



ESIEA

4th year
course
description
1st semester

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The 4th year in ESIEA

The objective of this year of study is to acquire knowledge and skills that will be directly applicable in the workplace in an international and complex environment. Students can tailor their studies to correspond to their talents, personality and personal and professional projects.

In the 4th year, our future engineers begin to specialise in order to be better prepared for their entry into the world of work.

▶ The students deepen their scientific and technical skills through the technical lectures in the core program:
Stochastic processes, digital and combinatorial optimisation, IP networks, systems programming and real time, virtual reality and digital imaging, senior project in digital sciences and technologies.

▶ They attend specific lectures depending on their elective program:

- **Embedded Systems**
- **Information Systems**

Embedded systems

Robotics, VHDL programming and random signal, real time OS software labs, control, estimation and identification, design of programmable components, serial transmission.

or

Information systems

Advanced Web programming, mobile programming and database management, software architecture, neural networks, information security and virology, distributed programming, estimation and data analysis.

▶ They consolidate their general engineering profile with lectures linked to business culture: introduction to sustainable development, introduction to law with an emphasis on labour law, project management and business projects, psychology of human relations, company management and language labs emphasising professional communication.

The core humanities program is completed by lectures and conferences on economy, law and business management. The business administration lecture contains a game simulation over several weeks bringing several student groups into competition.

During the seminar “environment and business strategy” (during a week in a ski resort) people from industry present hot topics in companies which the students develop in team work. The students then present their work to the experts.

This is an important and intense moment in the 4th year as the students are in contact with the business world for a whole week.

- ▶ The senior scientific project in the 4th year is carried out in teams of 3 or 4 students in partnership with a company or a research laboratory. This multidisciplinary project must be sustainable and must contain an innovative component.

- ▶ At the end of the 4th year, each student is ready for his/ her first real work experience and leaves for a technical internship of 4 months. The objective of the internship is to apply the acquired knowledge and skills in their study program to corresponding software or hardware projects in industry.

Program table

Module Code	Module Title	weighting	credits	work load	hours in class
TEC4BS1	Core program - Science and Technology	16,5	15	380	186
MAT4056	Estimation and data analysis	3		65	24
MAT4053	Digital and combinatorial optimisation	1,5		33	18
INF4032	IP Networks	2		44	18
LAB4413	IP Networks lab	2		44	18
INF4033	Systems programming and real time	2		44	18
PLU4190	Senior project in digital sciences and technology	6		150	90
HUM4BS1	Core program - Humanities and corporate culture	8	8	218	109,5
ENT4114	Company management and law	3		70	30
MAN4303	Project management	1,5		33	18
ENT4301	Introductory seminar				6
HUM4091	Psychology of human relations	1,5		33	15
LAN4081AN	English	2		44	21
MAN4307	APIC (Actions to Promote Information and Communication)			15	4,5
LANXX83XX	2nd foreign language; French for foreigners, reinforced English			23	15
FSE4BS1	Elective program - Embedded Systems	7	7	154	54
SYS4041	Robotics	2,5		55	18
LAB4411	Serial bus transmission	2,5		55	18
SIG4141	Random signal	2		44	18
FSI4BS1	Elective program - Information Systems	7	7	154	54
INF4041	Web Programming	2,5		55	18
INF4042	Mobile Programming	2,5		55	18
INF4040	Database management	2		44	18
TOTAL		31,5	30	752	349,5

Core program: Science and Technology

MAT4056 ESTIMATION AND DATA ANALYSIS

4th year – 1st semester in Paris-Ivry, Laval

Core program - Science and Technology (TEC4BS1)

3 ECTS, 24 hours on site lectures

Taught in English

OBJECTIVES:

This module aims first of all to summarise the key information of a database and to set up, if possible, a linear model built from this database (analysis of variance and regression). The objective of this model is essentially to do forecasts.

Use of existing parametric test and estimation functions of the linear model in the free software R.

PROGRAM:

Descriptive statistics: characteristics of position, of dispersion and form

PREREQUISITES:

Basic module of statistics and probabilities (3rd year course)

PEDAGOGICAL METHODS:

Lectures, labs, projects

EVALUATION METHOD:

Written exam

MATERIAL:

Beamer, specific software, powerpoints, moodle

BIBLIOGRAPHY:

Frédéric Bertrand et Myriam Maumy-Bertrand, Initiation à la statistique avec R, Dunod, 2ème édition, 2014

MAT4053 DIGITAL AND COMBINATORIAL OPTIMISATION

4th year – 1st semester in Paris-Ivry, Laval

Core program - Science and Technology (TEC4BS1)

1.5 ECTS, 18 hours on site lectures

Taught in English

OBJECTIVES:

Acquiring basic algorithmic and mathematical tools in digital and combination optimisation. Modelling and solving an optimisation problem without constraints (equality or inequality constraints) with Lagrange or Kuhn-Tucker multipliers, but also (in case of Lagrangian duality) being able to go to the next step in the set up of non linear digital optimisation without constraints.

Modelling a problem, a concrete situation in the form of a linear program or standard formulation. Implementing the simplex method.

PROGRAM:

- Digital and combination optimisation
- Optimisation issue (digital and discrete)
- Continuous unidimensional optimisation
- Multi-dimensional optimisation
 1. Gradient methods
 2. Newton methods
- Linear programming (simplex algorithm)
- Application of linear programming to the flows and transport issue.

PREREQUISITES:

- Resolution of linear systems either by hand (for small numbers), or with the standard Gauss elimination algorithm. Many exercises
- Matrix notations, mastering the correspondance between a matrix expression and its developed expression. Checking the matrix expression relevance by inspection of the matrix dimension or vectors. Exercises.
- Matrix products. Transposition of a matrix product. Exercises.
- Square matrix determinant, concept of a regular matrix, singular matrix; importance towards linear system resolution. Exercises.
- Linear dependency and linear independency, rank of a matrix; inverse of a matrix
- Concept of half-defined and defined matrix positivity, link with the intrinsic value for a real symmetric matrix (important and useful concept for the set up of real function convexity with several variables). Exercises.

PEDAGOGICAL METHODS:

Lecture, labs, computer labs

EVALUATION METHOD:

Written exam, project report

MATERIAL:

Photocopies

BIBLIOGRAPHY:

Handbook of Discrete and Combinatorial Mathematics / ROSEN, Kenneth H. ; MICHAELS, John G.- CRC Press : 1999.

Exercices d'analyse numérique matricielle et d'optimisation avec solutions / THOMAS, J.-M. ; MIARA, B. ; CIARLET, Philippe Gaston.- Dunod : 2001.

Introduction à l'optimisation / CULIOLI, Jean-Christophe.- Ellipses : 1994.

Mathematical Methods in Economics and Social Choice / SCHOFIELD, Norman.- Springer-Verlag : 2003.

Méthodes mathématiques de la finance / DEMANGE, Gabrielle ; ROCHET, Jean-Charles.- Economica : 1997.

Numerical optimization : theoretical and practical aspects / BONNANS, J. Frédéric ; GILBERT, J. Charles ; LEMARECHAL, Claude ; SAGASTIZABAL, Claudia A.- Springer-Verlag : 2003.

Optimisation combinatoire : graphes et programmation linéaire / SAKAROVITCH, Michel.- Hermann : 1984.

Optimisation combinatoire : programmation discrète / SAKAROVITCH, Michel.- Hermann : 1984.

Petits problèmes de mathématiques appliquées et de modélisation, issus des concours d'entrée à l'Ecole Normale Supérieure de Cachan / BIDEGARAY, B. ; MOISAN, L.- Springer-Verlag : 2000.

INF4032 IP NETWORKS

4th year – 1st semester in Paris-Ivry, Laval
Core program - Science and Technology (TEC4BS1)
2.0 ECTS, 18 hours on site lectures
Taught in English

OBJECTIVES:

Following the course in 3rd year, this course aims to rise in the layers in the OSI model to reach layer 7 and to work on historical protocols such as HTTP and dynamic routing.

List IPv6 contributions

Understand the RFC description of a historical protocol.

Work on existing examples of this protocol.

Work on systems of distributed files.

Explain the functioning of the main algorithms in dynamic routing.

PROGRAM:

- 1) TCP/ IP review
 - IPv4 addressing
 - Reference models
 - ARP, ICMP, IP
- 2) IPv6
 - Addressing

- Address construction
 - Mobility
 - Security
- 3) A historical HTTP protocol
 - Work on different RFC examples
 - 4) Systems of distributed files
 - Understand the functioning
 - Know how to use them
 - 5) Dynamic routing
 - Static routing review
 - Dynamic algorithm
 - 6) Introduction to network security

PREREQUISITES:

IP networks course (INF3037)

PEDAGOGICAL METHODS:

Lectures

EVALUATION METHOD:

Final examination

MATERIAL:

Photocopies, Moodle, Beamer

BIBLIOGRAPHY:

Pujolle Guy - Les réseaux (édition 2014) - Eyrolles

LAB4413 IP NETWORKS LAB

4th year – 1st semester in Paris-Ivry, Laval

Core program - Science and Technology (TEC4BS1)

2.0 ECTS, 18 hours on site lectures (12 h in lab, 6 h projects)

Taught in English

OBJECTIVES:

The aim of this module is to apply the notions seen during the course (INF4032).

Configure the network layer of an operating system

Implement a historic protocol

Design an operator network

PROGRAM

Lab 1 : Review TCP/ IP

Lab 2 : IPv6

Lab 3 : HTTP protocol implementation

Lab 4 : Security

Lab 5-6 : Dynamic routing

PREREQUISITES:

IP network course (INF 4032)

PEDAGOGICAL METHODS:

Lab

EVALUATION METHOD:

Project report, steps of validation during the lab

MATERIAL:

Photocopies, Moodle for reports and documents, Beamer

BIBLIOGRAPHY:

Pujolle Guy - Les réseaux (édition 2014) - Eyrolles

INF4033 SYSTEMS PROGRAMMING AND REAL TIME

4th year – 1st semester in Paris-Ivry, Laval

Core program - Science and Technology (TEC4BS1)

2.0 ECTS, 18 hours on site lectures

Taught in English

OBJECTIVES:

- Presentation of system programming principles
- Presentation of lowest level functions managed by the operating system(C-system)
- Presentation of the principles of real time programming
- Operate/ modify/ create programs in C using internal functions of the operating system (access to the file system, management of rights, processes, concurrent accesses, sockets, etc.).

PROGRAM:

- Advanced C (compilation review, static and dynamic libraries, parameters, debugging,)
- Access to file systems (handling, access rights, links, special files)
- Process management (creation, management, synchronisation, locks, tubes) and threads (management and mutex)
- IPC (message queues, shared memory zones, semaphores)
- Sockets

PREREQUISITES:

Course operating systems (INF3039 and INF3040)
IP network course (INF3037, LAB 3418, INF4032 and LAB4413).

PEDAGOGICAL METHODS:

Lectures, Lab, Projects, lectures and homework on Moodle

EVALUATION METHOD:

Netquizz (digital questionnaire), Moodle, quizzoodle

MATERIAL:

Beamer, specific software, LibreOffice presentation, Moodle

BIBLIOGRAPHY:

PLU4190 SENIOR PROJECT IN DIGITAL SCIENCES AND TECHNOLOGIES

4th year – 1st semester in Paris-Ivry, Laval
Core program - Science and Technology (TEC4BS1)
6.0 ECTS, 90 hours on site lectures
Taught in English

OBJECTIVES:

The objective is to set up tools, processes and methods necessary for a project by defining the expectations of the project, thinking about its interest, defining the operational framework and the work schedule (continued in S2).

Problematize and delimit the subject

Identify the problems to be solved

Regulate group dynamics

Organize the work

Work in teams

PROGRAM:

In the first semester the students define the project context and reply to the following questions:

- Who does what in the team, roles, responsibilities
- Feasibility study (placed into the context)

Why are we undertaking this project? What is at stake?

- Specifications: what must be done?
- Charter (or quality plan): how do we get organized to get things done
- Planning: when? (the different project steps)

For the most advanced groups a part of the realization is done in the first semester.

PREREQUISITES:

Management course in 2nd and 3rd year.

PEDAGOGICAL METHODS:

Independent work in teams of students who organize themselves with regular follow-up by a project leader

EVALUATION METHOD:

Each student gets an individual mark according to his/ her involvement in the project. There is a collective mark for the written report.

MATERIAL:

BIBLIOGRAPHY:

Core program humanities and corporate culture

4th year – 1st semester in Paris-Ivry, Laval

Core program: HUM4BS1 Humanities

8 ECTS/ 109,5 hours on site lectures

ENT4114 COMPANY MANAGEMENT AND LAW

4th year – 1st semester in Paris-Ivry, Laval

Core program - Humanities (HUM4BS1)

3.0 ECTS, 30 hours on site lectures

Taught in English

OBJECTIVES:

Understand the world of enterprise (first approach). Acquire the basics of enterprise management, accounting and labor as well as a view of the key management functions.

Part 1: Enterprise management and accounting.

Part 2: labour law

These notions will be put into practice in the second semester within the framework of a simplified business plan.

PROGRAM:

Part 1: Enterprise management

Introduction: Different enterprise perspectives / Marketing / Provisions / Results / Company health

Chap 1: Organisation of a company / Financial statements / revolving funds, WCR, cash position,

Cash flow / SIC Code

Chap 2: Balance sheet and nominal account / the accounting process and the main entries

Chap 3: Management principles: Sales qualification / Management of Purchasing and Suppliers / Managing general operating expenses / Payment terms / Wage bill / Cash position / Investment plan / Human resources management

Chap 4: Accounting for exceptional events: Company creation / Capital increase / Merger / Split-up

Part 2: Labour law

Introduction: Notions /labour law history / sources / labour law / controle of labour law application

Chap 1: Individual labour relations: work contract/ recruitment/ contract terms/ different types of contract/ contract fulfilment/ end of work relation

Chap 2: Collective labour relations/ union rights/ labour unions in the company/ institutions/ staff representative institutions/ key notions

Chap 3: From strike to social dialogue/ strike/ collective negotiations since the law of 20 August 2008/ ANI of 11 January 2013/ law of 14 June 2013/ Rebsamen law of 2015 relative to the social dialogue/ labour law of 2016

Chap 4: Job and skill management (GPEC) and continuing education (FPC)/ training plans, educational leave (CIF,) parental leave (CPF)/ skills assessment/ professionalization periods).

Chap. 5: special risks in the workplace: alcohol, drugs, tobacco use in the company/ moral harassment at work/ discrimination/ Intranet, Internet, NTIC, stress at work

Chap. 6: health and safety at work: monitoring of health of work/ work accidents/ accidents on the way to work/ professional diseases/ formal and informal sources for documents (single document, social report, reports from staff representatives, reports from committee on hygiene, safety and working conditions (CHSCT), works council, ...) regulatory framework (reminder)/ internal and external actors of health and safety at work/ notions of risks and dangerous situations/ risk prevention and management

PREREQUISITES:

None

PEDAGOGICAL METHODS:

Lectures, labs, work shops

EVALUATION METHOD:

Written exam, oral presentation, report, creation of a company profile

MATERIAL:

Power point, photocopies, beamer, Internet

BIBLIOGRAPHY:

ENSELME Gérard. « Comptabilité financière - comptabilité de gestion », Litec

LEFEBVRE Francis "Memento"

Code du travail

- Code de la sécurité sociale

- Droit du travail, droit Vivant – J-E Ray

- Droit du travail – J-M Verdier A Coeuret M-A Souriac

- Mémento Social - Francis Lefebvre

- Memo social – Liaisons sociales

- Marie-France Hirigoyen, « Malaise au travail, harcèlement moral, démêler le vrai du faux » Edition Syros

- Philippe Arbouch – Alexis Triclin : « Les tabous dans l'entreprise, Prévenir ces risques dont on ne parle jamais » Editions Eyrolle

MAN4303 PROJECT MANAGEMENT

4th year – 1st semester in Paris-Ivry, Laval

Core program - Humanities (HUM4BS1)

1.5 ECTS, 18 hours on site lectures

Taught in English

OBJECTIVES:

Train our students in the areas necessary for careers such as:

- project manager
- sales engineer

Forecast and fixed costs and costs of a project of a public tender until the contracts signature.

Carry out and follow up a project from the contract's signature until the final delivery to the customer.

Estimate industrial risks related to a project in a probabilistic universe.

Optimize the relations costs vs deadlines. Write an industrial report for a customer.

PROGRAM:

I. Forecasts, planning in a probabilistic universe: study of industrial risks

I.1 Objectives

I.2. Collection of industrial data

I.3. Mathematical modelling

I.4. Operational implementation

II. Cost handling

II.1. Data collection

II.2. The myth of "month x manpower"

II.3. The reality of "month x manpower"

II.4. Cost optimization in the GANTT chart

III. Forecast and cost handling

III.1. Calculation of the sales price of a project

III.2. Cost follow-up via s curves

III.3. Treasury and financial costs follow-up

IV. Cost vs deadline optimization in projects

IV.1. Objectives

IV.2. New definitions (ND)

IV.2.1 ND relative to arcs

IV.2.2 ND relative to costs

IV.2.3 ND relative to graphs

IV.3 FORD-FULKERSON algorithm

IV.4. Operational implementation

Appendix

A.1 EQUANT

A.2 MATRA

A.3 EDCI knowledge control (TOTAL)

PREREQUISITES:

3rd year course MAN3301

PEDAGOGICAL METHODS:

Lectures, projects

EVALUATION METHOD:

Project report

MATERIAL:

Specific software, photocopies

BIBLIOGRAPHY:

ENT4301 INTRODUCTORY SEMINAR

4th year – 1st semester in Paris-Ivry, Laval

Core program - Humanities (HUM4BS1)

0.5 ECTS, 6 hours on site lectures

Taught in English

OBJECTIVES:

Preparation to job interviews and meetings with companies during the Esiea seminar.

PROGRAM:

How to write a CV and job interview techniques

PREREQUISITES:

ENT3113

PEDAGOGICAL METHODS:

Lab, interviews

EVALUATION METHOD:

Interviews

MATERIAL:

Power point, internship offers, evaluation grids, model CV

BIBLIOGRAPHY:

HUM4091 PSYCHOLOGY OF HUMAN RELATIONS

4th year – 1st semester in Paris-Ivry, Laval

Core program - Humanities (HUM4BS1)

1.5 ECTS, 18 hours on site lectures

Taught in English

OBJECTIVES:

This module aims to federate and to develop win-win relationships in teams in terms of:

- motivation: understanding the fundamentals of motivation and how to create the conditions to make them last
- change management: understanding natural mechanisms of adaptation to changes
- understanding the richness of individual ways of workings; introduction to tools like Enneagram, Process com,

Learn how to communicate positively with others according to basic rules of a good relationship.

Understand group dynamics – how to say and make disagreements to be said in order to work on them

Look at situations called “situation of changes” with a dynamic and contextual understanding

PROGRAM (extracts):

- Fundamentals of motivation reviewed by Daniel H. Pink: historically (From Maslow to McGregor, Harlow and Deci).
- when the carrot and the stick demotivate
- The company specialists (Drucker, Collins, Hamel, ...)
- Motivation 3.0: introduction with logical levels from R. Dilts (PNL).
- Giving sense, shared vision
- emergence of talents and resources
- Issues and major objectives of change management
- Different steps of a change
- Evaluation of change impacts
- The socio-dynamic diagram of the actors
- Communication and training plan
- Usefulness and applications of the Enneagram model
- Fundamentals: 3 centres, characteristics, archetypes
- What is my archetype? What is my preferred centre ? What are my strategies to succeed?
- Motivation of each Enneatype ... with exercises !

PREREQUISITES:

None

PEDAGOGICAL METHODS:

Lectures, interviews, workshops, case studies

EVALUATION METHOD:

Presentation/ defence, participation

MATERIAL:

Beamer, microphone, principle: a theoretical intake explained by concrete cases of projects (risks, mistakes to be avoided, project outcome...)

BIBLIOGRAPHY:

None

LAN4081AN ENGLISH

4th year – 1st semester in Paris-Ivry, Laval

Core program - Humanities (HUM4BS1)

2.0 ECTS, 21 hours on site lectures

Taught in English

OBJECTIVES:

The objective of this module are to:

- Raise student awareness of the different management methods they will encounter in the world of work.
- raise student awareness of the different methods of selection and recruitment.

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

- produce professional-quality CVs and covering letters targeting specific jobs
- perform confidently during job interviews and when presenting themselves informally
- produce professional-quality, non ambiguous and register appropriate e-mails

PROGRAM:

- Reading articles and watching videos on different management methods
- Reading articles and watching videos on different recruitment methods
- Multiple writing assignments with instructor feedback
- Preparation of application materials
- Preparation of job interviews
- Viewing of examples of 60-second pitches. Preparing and performing individual pitch
- Continued work on professional e-mail writing

PREREQUISITES:

English level B2 according to the Common European Framework of References for Languages (CEFR)

PEDAGOGICAL METHODS:

Lab, lectures and homework on Moodle, interviews, workshops

EVALUATION METHOD:

Homework, interview simulation

MATERIAL:

Beamer, television, DVD, language lab, laptops, photocopies, CDs and DVDs, documents (texts, audios, videos) taken from the Internet

Moodle used to publish course materials and for certain activities

BIBLIOGRAPHY:

Most materials are developed for the specific needs of our students by the English teaching team at ESIEA.

MAN4307 APIC (Actions to Promote Information and Communication)

4th year – 1st semester in Paris-Ivry, Laval

Core program - Humanities (HUM4BS1)

0.0 ECTS, 4,5 hours on site lectures

Taught in English

OBJECTIVES:

During your studies and your professional life, you will have to mobilize your communication talents, either to promote a project in an association, or to convince a jury, or to make a presentation in front of your teachers, or to get an internship or a job, or to carry out a professional mission, etc.

The APIC (Actions to Promote Information and Communication) is one of the modules enabling you to better communicate. It has three objectives:

- 1- To give an overall vision, on theoretical and functional aspects of persuasive communication on interpersonal and strategic aspects.
- 2- To put your knowledge into practice in order to promote the school during events organised by the public relations department.
- 3- To promote the actions of the different school clubs and pedagogical projects (scientific or humanities) carried out by students by giving practical advice.

PROGRAM:

Notions presented:

Theoretical approach of communication techniques

Basic principles of programming

Neurolinguistics

Model of probability, Maslow pyramid, cognitivist theory, different types of perception (emotional and rational)

Basic principles, methods and processes of rhetorics and persuasive communication: writing of a rhetoric speech, factors increasing credibility, formulation principles, influence laws, etc.

The non verbal dimension of communication: attitude, body language and synchronisation.

Useful tips and general factors in communication situations of an “Esiearque”.

PREREQUISITES:

None

PEDAGOGICAL METHODS:

Conferences and projects

EVALUATION METHOD:

Evaluation per semester.

Quantitative and qualitative evaluation (bonus/ malus).

Each student has to perform at least one communication action per semester in the service of his/ her school allowing him/ her to put into practice the techniques.

MATERIAL:

« Art et science de l’Influence » Kevin Hogan. Collection Psychologie et Communication – Ixelles Edition 2009

« L’argumentation dans la communication » de Philippe Breton, Collection Repères – La Découverte 2009

BIBLIOGRAPHY:

None

LAN1234FR FRENCH FOR FOREIGNERS

4th year – 1st semester in Paris-Ivry, Laval

Core program - Humanities (HUM4BS1)

0.0 ECTS, 15 hours on site lectures, workshops in language lab

Taught in French

OBJECTIVES:

The objectives are twofold:

- on the one hand, the students acquire a sufficient level in French to be autonomous in its day to day use, particularly in verbal exchanges
- on the other hand, the students learn how to write and present scientific and technical reports in order to facilitate their scientific and technical studies in France.

TARGET COMPETENCES

- to be able to understand and speak in day to day situations
- to be able to write and present a technical or scientific report

PROGRAM:

Workshops on writing of scientific and technical reports
Focus on cultural competency
Study of authentic texts
Understanding of audio and video segments
Speaking about personal or professional issues
Writing about personal or professional issues
Grammar exercises
Vocabulary acquisition
Presentation of personal work orally or in written form
Interactive speaking/ debates
Workshops in the language lab

PREREQUISITES:

B1 level

PEDAGOGICAL METHODS:

Lab, lecture, interviews, workshops

EVALUATION METHOD:

Homework, written and oral exams

MATERIAL:

Beamer, television, DVD, language lab, laptops, photocopies, CDs and DVDs, documents
(texts, audios, videos) taken from the Internet

BIBLIOGRAPHY:

Most materials are developed for the specific needs of our students by the French teaching team at ESIEA.

Specific teaching in the elective program

Embedded Systems

4th year – 1st semester

Elective program: FSE4BS1 EMBEDDED SYSTEMS

7.0 ECTS, 54 hours on site lectures

Taught in French

SYS4041 ROBOTICS

4th year – 1st semester

Elective program: FSE4BS1 EMBEDDED SYSTEMS

2.5 ECTS, 18 hours on site lectures

Taught in French

OBJECTIVES:

This module is an introduction to robotics.

The objectives in terms of knowledge are:

- To know the applications for robotics, existing robotic systems and their features,
- To know the different functions to be performed by a robotic system and the main technologies to achieve them,
- To know the difficulties inherent to mobile and industrial robotics and the main methods to resolve them.

Afterwards these competences are put into practice (workshops) on robotic platforms.

Students learn:

- To design and analyse a robotic system,
- To choose its components in order to achieve the expected functions,
- To implement a robotic system and to develop some of its functions.

PROGRAM:

Introductory course to robotics (6 h)

- The different fields of robotics
- General structure of a robot: general structure of the sensors, actuators, controllers, communications, user interfaces.
- Introduction to mobile robotics: mechanical bases, modelling, environment representation, functions to be carried out (perception, localization, navigation, planning, control)
- Introduction to industrial robotics: robot types, performances, modelling of serial robots, patch generation and control.

Lab work (18 h) on robotic platforms

PREREQUISITES:

Algorithms, programming, C language, automatics, basic knowledge in electronics and sensors, motor control

PEDAGOGICAL METHODS:

Lab, lectures, projects

EVALUATION METHOD:

Oral presentation, defence

MATERIAL:

Beamer, robotic platforms for labs, course slides and lab subjects are available on the Moodle

BIBLIOGRAPHY:**LAB4411 SERIAL BUS TRANSMISSION**

4th year – 1st semester in Paris-Ivry, Laval

Elective program: FSE4BS1 EMBEDDED SYSTEMS

3 ECTS, 18 hours on site lectures

Taught in French

OBJECTIVES:

Introduction to basic notions on serial communication and serial bus transmission.

PROGRAM:

Presentation

- Basics of serial communication
- General principles of fieldbus
- Study of different bus types

Practical applications

- Project with study and development of a serial bus transmission.

PREREQUISITES:

Programming in C language

PEDAGOGICAL METHODS:

Lectures and labs

EVALUATION METHOD:

Presentation and/ or written exam, report

MATERIAL:

BIBLIOGRAPHY:

PARET, Dominique. Réseaux multiplexés pour systèmes embarqués. DUNOD

SIG4141 RANDOM SIGNAL

4th year – 1st semester in Paris-Ivry, Laval

Elective program: FSE4BS1 EMBEDDED SYSTEMS

2.0 ECTS, 18 hours on site lectures

Taught in French

OBJECTIVES:

Most of the natural signals are more or less uncertain and contain disturbances or unpredictable noise, for example, the speech signals, radar/ sonar signals, signals transmitted by telephone lines, signals of brain activity, or electrocardiogram signals, geodetic signals or signals from the stock exchange or coming from information flows on Internet...

Most of the time, these signals are produced by processes which are complicated to describe or which are unknown or an issue of observations presenting to many uncertainties.

This module aims to present techniques and probabilistic modeling allowing to characterise and to treat these signals, called random, by data retrieval.

PROGRAM:**Treatment of random signals:**

- Probability, distribution function, probability density, mathematical expectation
- Random processes
- First and second-order moments (average, standard deviation, correlation). Stationarity and ergodicity of a random process
- Random processes filtering and spectral analysis
- Applications: appropriate filtering, DSP estimators, estimators of statistical average, linear prediction

Information theory

- Quantitative measure of information: entropy and mutual average information

PREREQUISITES:**Mathematics:**

Theory and calculation of probabilities, complex analysis

Theory of deterministic signal:

Temporal representation of continuous signals, frequency representation of continuous signals, spectral signal analysis

- Automatic:

Linear invariant time models, frequency and temporal analysis of LTI systems

PEDAGOGICAL METHODS:

Lab, course, Matlab TDAO

EVALUATION METHOD:

Written exam

MATERIAL:

Beamer, specific software, Power Point (photocopies of the slides) and Moodle

BIBLIOGRAPHY:

Théorie et traitement des signaux, De Frédéric de Coulon

Théorie des signaux et des systèmes tomes 1 et 2, Bernard Picinbono

Specific teaching in the elective program

Information Systems

4th year – 1st semester in Paris-Ivry, Laval
Elective program: FSI4BS1 Information Systems
7.0 ECTS, 54 hours on site lectures

INF4041 ADVANCED WEB PROGRAMMING

4th year – 1st semester in Paris-Ivry, Laval
Elective program: FSI4BS1 Information Systems
2.5 ECTS, 18 hours on site lectures
Taught in English

OBJECTIVES:

Conceive a Website based on modern technologies of Web development (CMS). Understand operational problems of Websites. Develop a Website test procedure .

PROGRAM:

Three tiers web architecture – description of the different layers of Website architecture (presentation/ application/ data). Description of the way a CMS defines these different layers.

Web infrastructure – description of the network supporting a Website in production.

Analysis of problems resulting of the insulation of components, to replicate data and user work load distribution.

Web testing – analysis of the problems resulting of the validation of user entries, important Website updates and search engine optimisation. Initiation to Web testing allowing to solve these problems and, especially initiation to web crawling, to regular expressions, to SEO and to automatic tests of Website components.

Lab – Set up of a Web architecture

Guided implementation of a Website with CMS chosen by the teacher. The final concept of the Website is chosen by the student. The lab intends to built the Website skeleton.

The Website resulting of the lab must include: a database, a user management, a form, a dynamic content, a personalised content (depending on the user). Starting from the skeleton done in the lab, the student has to conceive a Website according to the project he or she has chosen.

PREREQUISITES:

Basic Web-development (HTML, CSS, PHP, Javascript)

Basic network notions (lecture INF3037)

PEDAGOGICAL METHODS:

Presentations, lab

EVALUATION METHOD:

Lab evaluation, multiple choice

MATERIAL:

Power Point, photocopies

BIBLIOGRAPHY:**INF4042 MOBILE PROGRAMMING**

4th year – 1st semester in Paris-Ivry, Laval

Elective program: FSI4BS1 Information Systems

2.5 ECTS, 18 hours on site lectures

Taught in English

OBJECTIVES:

Learn the basics of mobile programming on Android.

Learn the basic tools in order to create a graphical interface on Android.

Understand the life cycles of Activities, the sand box concept, Fragments and Manifest operations.

Understand the meaning of service and implement a basic version.

PROGRAM:

The course focuses on the basics of mobile programming and its paradigms by creating a mobile application which is interfaced with a Web server (output of the INF4041 module).

The tutorials are done on Android.

The course navigates constantly between presentation of the theories involved and practical hands-on application by the students.

The project is based on the students' ideas after validation by the instructor. It must retrieve data of an API REST and display them on Android using the tools presented in the lab.

PREREQUISITES:

None

PEDAGOGICAL METHODS:

Lab

EVALUATION METHOD:

Project

MATERIAL:

Beamer, Computer, Power Point

BIBLIOGRAPHY:

INF4040 DATABASE MANAGEMENT

4th year – 1st semester in Paris-Ivry, Laval

Elective program: FSI4BS1 Information Systems

2.0 ECTS, 18 hours on site lectures

Taught in English

OBJECTIVES:

Understand the working of a database system and the operating issues, deploy the software and know how to implement DBMs in production.

Students learn:

- To install and configurate software for database servers
- To execute a stored procedure for maintenance.
- To understand the functioning of a database server and, an SQL query, input and output mechanisms and CACHES management.
- To know how to set an instance, reviews of SQL and PL/ SQL languages
- To understand the optimization of SQL queries, define indexes and control inputs and outputs
- to know how to adjust data models, optimize schemes with modelling and reverse engineering techniques.

PROGRAM:

Most common SQL-based architecture, query processing, cache management, transactions, concurrent accesses and persistence, isolation levels, increased levels, distributed bases, role of the DBA, user management and data storage management, internal data structure, partitioning, problems of data security, data storage and restoring, high availability, and Disaster Recovery Plans, performance problems as seen by the administrator, performance stability, plans, statistics, expectations, performance problems.

PREREQUISITES:

Minimum knowledge of operating systems, especially Linux/ Unix, notions of DBM and SQL.

PEDAGOGICAL METHODS:

Course, Lab

EVALUATION METHOD:

Written exam, homework

MATERIAL:

Beamer, specific software, Power Point, PDF on Moodle

BIBLIOGRAPHY: