts, GRAFCET) and implementation techniques. Risk analysis of asynchronous sequential systems.
2. Computer architecture: processor architecture, instruction execution, instruction set, stack operation, pipeline, interrupt, cache and virtual memory management, input/ output/, buses
3. Models and analysis of linear time-invariant systems: differential equation, transfer function, state space equation: relations between the different models. Linearisation. Responses: time and frequency. Stability: mode criteria, Routh Criterion, Root locus. Controllability, observability. Criteria for controllability and observability**.**

Organisation:
- lectures,
- tutorials in groups,
- lab-work in subgroups,
- small projects,
- Tutorial and lecture notes for "Control of Discrete Events Systems"
- lab-work instructions with technical notes on equipment
- Specifications fro small projects

Main difficulties for students:
Models and analysis of time-invariant linear systems: the prerequisites of linear algebra are, in general, not well understood .

Assessment :
written examination,
evaluation of lab-work
project report
Assessment method : Written exam, Report
Number of hours : 33.75h (lectures), 20h (tutorials), 23.25h (lab work),
Prerequisites :

Computer Hardware semester 3, IMACS
Linear algebra, differential equations, Laplace transform, feedback systems,
Semesters 1 and 2, IMACS semester 3 and 4
Unit of study coordinator : Audine SUBIAS
Mode of study : Initial training
Semester : 1
Bibliography :
-"Contemporary Logic Design " R.H. Katz, The Benjamin/Cummings Publi.Comp. 1994
- "Réseaux de Petri : théorie et pratique" BRAMS, Tomes 1 et 2, 1983, Eds. MASSON
- "Du Grafcet aux réseaux de Petri" R. David, H. Alla, 1992, HERMES (Série Automatique)
-"On visual Formalism " D. harel, 1985, Communication of the ACM, vol. 31 n° 5l
-"Organisation et architecture de l'ordinateur" W. Stallings, 2003, Pearson Education France
-"Architecture de l'ordinateur" A. Tanenbaum, 2001, Dunod
-« Analyse et commande des systèmes linéaires » B. Pradin and G. Garcia. Presses Universitaires du Mirail, 2009

I3CCGE31 (5 ECTS credits)
Job search and languages
Objectives :

Job search Modules, French and English
At the end of this module, the student will have understood and be able to explain (main concepts):
How to find a work placement (and later on a job) and grasp the differences between methods in France and English-speaking countries.
The student will be able to:
- do a personal assessment, and start elaborating a professional project
- use current research tools (web, online networks, company websites) to conduct a documentary survey on recruitment
- seek placements matching his aim and profile
- find and analyse an English advertisement in his future field
- adapt a resume and cover letter for a specific job-application
- write a resume in English based on different models according to country
- show the application meets the company's requirements
- prepare for an interview (self-knowledge, company awareness, preparation of adequate questions)
-show adequate degree of proficiency in job-search-related technical English to be able to take an interview
Second-language course
Objectives are defined according to European specifications for the five language skills and specific to the various languages proposed - German, Spanish, Chinese - and to students' levels. For further information, see: https://moodle.insa-toulouse.fr/course/view.php?id=44
Whenever possible, if language skills are sufficient
- analyse a job ad
- simulate a job interview
- write resume and cover letter
Remedial English
This module is available to students in certain very specific cases, as a substitute for LV2.
Description :
Programme (detailed contents) :

- personal assessment and project
- resume and cover-letter writing in French and English
- research on companies and job market
- new recruitment techniques
- establishing professional and internet networks
- training for interviews
- recruitment techniques in English-speaking countries
- analysis of English job ads

Organisation of French course:
4 morning or afternoon sessions, with classes, workshops, internet research, presentations and simulations - 15 h
English course:
one weekly tutorial (17h30)
Second language
Two weekly tutorials: 32h30 total
Main difficulties for students:
fluency and use of relevant vocabulary
awareness of language register for the cover letter and interviews
Assessment :
How do you assess that the objectives have been reached ?

TRE module in French:
- oral presentation and written report on current recruitment techniques in companies
- job interview simulation (application for work placement) followed by teacher's feed-back
- resume and cover letter corrected and commented by teacher (no mark)
Job search module in English
- Graded job interview for an engineering position in an English speaking country, based on graded resume and cover letter.
Second language module:
Continual assessment 50% including Spoken interaction and conversation & Final examination (50%) on reading and listening comprehension, written expression
How does your assessment system help the student to reach the objectives ?
The various types of evaluation (see above) enable students to assess their personal job-search skills.
Simulations are as close as possible to real situations; proper training is given through class activities, covering both professional skills and relevant language tools
Assessment method : Written exam
Number of hours : 65h (tutorials), 47h (Personal work)
Prerequisites :
None
Mastery of French (for TRE module)
Unit of study coordinator : Barbara MOORE
Mode of study : Initial training
Semester : 1
Bibliography :

Lecture notes are on-line on moodle
Press articles distributed by teachers
webography: europass, monster, engineeringjobs, totaljobs

I3CCGA11 (5 ECTS credits)
Improving autonomy and building a professional project - level 3
Objectives :
At the end of this module, the student will have understood the mains concepts and will be able to :

- build a coherent and effective project team
- widen his knowledge and improve his skills
- become familiar with all aspects of the profession

The student will be able to:
- Analyse a problem in a group, stating its scope and the various ways to consider it in interaction with others. The students will take into account criteria such as organisation, physical involvement, technical capacities, strategy, motivation, self confidence and confidence in others.
- Make decisions as a team, listen to other people's position and adapting to the general view.
- Find out about the team's capacities, developing a critical analysis and identifying the strengths and weaknesses in oneself and in others.

Description :
Programme (detailed contents) :

Physical education,
Personal Project,
Specially adapted courses for top-level **musicians, athletes and dancers.**
Organisation:
Yearly organisation with regular courses, projects and training sessions. In groups of 4, the students carry out an assignment dealing with one of the career openings of their orientation (food, pharmaceutics, environment, water, waste, chemistry, energy, quality, production, research,...) This As well as document search, this study includes a practical part (meeting with engineers, visiting industrial plants,...) aimed at confronting the students with the real industrial world.
Main difficulties for students:
Listening to others and accepting other people's positions,
Overcoming prejudices and representations.
Assessment :
How do you assess that the objectives have been reached ?

Improvement in technical skills, quality of individual and group actions, involvement in activities, enjoying physical activities.
How does your assessment system help the student to reach the objectives ?
Assessment grids, formative assessment, self assessment, continuous testing, regular interactive reviews.
Assessment method : Oral exam, Report, Lab work
Number of hours : 67.5h (tutorials), 19h (Project), 80h (Personal work)
Unit of study coordinator : Claude MARANGES
Mode of study : Initial training
Semester : 1

I3MAEL21 (6 ECTS credits)
Electronics and Signal
Objectives :
At the end of this module, the student will have understood and be able to explain (main concepts) :

Electronics section:
This course is devoted to analog electronic design and implementation
from the basic transistor to operational amplifier.
The student will be able to:
- design an electronic circuit, given the design specification
- perform simulations of analog circuits
- choose appropriate components
- build and test a prototype with a bread-board
- do the layout and assemble a printed circuit board

Signal Processing section:
For a good understanding of signals and systems, principles of signal theory
and methods of signal processing, with emphasize on spectral analysis and digital
filter design.
Description :
Programme (detailed contents) :

Electronics section:
- Bipolar transistors for A, B, AB classes
- Power dissipation
- transistor amplifiers
- Designs using operational amplifiers, taking their limitations into account

Organisation:
One of the main objectives of this course is to learn electronics through hands-on experience.
It is composed of 14 problem-oriented practical sessions. Systematically, one or two real cases
will be emphasized using common analog components.
Signal Processing section:
First part: Random Signals
1. Definitions (random processes, stationary signals, correlation, covariance,
spectral density)
2. Spectral analysis
3. Filtering of random signals

Second part: Digital Filtering
1. Signal conversion (Analog / Digital, Digital / Analog, Quantisation noise)
2. Discrete-Time linear systems
3. Filter structure and Design

Assessment :
How do you assess that the objectives have been reached ?

Through observation and support during the practical sessions.
At the end of the course, two written exams test the theoretical knowledge
Assessment method : Written exam
Number of hours : 14h (lectures), 18h (tutorials), 46h (lab work),
Unit of study coordinator : Thierry ROCACHER
Mode of study : Initial training
Semester : 2
Bibliography :
A.W.M Van den Enden et N.A.M. Verhoeckx, "Traitement numérique du signal - une introduction", Dunod, 2003.Qunquis, "Le traitement de Signal Sous Matlab, " Hermes, 2000Tisserand, Pautex, Schweitzer "Analyse et Traitement des signaux, méthodes et applications au son et à l'image", 2ème édition Sciences Sup Dunod, ISBN 978-2-10-052437-2

I3MAIF31 (4 ECTS credits)
Databases, C and Network programming
Objectives :

The teaching unit consists of two distinct parts: Databases and C & network programming.
Database:
At the end of this module, the student will have to describe and explain the following concepts:
· creation and use of databases;
· the data model: Entity-relationship or UML class diagram;
· the relational model;
· relational normalisation: functional, multivalued or join dependencies, normal forms 1 to 5, relational design methods;
· query languages: relational algebra, tuples and domain calculus, SQL.
Students will create a map of studied concepts: modelling, validation, implementation and querying.
Students will be able to use these concepts for conceiving and implementing an effective database:
· to conceive the entity-relationship model;
· to derive the relational model from the E/A model and vice-versa, perform reverse engineering;
· to validate the obtained model;
· to implement the database with the provided DBMS and the necessary verification of constraints on data;
· to write the database queries with the different languages and verify their correctness with the expected results;
· to evaluate the global results against the initial requirements and suggest improvements.
C and network programming
At the end of this module, the student will be able to:
· manipulate the following notions using the C language: pointers, strings and parameter passing,
· program a simple distributed internet application using the socket interface (TCP/UDP socket API),
· be familiar with the major internet applications (http, ftp, smtp, etc.).
Description :

Database:
· *Program (detailed contents):*
· Introduction to Databases
· The entity-relationship model
· The relational model
· Normalisation and validation
· Query languages
· Implementation of a database
C and network programming:
- C: Students should simulate a problem in the computer-science domain: OS scheduling, network routing or file-systems. Simulation of the chosen system. The different phases of the development (specification, conception and programming) are coordinated by a teacher.
- Network: The first part of the course describes the main distributed Internet applications (http, ftp, smtp, etc.). The second part describes the TCP/UDP socket interface (in C) allowing a program to transfer data between two distant hosts. Two labs illustrate the second part through the implementation of a simple application aimed at generating data via TCP or UDP.
Organisation:
Database:
The lectures and tutorials are alternated. The project is given at the beginning of the module and worked through during tutorials.
The last lab sessions are reserved for programming with the database software.
A handout of the course is distributed and an on-line site contains some documents and exercises (with and without correction).
C and network programming:
- C: Specification and general conception are done during tutorials. Programs are written during lab-work
- Network: The lectures are followed by the 2 labs. The students work in pairs.
Main difficulties for students:
Database:
Understanding and using the normal forms and the query languages (relational).
C and network programming:
- C: knowledge of algorithms, manipulation of C pointers and parameters.
- Network: manipulation of C pointers**.**
Assessment :
How do you assess that the objectives have been reached ?
Database :

Formative assessments are conducted during the sessions on all the topics.
Corrected exercises and self-assessments grids are available on-line.
The full development of the database is subject to an assessment of results and to one report (one per pair).
The written examination evaluates each student individually.
C and network programming :

- C: through the development of the project
- Network: through the software developed during the two labs
How does your assessment system help the student to reach the objectives ?
Database :

Alternate lectures, tutorials and on-line exercises give students opportunities to practice.
Self-assessment grids are given progressively and concept maps built by students help them to check their knowledge.
C and network programming :

Putting concepts into practice allows assimilation.
Assessment method : Written exam, Report, Lab work, Project.
Number of hours : 22.5h (lectures), 13.75h (tutorials), 16.5h (lab work), 5.5h (Project),
Prerequisites :
Database : none
C and network programming :

- First and second year courses on Algorithms & Programming (I1ANIF12, I1ANIF20, I2AIIF20).
- Third year course on C language.
- Third year course on computer networks.

Unit of study coordinator : Daniel MARRE
Mode of study : Initial training
Semester : 2
Bibliography :
C. Date - Introduction aux bases de données - Thomson
G. Gardarin - Bases de données - Eyrolles
D. Marre - Bases de données - support de cours - Insa Toulouse
T. Monteil, V. Nicomette, F. Pompignac, S. Hernando, Du langage C au C++, Presses Universitaires du Mirail
B. W. Kernighan et D. M. Ritchie, Le langage C, Masson

I3MAPH31 (4 ECTS credits)
Electromagnetisms in materials and waveguides - classical mechanics
Objectives :
Electromagnetisms in materials :

At the end of this module, the student will have understood and be able to explain the concepts related to the propagation of electromagnetic waves in simple materials (linear, homogeneous and isotropic, dielectric, magnetic or conductive), the reflection and the refraction at one interface, the principle of metallic and dielectric (optical fibres) waveguides and the related electromagnetic energy transport.
Students will be able to use Maxwell's equations to determine the nature of the electromagnetic waves in a simple system (L.H.I. material, interface between two materials, confined space between two planes of conductive material). They will be able to determine the conditions and the characteristics of electromagnetic wave propagation in metallic and optical-fibre waveguides
Classical Mechanics :

At the end of this module, the student will have understood and be able to explain the notions of twist and wrench which are at the heart of the course, the theorems of Newton and Euler which describe the movements of mechanical systems and the forces and momentums appearing.
The student will be able to: solve an elementary problem of classical mechanics. He should be able to handle the notions of power and energy.
Description :

Programme (detailed contents): Electromagnetism fundamental equations in dielectric, metallic and magnetic materials. EM wave propagation in linear, homogeneous and isotropic materials. Continuity equations. Application to reflection and the refraction. Propagation in rectangular metallic and optical waveguides.
Organisation: The student will be given supports for lectures, tutorials and lab work. The lectures focus on the new concepts, their illustration and the demonstrations of some mathematical expressions related to the physical phenomena. The tutorials, as well as the lab-work, directly relate to the lectures through practical examples.
Mechanics :

Fundamental knowledge for the study of movements of mechanical systems and forces and momentums appearing.
Short recall of mathematical basics: vectors, linear operators, points, fields vectors and twist/wrench theory.
The course is divided in three parts.

Kinematics: velocities, accelerations and their composition formulas; Kinetics: kinetic and dynamic twist and wrench; particular case of a solid: inertia operator and inertia elements. Dynamics: notion of Galilean space, theorems of Newton and Euler, power, energy, kinetic energy.
Main difficulties for students: Difficulties with intrinsic reasoning and tendency to begin with extrinsic quantities with respect to a particular frame (generally the fixed one). Difficulties with analytical calculations.
Assessment :
How do you assess that the objectives have been reached ?

For the teacher, the tutorials and the lab work are means of evaluating the global understanding of the main concepts. A first short exam, taking place in the first third of the course, allows the assessment of the understanding of the generalisation of the electromagnetism fundamental laws to the different materials. A second longer exam focuses on the evaluation of the last two thirds of the course.
How does your assessment system help the student to reach the objectives ?
Thanks to the tutorials and the lab work, the students are indeed able to evaluate themselves for each new concept. The first short exam, taking place relatively early, allows the students enough time to do additional personal work to overcome their personal difficulties.
Mechanics :
How do you assess that the objectives have been reached ?

Through tutorials and a final written exam. The examinations from previous years and their solutions are given to students.
How does your assessment system help the student to reach the objectives ?
The written examination, which is a long one, is an essential part of the programme. The students have to solve a real-life problem on their own.
Assessment method : Written exam, Lab work
Number of hours : 27.75h (lectures), 18.75h (tutorials), 8.25h (lab work), 41h (Personal work)
Prerequisites :
Electromagnetism in vacuum (S3, old code APOGEE : I2AIPH30)
Mathematical tools : complex number, vector field, differential calculus.
Notions of linear algebra, kinematics and dynamics of the material point.

Unit of study coordinator : Andrea BALOCCHI - Marc RENAUD
Mode of study : Initial training
Semester : 2
Bibliography :
Supports de cours : Propagation des ondes, A. Balocchi, I. Gerber, S. Lachaize, 2007
Livres : M. Hulin, Equation de Maxwell, Ondes électromagnétiques, Dunod, 1993, ISBN : 2-10-001657-1 ; J.-P. Pérez, Electromagnétisme, Masson, 1996, ISBN : 2-225-85236-7
Mécanique classique tomes 1 et 2, J.J. Moreau, Masson, 1968
Cours de mécanique, P. Brousse, A. Colin, 1973 (le plus proche de ce cours)

I3MAIF21 (3 ECTS credits)
Hardware - assembly langage
Objectives :
At the end of this module, the student will have understood and be able to explain (main concepts) :

- Von Neumann model
- ALU, memory, input/output circuits, CPU, interrupt mechanism,
pipeline execution of the instructions
- Instruction set and programming in assembly language
- The components of a software development kit: compiler, linker, loader,
debugger
The student will be able to:
- Understand the principles of an instructions set
- Develop an assembly language program for a microcontroller
- Use of tools for a cross-language development process
Description :
Program (detailed contents) :

Usefulness of the assembly language and presentation of a microcontroller based on an ARM Cortex M3 core, Memory organisation and program organisation, sections, instructions, data, address modes. Structures (tables, chains, record, stack).· Internal modularity (algorithmic structures) and external modularity (assembly by parts, linker, loader, debugger).
Main difficulties for students:
Insufficiency in Boolean algebra - Lack of rigour
Assessment :
How do you assess that the objectives have been reached ?
By evaluating them in a real situation on a computer
How does your assessment system help the student to reach the objectives ?
Because it's impossible to write a program without correct understanding
Assessment method : Written exam, Lab work
Number of hours : 12h (lectures), 7h (tutorials), 16h (lab work), 30h (Personal work)
Unit of study coordinator : Vincent MAHOUT
Mode of study : Initial training
Semester : 2
Bibliography :

· **ARM Assembly Language: Fundamentals and Techniques**, William Hohl, Taylor & Francis, Inc., (ISBN 9781439806104)
· **The Definitive Guide to the ARM Cortex-M3,** Joseph Yiu, Elsevier Science & Technology Books (ISBN 9780750685344)
+ Moodle de l'INSA

I3MAAU21 (3 ECTS credits)
Control of Linear Time Invariant Systems
Objectives :
At the end of this module, the student will have understood and be able to explain (main concepts) :

The main methods of design of control laws for linear time-invariant systems described in the state-space or in the frequency domain.
The student will be able to:
- define the main characteristics of the control law from the specifications,
- design the control law in the state-space (location of poles) or in the frequency domain (phase lag or lead, location of poles).

Description :
Programme (detailed contents) :

- Specifications
- Phase lag or lead correction
- PID
- State feedback control (location of poles)
- Observers
- Observer based control

Main difficulties for students:
The knowledge of the different models of linear systems in the state-space and the frequency domain. In particular linear algebra basics.
Assessment :
How do you assess that the objectives have been reached ?
Evaluating the progress done by students in the classroom exercises.

Assessment method : Written exam, Report, Lab work
Number of hours : 15h (lectures), 10h (tutorials), 13.75h (lab work),
Prerequisites :
Linear algebra, Laplace and Fourier transforms, differentiel equation.

Unit of study coordinator : Germain GARCIA
Mode of study : Initial training
Semester : 2
Bibliography :
Bernard Pradin et Germain Garcia. Analyse et commande des systèmes linéaires continus. Presses Universitaires du Mirail. 2009.