Programs 3A-S1

CONTENTS

01/09/2017

MAT3055 - PROBABILITY THEORY

Cycle:	Foundation	**Location:**	Paris-Ivry/Laval
Unit:	MATHEMATICS AND COMPUTER SCIENCE	**Weighting:**	1.5
Semester:	1		
Language:			

Number of hours:	21 h	**Integrated module**	21 h
		Lectures:	0 h
		Tutorials:	0 h
		Practicals:	0 h
		Project:	0 h
		Workshop:	0 h

Module summary:

This module introduces the foundation probability concepts and tools that are essential in themselves and will be required to follow the 2nd semester Statistical Analysis module, which has many different applications in a range of very different fields, such as Epidemiology, Finance, Insurance, IT, etc.

The Probability and/or Statistics concepts studied in this module can also be used by students in their mid-course or final statistical data processing projects.

The tools taught in this module are also required to be able to successfully follow several of the 4A modules, namely: Stochastic processes, Random signals and Data Analysis and data science in 5A.

Learning objectives	**Students will be assessed on their ability to...**
Understanding probability theory and statistics	Classroom learning and practical exercises
Identifying the conditions of application and use of tools in concrete situations	Detail the type of exercises used to achieve the learning objectives
Applying statistical techniques in various engineering fields (safety, medical fields, decision-making tools, industrial processes, finance, etc.)	

Contents:

1. Probability spaces
   - Introduction and recalls
   - Random experiment
   - Events
   - Trial space

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- Language of events
- Concept of Probability
- Finite probability space
- Probability calculation on a finite probability space
- Equiprobability
- Probability spaces: general case
- Sigma-algebra (or sigma-field)
- Complete event system

2. Conditional probabilities
- Introduction
- Conditional probabilities
- Joint probability distribution
- Total probability distribution
- Bayes' theorem

3. Independence in probability theory
- Independence of two events
- Independence in a sequence of events

4. Overview of real-valued random variables
- Definitions
- Operations
- Cumulative distribution function
- Moment generating function

5. Discrete finite random variables and vectors
Discrete finite random variables
- Probability distribution for a finite discrete random variable
- Cumulative distribution function for a finite discrete random variable
- Function distribution for a finite discrete random variable
- Moments of a finite discrete real-valued random variable; mathematical expectation; variance and standard deviation

Linked continuous real random variables
- Probability distribution for linked continuous real-valued random variables
- Marginal distribution
- Independence of two real-valued discrete random variables with finite values
- Covariance and linear correlation coefficient
- Conditional distributions
- Conditional expectation and variance

6. Usual discrete distributions
Finite discrete distributions
- Bernoulli distribution
- Binomial distribution
- Hypergeometric distribution
- Uniform distribution on integers [1, n]

Infinite discrete distributions

- Geometric distribution
- Poisson distribution

7. Continuous finite random variables and vectors

Continuous real-valued random variables
- Density and cumulative distribution function
- Examples of real-valued random variable with density
- Mathematical expectation
- Variance and Standard deviation
- Density of the sum of two independent continuous real-valued random variables
- Moment generating function
- Characteristic function

Continuous real random vectors
- Linked continuous real random variables
- Probability distribution for linked continuous real random variables
- Marginal distributions
- Conditional distributions
- Independence of two real-valued discrete random variables
- Covariance and linear correlation coefficient
- Conditional expectation and variance
- Generalisation to a random vector with dimension n

8. Usual discrete distributions
- Normal distribution
- Chi squared distribution
- Fisher distribution
- Student's distribution

9 Convergences
- Bienaymé-Tchebychev inequality
- Weak law of large numbers
- Convergence in distributions and approximations
- Central limit theorem

- Approximation of binomial distribution by a Poisson distribution
- Approximation of a hypergeometric distribution by a binomial distribution
- Approximation of binomial distribution by a normal distribution

Pre-requisites:
Prior knowledge of the following is strongly recommended:
- Generalised integrals
- Multivariate functions

Learning methods:
Integrated module

Assessment:

Media:
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Bibliography:

INF3037 - IP NETWORKS

Cycle:	Foundation	**Location:**	Paris-Ivry/Laval
Unit:	MATHEMATICS AND COMPUTER SCIENCE	**Weighting:**	1
Language:	French		

Number of hours	18 h	**Lectures/Tutorials:**	0 h
		Lectures:	18 h
		Tutorials:	0 h
		Practicals:	0 h
		Project:	0 h
		Workshop:	0 h

Module summary:
The module will explain the operation of a wired LAN and the Ethernet and IP protocols.

Learning objectives	**Students will be assessed on their ability to...**
Listing the various network standardisation bodies and their remit.	List the layers for the OSI and TCP/IP models Name the bodies and their role and the sector concerned.
Classifying the networks. Assessing the quality and performance of a network technology according to its operating modes.	Submit a tender presenting the pluses and the minuses of the technologies proposed.
Describing and characterising the electrical systems used in LANs. Assessing the quality of an installation in the light of current standards.	Suggest specific technologies to meet a defined need.
Describing how the Ethernet and TCP-IP systems operate.	

Contents:
- OVERVIEW
- History From Shape to ENIAC, from central processing to cloud computing
- Standardisation: The OSI model, IEEE 802, IETF, UIT
- Classification: according to space, topology and use
- ACCESS TECHNOLOGIES
- Wired systems, access methods (competing access,

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switching, physical addressing)
- INTERNET
- history, operation, DNS, routers
- ETHERNET and TCP-IP
- simultaneously with LAB3418

Pre-requisites:	Operating systems (INF3039)
Learning methods:	Lectures and e-learning
Assessment:	Digital questionnaires (Moodle platform)
Media:	Presentations with commentaries, fact sheets, digital self-testing questionnaires, Video-projector
Bibliography:	Pujolle Guy - Les réseaux (édition 2014) - Eyrolles
Keywords:	OSI, IETF, IEEE, LAN, MAN, WAN, RFC models, Ethernet, switching, hubs, CSMA/CA, CSMA/CD, @MAC, RJ45, VLAN, ARP, TCP-IP, @IP, ICMP, static and broadcast routing, network mask.

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LAB3418 - IP NETWORKS LAB

Cycle:	Foundation	**Location:**	Paris-Ivry/Laval
Unit:	MATHEMATICS AND COMPUTER SCIENCE	**Weighting:**	1
Language:	French		

Number of hours	18 h	**Lectures/Tutorials:**	0 h
		Lectures:	0 h
		Tutorials:	0 h
		Practicals:	18 h
		Project:	0 h
		Workshop:	0 h

Module summary:
Applying the knowledge acquired in module INF3037

Learning objectives	**Students will be assessed on their ability to...**
Creating a wired personal local network	Report to be handed in at the end of each session
Defining and administering an IP addressing plan	Report to be handed in at the end of each session
Administering active network components	Report to be handed in at the end of each session
Administering network services	

Contents:	LAB1: Reminder of Linux system commands
	LAB2: Learning to use the equipment (physical or simulated)
	LAB3: Micro LAN
	LAB4: Mini LAN
	LAB5: Static routing
	LAB6: VLAN and inter-VLAN routing
	LAB7: Name resolution
Pre-requisites:	Operating systems (INF3039)
	IP networks (INF3037)
Learning methods:	Lectures, tutorials, e-learning
Assessment:	Digital questionnaires and assessed practicals

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Media:	- Presentations with commentaries - Tutorial hand-outs - Tutorial exercise solutions - Technical fact sheets - Digital self-testing questionnaires Desktop or laptop computers Active Network Components
Bibliography:	Pujol Guy - Les réseaux (édition 2014) - Eyrolles
Keywords:	Ethernet, switches, hubs, @MAC, RJ45, VLAN, ARP, TCP-IP, @IP, ICMP, static routing, broadcast, network mask, CIDR, router, ifconfig, arp, ping, arping, route, iptables, dhclient, host

INF3034 - OBJECT-ORIENTED PROGRAMMING

Cycle:	Foundation	**Location:**	Paris-Ivry/Laval
Unit:	MATHEMATICS AND COMPUTER SCIENCE	**Weighting:**	1.5
Language:	French		

Number of hours	24 h	**Lectures/Tutorials:**	0 h
		Lectures:	9 h
		Tutorials:	0 h
		Practicals:	15 h
		Project:	0 h
		Workshop:	0 h

Module summary:
Designing and implementing computer programmes by applying basic object-oriented concepts (breaking down a problem into concepts or objects and implementing the functionalities required by interaction between the objects)

Learning objectives	**Students will be assessed on their ability to...**
Identifying the components of a basic object (its specific attributes and its capacity to interact with other objects) and of a complex object (comprising several other objects) Breaking down the process leading to a given functionality resulting from interaction between the objects	Answer questions on the subject (pen and paper)
Being familiar with the fundamental object language concepts (classes, encapsulations, inheritance, polymorphism), references vs. pointers, memory management, error management, genericity.	Answer questions on the subject (pen and paper) Code the concepts in Java language
Interpreting an object-oriented model of an application	Produce a programme on the basis of a UML-type diagram model
Using the main libraries (I/O, collections, etc.)	Use them effectively to create applications
Creating an elementary HMI Distinguishing between a Java compiler and a virtual Java machine	Create an object-oriented application with a graphic interface

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Distinguishing between iterative programming and an object-oriented approach

Structure code according to current object coding standards

Contents:	• Principles of the object-oriented approach and its impact on the definition of a language • Introduction to Java programming language (virtual machine, GC, …) • Classes, Objects, references vs pointers, constructors, static members • Extensibility (inheritance), protected mode, abstract classes, interfaces • Error management (Exceptions) • I/O management, Serialisation and object graphs • Generics, Collections • IHM with SWING
Pre-requisites:	C-language programming
Learning methods:	• Lecture introducing the concepts and their uses • Direct application of the concepts through tutorials
Assessment:	Written exam
Media:	Slides, practical exercises, official documentation
Bibliography:	Official Java Documentation (https://www.oracle.com/java/index.html)
Keywords:	Object-oriented programming, object method, Java language, algorithmics, HMI

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LAB3034 - OOP PROJECT

Cycle:	Foundation	**Location:**	Paris-Ivry/Laval
Unit:	MATHEMATICS AND COMPUTER SCIENCE	**Weighting:**	1
Language:	French		

Number of hours	15 h	**Lectures/Tutorials:**	0 h
		Lectures:	1.5 h
		Tutorials:	4.5 h
		Practicals:	0 h
		Project:	9 h
		Workshop:	0 h

Module summary:
Designing and implementing a Java project that updates the points studied in the tutorials (Java basics, String, Collections, Persistence, GUI).
The project must be planned in advance and finalised as if for a potential client (unlike the tutorials, that are based on specific instructions).

Learning objectives

Designing and implementing computer programmes by applying basic object-oriented concepts (breaking down a problem into concepts or objects and implementing the functionalities required by interaction between the objects)

Designing a project from end-to-end (conception, structure, code and debugging)

Students will be assessed on their ability to...

Design and implement a Java project that updates the points studied in the lectures (Java basics, String, Collections, Persistence, GUI).

The project must be planned in advance and finalised as if for a potential client (unlike the tutorials, that are based on specific instructions).

Contents:

Pre-requisites:	Basic notions of object-oriented programming
Learning methods:	Java programming language: Overview, Types, Algorithmics basics, Classes, Interfaces; Instances, Exceptions, Libraries, HMIs

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Assessment: Written exam

Media:

Bibliography:

Keywords:

INF3039 - OPERATING SYSTEMS

Cycle:	Foundation	**Location:**	Paris-Ivry/Laval
Unit:	MATHEMATICS AND COMPUTER SCIENCE	**Weighting:**	2
Language:	French		

Number of hours	30 h	**Lectures/Tutorials:**	0 h
		Lectures:	15 h
		Tutorials:	0 h
		Practicals:	15 h
		Project:	0 h
		Workshop:	0 h

Module summary:
Introduction to and use of the basic features of an operating system.

Learning objectives	**Students will be assessed on their ability to...**
- Installing, configuring and exploiting a Linux operating system on a multi-system (multi-boot) or virtual (Virtualbox) architecture - Using the basic system functionalities	- Direct in-class assessment (quizoodle) - Assessment questionnaire at the end of the module (on Moodle platform or paper) - Assessed practicals

Contents:	Introduction to and use of the basic features of an operating system.
Pre-requisites:	Knowledge of PC architecture
Learning methods:	- Introduction to the Unix/Linux systems (role of an OS, history, licensing) - Starting sequence - Multi-system or virtual platforms - Hands-on use (graphic environment, Shell presentation) - Basic commands - Software management (packet installation, dependence management, source compilation) - File systems (partitions, tree diagram) - User management (user characteristics, group management) - Process management (activity monitoring, launch, end of process)

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- Introduction to Shell scripts (variables, tests and loops)

Assessment: Digital questionnaires
Assessed tutorials

Media: Presentations with commentaries, tutorial hand-outs, tutorial exercise solutions, technical fact sheets, self-testing online questionnaires, desktop or laptop computers
Linux and virtualisation software (Virtualbox)

Bibliography: http://professeurs.esiea.fr/abdat/inf3032

Keywords: Virtualisation (VM and hypervisors), Linux, BIOS, partitions, bootloader, file system, process, shell, shell scripts

LAB3040 - C-LANGUAGE PROJECT

Cycle:	Foundation	**Location:**	Paris-Ivry/Laval
Unit:	MATHEMATICS AND COMPUTER SCIENCE	**Weighting:**	1
Language:	French		

Number of hours	24 h	**Lectures/Tutorials:**	0 h
		Lectures:	1.5 h
		Tutorials:	7.5 h
		Practicals:	0 h
		Project:	15 h
		Workshop:	0 h

Module summary:
The module will give students the opportunity to continue to programme in C language, a skill required in the 4A modules. (the language is not used in 3A).
This is also a specialisation module. The aim is also to make the students more independent (there is no formal lecture, although there may be a few introductory sessions and learning support sessions).
The module will give students the opportunity to continue to programme in C language, a skill required in the 4A modules. (the language is not used in 3A).
This is also a specialisation module. The aim is also to make the students more independent (there is no formal lecture, although there may be a few introductory sessions and learning support sessions).

Learning objectives	**Students will be assessed on their ability to...**
Constructing a model for and solve a problem	Study a problem proposed by the teacher and construct an equation (model it) to generate the appropriate algorithm. (pen and paper)
	Find the relevant information to solve the problem. Sort the data and identify the most relevant data. (bibliography/webography)
Programming in C language	Carry out a project, using the notions studied in the module (pointers, recursiveness, structures, files trees, graphs, etc.) (on computer)
	Use the debugger to follow the execution of a programme and detect bugs & memory leaks. (on computer)

Contents:	Software project using C language
Pre-requisites:	INF2031, LAB2412, INF2032,LAB2414 for students having followed Year 2
	INF3036 for "new" students entering in semester 3A

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Learning methods: - Autonomous work in pairs.
- There will only be one introductory lecture and a support session mid-project is required.
- The tutor will be available whenever possible to answer questions (by email or face to face).

Assessment: Functional assessment (does the programme do what it is supposed to do) and oral presentation if requested by the teacher.

Media: Desktops in the computer labs.
Subject sent to the students.
Computer lab machines plus the students' own laptops (the project comes under autonomous learning).
Available slots in the computer rooms must be earmarked for this project.

Bibliography:

Keywords: C language, autonomous learning, functional quality of the code (memory management, optimisation)

INF3031 - DATA BASES

Cycle:	Foundation	**Location:**	Paris-Ivry/Laval
Unit:	MATHEMATICS AND COMPUTER SCIENCE	**Weighting:**	1.5
Language:	French		

Number of hours	24 h	**Lectures/Tutorials:**	0 h
		Lectures:	9 h
		Tutorials:	6h
		Practicals:	9 h
		Project:	0 h
		Workshop:	0 h

Module summary:
Presentation of different DBMS, relational concepts, modelling, advanced SQL data base query language features, including stored procedures with several variants in common use in business contexts (Oracle, MySQL, SQL Server, etc.).

Learning objectives	**Students will be assessed on their ability to...**
Understanding SQL language and designing relational data base logic diagrams. - Designing conceptual and relational data base models. - Developing procedures stored in procedural language. - Understanding the techniques used in the end-to-end development of an application, using a data base.	- Assessment by tutorial reports - Knowledge assessment questionnaire (multiple choice exam on the creation of data structure models)

Contents:	- Introduction to data bases and modelling - Introduction to SQL - creating tables, constraints - Finding data in a table - selection, projection, aggregating - Finding data in several different tables - internal and external joints, set operators - Ordering and presenting data - sorting, windowing, examples of implementation - Fuzzy searches - finding the "best equivalence" and searching on keywords (tags) - Changing data - transactions, insertions, deletions,

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updates, changing data from a file, updating data in one table using data from another
- Functions, Procedures and Triggers
- Optimising indexing operations
- Views, safety and access rights

Pre-requisites: Programming basics

Learning methods: Lectures, Tutorials, Practicals

Assessment: Assessment in the tutorials + final exam
                             Practicals mark (mini project)

Media: Powerpoint + PDF versions, Projector

Bibliography: (optional book in English)
                             Faroult, Stéphane. SQL Success Database Programming
                             Proficiency. Londres: RoughSea, 2013.

Keywords: DBMS, SQL

INF3042 – WEB PROGRAMMING

Cycle: Level:	Foundation	**Location:**	Paris-Ivry/Laval
Unit: MATHEMATICS AND COMPUTER SCIENCE	MATHEMATICS AND COMPUTER SCIENCE	**Weighting:**	1.5
Language:	French	**Semester:**	1
Number of hours	18 h	**Lectures/Tutorials:**	approx. 6-8 h
		Lectures:	0 h
		Tutorials:	0 h
		Practicals:	approx. 10-12 h
		Project:	0 h
		Workshop:	0 h

Module summary: Creating a simple web site without a framework, using web programming languages like HTML, CSS, Javascript and PHP.

Learning objectives	**Students will be assessed on their ability to...**
Mastering the basics of HTML, CSS, Javascript and PHP.	Assessed practical
Differentiating client and server!	Assessed practical

Contents:

The HTTP protocol

Presentation of HTLM with practical exercises (~30min – 1h) – formatting a page using HTML tags.

Presentation of the CSS with practical exercises (~30min – 1h) – use of flexbox on a simple HTML page to place the components exactly in the desired position and to make the page *responsive* (the components adapt automatically to the resolution).

Presentation of JavaScript with practical exercises (~30min – 1h) – Simple animation by dynamic CSS modification.

The Client / Server concept.

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Presentation of PHP with practical exercises (~30min – 1h) – Questionnaire with server reaction according to reply. Implementation of a PHP user session (with a simple hash table in a global variable, not a DB).

Practical: creating a web site
Content chosen by the student with constraints:
* No framework or library other than those provided by HTML, PHP, JavaScript and PHP.
* Must contain a menu banner.
* Must contain a client side dynamic part (in JavaScript).
* Must be *responsive.*
* Must include a user management feature (with or without DB, can be a hard-coded user list or simply stored in a file).
* Must contain a server side dynamic part (reacting differently to users or just visitors).

Pre-requisites:
- Knowledge of the key TCP/IP and DNS network mechanisms.
- Have a good knowledge of at least one programming language.

Learning methods:
Alternating face to face lectures and practical exercises and Tutorials.

Assessment:
Tutorials

Media:
Slides, *boilerplate* for exercises (so as not to start from scratch)

Bibliography:
https://www.w3schools.com/**Erreur ! Référence de lien hypertexte non valide.** (additional support for programming language concepts)

Keywords:
HTML, CSS, JavaScript, PHP, Client, Server.

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PLU3195 - SCIENTIFIC AND TECHNICAL PROJECT: DEFINING THE PROJECT

Cycle:	Foundation	**Location:**	Paris-Ivry/Laval
Unit:	PHYSICS, ELECTRONICS AND SYSTEMS	**Weighting:**	1.5
Language:	French		

Number of hours	30 h	**Lectures/Tutorials:**	0 h
		Lectures:	0 h
		Tutorials:	15 h
		Practicals:	0 h
		Project:	30 h
		Workshop:	0 h

Module summary:
Designing a complex system (with interacting sub-systems): Defining, Modelling, Simulating/Testing, Validating the model on a prototype, Explaining the model, Comparing with the end-product, Proposing improvements, Implementing the system, Improvements Promoting the project

Learning objectives	Students will be assessed on their ability to...
Defining a problem and the limits of a subject	Framework document presenting the subject of the project
Identifying the problems to be solved	Submission of a project framework presenting a relevant and coherent breakdown of the different stages in the implementation of the project.
Controlling group dynamics, Organising the work, Working in teams	Organisation of regular follow-up meetings for the team to present a progress report, the breakdown of tasks between the memb next stages.

Contents:	The Engineering Sciences project is designed to confront the student with project planning in engineering projects, to develop team work, communication techniques and collaborative work. The students make up teams of 4 to 5 and choose the field that they want to work on. The project takes place over the two semesters.

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The aim is to create an application or an experimentation that meets the medium-term needs of a business, an NGO or an educational organisation. It is based on a scientific and technical study of the project, using practical company experience on similar projects.

This first part focuses on project definition: identifying the needs and functional specifications.

Pre-requisites:

Learning methods:
- Project-based learning: contact with the supervisor and autonomous work.
- Team work and use of a collaborative work space.
- Project management.

Assessment: Report with oral presentation

Media:

Bibliography:

Keywords: Projects, group work, collaborative work, project-based learning, anti-plagiarism checks, innovation, intellectual honesty, project leadership, critical mind, project monitoring, planning, needs identification, functional specifications.

SYS3041 - MICROPROCESSOR-BASED SYSTEM ARCHITECTURE

Cycle:	Foundation	**Location:**	Paris-Ivry/Laval
Unit:	PHYSICS, ELECTRONICS AND SYSTEMS	**Weighting:**	2.5
Language:	French		

Number of hours	27 h	**Lectures/Tutorials:**	0 h
		Lectures:	13.5 h
		Tutorials:	0 h
		Practicals:	13.5 h
		Project:	0 h
		Workshop:	0 h

Module summary:
- Knowing how to analyse a microprocessor system architecture, design a basic system comprising the key elements (processor, RAM and EEPROM, input/output interfaces) required to develop an application.
- Understanding the basics of assembly language programming.

Learning objectives
Explaining the architecture, designing the interfaces and the applications for a basic microprocessor-based system.

Students will be assessed on their ability to...
Analyse and identify a microprocessor-based system architecture.
Use the manufacturers' technical documentation.
Develop an input/output management application in assembler or C language.
Link the peripherals to the microprocessor buses.
Use the peripherals (timer, UART, etc.) and develop the management programmes.

Contents:
Microprocessor-based system architecture
- Introduction: central memory, command unit and processing unit.
- Support materials and information transfer: buses, multi-circuit connections on one bus, three state logic and its uses.
- Central memory transfers: topographical and temporal aspects.
- Design of a minimal system.
- Applications: creating memory levels.

Microprocessor internal structure and operation:
- Processing unit: composition and role.

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- Command unit: structure, operation sequencing and instructions sets.
- Addressing unit: composition and role.
- Execution of a simple programme (example: X86 Intel family).
- Addressing modes: immediate, inherent, direct, extended, relative, indexed, etc.
- Applications: handling memory-stored data, configuration and use of the parallel interface.

Micro-controllers: (Motorola and Microchip families)
- Introduction: specific features, application fields.
- Internal structure: integrated memories, I/O ports, series communication circuits, internal registers and accumulators, analogue/digital converter.
- Addressing modes and instruction sets.
- Applications: reading data produced by a matrix keyboard.

Digital signal processor (DSP):
- The origins of DSPs: why were they invented? Performance comparison between traditional operational amplifier circuits and DSP circuits: main benefits. Fields of application.
- Central architecture: arithmetic and logic unit, address generation unit, programme control unit, access and parallel transfer. HARVARD type architecture.
- Addressing modes and instruction sets: linear and modulo addressing, instruction summary, instruction line structure.
- Programme organisation: definition of data work zones and instruction zones, recurring equation programming in signal processing (examples).
- Applications: example illustrating the importance of parallel data transfer between memories and internal registers and the benefits of traditional processors.

Pre-requisites:	SYS2041
Learning methods:	18 lectures, Tutorials: 9h
Assessment:	Written exam
Media:	
Bibliography:	www.freescale.com www.ti.com www.microchip.com
Keywords:	Architecture, arithmetic and logic unit, control unit, addressing unit, buses (addressing, data, control), chronogram, three state logic, synchronous and asynchronous protocols, interruption, memory and input/output mapping, address de-coding, parallel and serial interfaces, addressing modes, instruction set,

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assembler, DSP, parallel transfers and pipeline architecture, modulo addressing, mac operation.

SIG3141 - DETERMINISTIC SIGNALS AND FOURIER ANALYSIS

Cycle:	Foundation	**Location:**	Paris-Ivry/Laval
Unit:	PHYSICS, ELECTRONICS AND SYSTEMS	**Weighting:**	3
Language:	French		

Number of hours	45 h	**Lectures/Tutorials:**	0 h
		Lectures:	15 h
		Tutorials:	15 h
		Practicals:	15 h
		Project:	0 h
		Workshop:	0 h

Module summary:
Introduction to signal processing, focusing on deterministic signal analysis tools: Fourier analysis, sampling, filtering, etc.
The main aim is to provide students with a good mastery of the mathematical tools and the implementation of filtering functions.

Learning objectives	**Students will be assessed on their ability to...**
Using a Fourier series to compute the development of a periodic finite energy signal over a period.	For a periodic finite energy signal over the period: - Compute the Fourier coefficients - Compute its mean power - Use a Matlab graph to represent its development to the nth order (for different values of n)
Being able to compute the Fourier transform of a stable signal (L1) or of a finite energy signal (L2).	For a given signal, check which functional space it belongs to (L1, L2, etc.) and compute its Fourier transform (in L1, L2 or along the distributions).
Being able to compute the correlation function for a finite energy signal or a finite mean power.	Determine the time lag for a transmission channel.
Understanding the conditions in which the sampling theorem can be applied.	The conditions required for a voice signal to be transmitted digitally at the speed of 64kbps.
Synthesising the ideal low pass digital filter.	De-encryption of the Canal+ audio channel.

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Contents:

1. SIGNAL REPRESENTATION
1.1 Introduction
1.2 Continuous-time and discrete-time signals
1.3 Elementary signals
1.4 Signal energy and power
1.5 Fourier analysis: Fourier series and transforms
Computer-assisted activities: Introduction to MATLAB

2. CORRELATED SIGNAL ANALYSIS
2.1 Finite energy signals
2.2 Finite average power signals

Computer-assisted activities: Fourier series

3. LINEAR FILTERING
3.1 Impulse response and frequency response
3.2 Finite energy signal filtering
3.2 Elementary filters
3.3 Amplitude modulation

Computer-assisted activities: Correlation functions

4. SAMPLING
4.1 Introduction
4.2 Band-limited signals
4.3 The sampling theorem
4.4. Ideal sampling
4.5 Spectrum folding or aliasing
4.6 Anti-folding filter

Computer-assisted activities: Sampling

5. DISCRETE FOURIER TRANSFORMS AND FAST
FOURIER TRANSFORMS
5.1 Discrete Fourier transforms
5.2 Fast Fourier transforms

6. Z TRANFORMS
6.1 Definition and overview
6.2 Inverse Z transform
6.2.1 Inverse rational fraction
6.2.2 Inversion by application of the residue theorem
6.3 Z transform properties
6.4 Signal stability

7. DIGITAL FILTERING
7.1 Introduction
7.2 Classification of filters
7.3 Finite impulse response filters
7.3.1 Linear phase filters
7.3.2 FIR filter synthesis using the window method

Computer-assisted activities: Designing digital filters

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Pre-requisites: Series

Learning methods: 18 Signals lectures, Tutorials 12h, and Computer-assisted tutorials 6h
Learning methods based on:
- lectures to present the main concepts and illustrate them through examples.
- tutorial sessions designed to implement the theoretical tools on computer, making intensive use of MATLAB language.

Assessment:

Media:

Bibliography: [1] Débuter en traitement numérique du signal.
Author: Jean-Noël Martin.
Publisher: Ellipses Marketing, September 2005 edition.
ISBN-13 code: 978-2729824877

[2] Analyse et traitement des signaux.
Authors: Etienne Tisserand , Jean-François Pautex, Patrick Schweitzer.
Publisher: Dunod, 2nd edition January 2009.
ISBN-13 code: 978-2100524372

[3] Le traitement du signal radar.
Author: Renaud Cariou.
Published by Dunod, May 2012 edition.
ISBN-13 code: 978-2100577972

Keywords: Fourier, Fourier series, frequency, convolution, Fourier transform, Hilbert, orthogonal projection, Hilbert base, distribution, continuous time signal, discrete time signal, spectrum, sampling, quantification, discrete Fourier transform, Z transform, filtering.

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LAB3411 - MICROCONTROLLER PROCESS MANAGEMENT

Cycle:	Foundation	**Location:**	Paris-Ivry/Laval
Unit:	PHYSICS, ELECTRONICS AND SYSTEMS	**Weighting:**	2
Language:	French		

Number of hours	21 h	**Lectures/Tutorials:**	0 h
		Lectures:	0 h
		Tutorials:	0 h
		Practicals:	21 h
		Project:	0 h
		Workshop:	0 h

Module summary:
Analysing and designing a complete system with an architecture based on a microcontroller
- Using the system to develop an application designed to command an external process.

Learning objectives
Developing an architecture application based on a microcontroller and peripherals (sensors and actuators).

Students will be assessed on their ability to...
Connect the peripherals and components to the microprocessor taking into account the technical specifications in the documentation.
Design and develop the hardware and software part of a microcontroller-based system.

Contents:
- Learning to use the development tools
- Analysing the development map, the sensors, actuators and interfaces
- Designing and implementing the electronic circuit
- Programming and tests
- Applications: controlling a stepper motor, a liquid crystal screen, managing a matrix keyboard and creating a calculator, etc.

Pre-requisites: SYS3041

Learning methods: Practicals, Projects

Assessment: Oral presentation and/or written exam, report

Media:

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Bibliography: www.freescale.com www.microchip.com

Keywords: Microcontroller, programming

LAB3412 - DIGITAL SIGNAL PROCESSING

Cycle:	Foundation	**Location:**	Paris-Ivry/Laval
Unit:	PHYSICS, ELECTRONICS AND SYSTEMS	**Weighting:**	2
Language:	French		

Number of hours	21 h	**Lectures/Tutorials:**	0 h
		Lectures:	0 h
		Tutorials:	0 h
		Practicals:	21 h
		Project:	0 h
		Workshop:	0 h

Module summary:
- Knowing how to implement different signal processing algorithms on a digital signal processor adapted to the specific architecture of that particular processor.
- Processing an audio signal.

Learning objectives
Developing digital processing on discrete signals, by programming real-time processing algorithms in C-language on a DSP platform.

Students will be assessed on their ability to...
Design and develop FIR and IIR-type filters.
Develop audio signal processing in C-language on a DSP platform, using MATLAB.

Contents:
The DSP card: memory location, port identification, study of A/N and N/A interface
Software component: initialisation of the DSP and circuit Converter
Applications: signal derivative and integral, digital oscillator, digital filters, audio processing (echo, reverberation, compression, etc.)

Pre-requisites: SYS3041

Learning methods: Practicals, Projects

Assessment: Oral presentation and/or written exam, report

Media:

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Bibliography:

Keywords: DSP, digital filter, digital processing

HUM3091 - PERSONAL DEVELOPMENT PROJECT - LAUNCH

Cycle:	Foundation	**Location:**	Paris-Ivry/Laval
Unit:	PERSONAL DEVELOPMENT PROJECTS FOR ENGINEERS	**Weighting:**	2
Language:	French		

Number of hours	12 h	**Lectures/Tutorials:**	0 h
		Lectures:	0 h
		Tutorials:	0 h
		Practicals:	0 h
		Project:	12 h
		Workshop:	0 h

Module summary:
ESIEA's personal development projects are community-oriented and responsible, practical and realistic, rational and humanistic. They allow students to carry out a project over a whole academic year in a field of their choice (artistic creation, environmental protection, social and solidarity economy, not-for-profit associations, etc.). The project should address new issues and test the student's capacity to deal with complex challenges and develop transversal skills. The personal development projects allow students to develop both on a personal and a professional level.

Learning objectives	Students will be assessed on their ability to...

Contents:	- Workshops: project management methods, advanced analysis (the three project phases: launch, implementation, outreach), drafting a pre-project report (the problems to be addressed, objectives, action plan and funding), how to present a project orally, communication strategies. Specific workshops: strategic plan, enhancing project visibility within and outside one's own circle, at the international level, looking for new

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partners (financial or donors in kind).
- Lectures: on a given theme each year (2014-2015: metamorphosis) and on current societal topics: women and science, solidarity initiatives, the digital ontophanic system, etc.
- The project is supervised by professors, ESIEA alumni, professionals from industry and not-for-profit organisations.
- Mentoring meetings (once or twice a semester): taking stock, project advancement, evaluation of the digital portfolio, recommendations...
The personal development projects focus mainly on project management in year 3, but not exclusively.

Pre-requisites: Introduction to project management, methodology benchmarks seen in 2nd year.

Learning methods:
- Drafting an initial project
- Presenting one's initial project in public (no simulation)
- Meetings

Assessment:
- Assessment of the written draft project
- Assessment of the public presentation
- Monitoring assessment as the case may be (Actions undertaken and planned / progress objectives defined by the student at the beginning of the year)

Media:

Bibliography: Stéphane Vial, L'être et l'écran : comment le numérique change la perception, Paris, Presses universitaires de France, coll. « Hors collection », 2013

Keywords: Project, autonomy, responsibility, decision-taking, team, budget, planning, time management

ENT3112 - MACRO-ECONOMICS AND INDUSTRIAL ECONOMICS

Cycle:	Foundation	**Location:**	Paris-Ivry/Laval
Unit:	PERSONAL DEVELOPMENT PROJECTS FOR ENGINEERS	**Weighting:**	2
Language:	French		

Number of hours	21 h	**Lectures/Tutorials:**	0 h
		Lectures:	12 h
		Tutorials:	9 h
		Practicals:	0 h
		Project:	0 h
		Workshop:	0 h

Module summary:
This module aims to:
- enable students to understand and analyse their economic environment at the international, national and business level.
- provide students with a real knowledge business and industry (including the Electronics, Information Technology, and Telecom sectors) to help them access the job market, and provide company and sector analysis tools.

Learning objectives	**Students will be assessed on their ability to...**
- Understanding and analysing the international and national economic environments on the basis of general macroeconomic knowledge.	- Answer questions on key concepts in a final exam and provide examples showing that the concepts have been fully understood.
- Understanding and analysing a business, to facilitate employment and professional development.	- Assessment by final exam. - Case study as part of a micro-project: students work in teams, analysing the business of their choice in view of their future career choices, using the instruments seen in class. The report produced at the end of the project will be assessed and may be presented orally in one of the tutorials.
- Understanding and analysing a business sector, to facilitate employment and professional development.	- Assessment by final exam. - Sector analysis: using their micro-project as a basis, students analyse the industry sector to which their chosen business belongs, as a team, using the instruments provided in class. These sector and business analyses can feed into the

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ESIEA's data base, used to help students find internships and job opportunities.

- Understanding the innovation economy in a business context.

Contents:

This module aims to:
- enable students to understand and analyse their economic environment at the international, national and business level.
- provide students with a real knowledge business and industry (including the Electronics, Information Technology, and Telecom sectors) to help them access the job market, and provide company and sector analysis tools.

Pre-requisites:

None

Learning methods:

1-INTRODUCTION TO ECONOMICS
Capitalism. Market operation.
Economic policies.
Current issues: unemployment, GDP, government debt and budget deficits, growth, financial crisis, globalisation, competitiveness, social benefits and the Welfare state, etc.

2-CORPORATE ECONOMICS
Business: types, organisations, main functions.
Market structure: supply, demand, concentration, barriers.
Perfect competition, monopolies, oligopolies, international competition.
Strategies: generic, technological, specialisation, etc.

3-INDUSTRIAL ECONOMICS
The production system: industrial production, sector, industry, branch.
Sector analysis instruments.
French and world industries. Industrial and territorial ecology.

4-INNOVATION ECONOMICS
Traditional approach. The innovative enterprise. Process, cycles.
Technological innovation: products/processes/organisational, disruptive/incremental/routine.
Innovation strategies. Developing new products.

Assessment:

Knowledge assessment: final exams, netquiz, multiple-choice exams, presentations.
Skills assessment: case study reports, micro-project reports, presentations.

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Media: Power-Point, Overhead projector

Bibliography: BEITONE, Alain. ECONOMIE (ECONOMICS) SIREY
Editions Dalloz.
ANGELIER, Jean-Pierre. ECONOMIE
INDUSTRIELLE.(INDUSTRIAL ECONOMICS) Presses
Universitaires de Grenoble.
Not limited to the above titles.

Keywords: - economics, macroeconomics, microeconomics;
business, industry,
- innovation, employability, sector analysis,
- case studies, market, strategy, competition.

LAN3081AN - ENGLISH

Cycle:	Foundation	**Location:**	Paris-Ivry/Laval
Unit:	PERSONAL DEVELOPMENT PROJECTS FOR ENGINEERS	**Weighting:**	2
Language:	English		

Number of hours	21 h	**Lectures/Tutorials:**	0 h
		Lectures:	0 h
		Tutorials:	21 h
		Practicals:	0 h
		Project:	0 h
		Workshop:	0 h

Module summary

In this module, students will analyze information about ESIEA's mission abroad program to better develop their own goals for international work and study. Notions of cultural identity, fighting stereotypes and accepting difference will be introduced. Students will begin acquiring skills for effective presentations.

Learning objectives	**Students will be assessed on their ability to...**
Understanding and using the language of trends and change	Understand and use the language of trends and change; incorporate this language in oral presentations
Speaking clear, understandable and structured English on a clearly defined topic using appropriate vocabulary and signposting	Presentations, telephoning to meet an objective
Writing a simple email giving and requesting information for the purpose of doing a mission abroad	Lessons on emailing, followed by in-class and at home writing activities
Naming the major international academic programs offered by ESIEA and explain application procedures: Erasmus, BCI, dual degrees	

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Assuming a self-reflexive attitude toward notions of identity, cultural context

Assume a self-reflexive attitude toward notions of identity, cultural context

Contents:

In this module, students will analyse information about ESIEA's mission abroad program to better develop their own goals for international work and study. Notions of cultural identity, fighting stereotypes and accepting difference will be introduced. Students will begin acquiring skills for effective presentations.

Pre-requisites:

English level B1 according to the Common European Framework of Reference for Languages (CEFR).

Learning methods:

This module will include work on preparing the mission abroad in the following notional areas:
-Introducing the notion of cultural identity
-Raising awareness of how France and the French are viewed by others
-Completing intercultural questionnaires and comparing data coming from different countries
-Gaining knowledge about the opportunities ESIEA offers and discussing the pros and cons of the various opportunities in English;
Students will learn to
-Email and telephone effectively in English to prepare a stay abroad
Students will begin acquiring skills for effective presentations.
-Body language
-Signposting language
-Use of visuals, etc.

Assessment:

Continuous assessment based on work done both in class and at home, final evaluation based on Business Plan and presentation.

Media:

Photocopies, CDs and DVDs, documents (text, audio, audiovisual) taken from the Internet, Equipment used Language laboratory, computer laboratory, CD and DVD players, laptops, video projectors, televisions, document projectors

Bibliography:

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

Keywords:

English, business, work, finance, human resources, marketing

LANXX83XX - SECOND FOREIGN LANGUAGE, FFL, ADVANCED ENGLISH

Cycle:	Transition	**Location:**	Paris-Ivry/Laval
Unit:	PERSONAL DEVELOPMENT	**Weighting:**	0
Language:	German - Chinese - Spanish - Japanese - Italian		

Number of hours	15 h	**Lectures/Tutorials:**	0 h
		Lectures:	0 h
		Tutorials:	15 h
		Practicals:	0 h
		Project:	0 h
		Workshop:	0 h

Module summary:
- Learning to communicate and interrelate with people in their own language
- Prepare for language certification tests (TOEIC, Goethe Zertifikat, Cervantes, etc.)
- Be able to use the grammatical structures of the chosen language so as to communicate simply and clearly

Learning objectives

Understanding texts in the target language, with the help of a dictionary.

Writing clear and comprehensible texts (e-mails, CVs, cover letters) in the target language with the help of a dictionary.
Following a conversation or a brief audio-visual recording in the target language.

Making himself/herself clearly understood in the target language.

Students will be assessed on their ability to...

Read authentic texts in the target language, in class and at home. Texts may also be published on the Moodle platform or sent via an on-line learning platform. The teacher may use some of these texts to make a graded assessment of students' reading skills.

Write texts in the target language, in class and at home. The teacher may make a graded assessment of some of these written assignments.

Listen to authentic recordings in the target language, in class and at home. Texts may also be published on the Moodle platform or sent via an on-line learning platform. The teacher may use some of these audio or audio-visual recordings to make a graded assessment of students' listening comprehension skills.

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Contents: Determined by the teacher. May include:
- Texts dealing with current affairs
- Audio-visual recordings
- Oral communication on personal or professional matters
- Written communication on personal or professional matters
- Grammar exercises
- Vocabulary extension exercises
- Oral presentations
- Interactive communication / debates

Pre-requisites: Students must already have a level of competence allowing them to follow the course.

Learning methods: General methodology adapted to all learning styles: written and oral comprehension work, practical exercises in class and at home to acquire the automatic reflexes needed to communicate fluently in writing and orally in the language, "real-life" situations, presentations in class.

Assessment: Continuous assessment based on the work done in class and at home, set assignments in class, presentations and oral exams, recording of individual speech, use of e-learning resources, as the case may be.

Media: Handouts, PPT presentations, Language laboratories, CDs and DVDs, on-line audio and audio-visual documents, authentic news media sources, "realia" (various target culture documents: tickets, programs, adverts, etc.)

Bibliography: Determined by the teacher.

Keywords: German, English, Chinese, Spanish, Italian, Japanese, Communication, CV, intercultural

MAN3305 - APIC

Cycle:	Foundation	**Location:**	Paris-Ivry/Laval
Unit:	PERSONAL DEVELOPMENT PROJECTS FOR ENGINEERS	**Weighting:**	1
Language:	French		

Number of hours	4.5 h	**Lectures/Tutorials:**	0 h
		Lectures:	0 h
		Tutorials:	0 h
		Practicals:	0 h
		Project:	0 h
		Workshop:	0 h

Module summary:

As a student and in your professional life, you will need to use those skills. You will need them to showcase a group project, convince an examination board, do a presentation for a tutor, apply for an internship or for a job, or carry out professional projects...

You will need to communicate and be able to:
- Promote an idea, an achievement or a product;
- Work in a team, defend an argument, negotiate an agreement;
- Inform and convince people from many walks of life, including some who are from a different background and do not share your technical knowledge.

The APIC (Information and Communication promotion initiatives) module is designed to help you improve your communication skills. It has three aims:

1. Provide a theoretical and functional overview of different aspects of persuasive, interpersonal and strategic communication, designed to construct a message, deliver it at the appropriate moment, reinforce its argumentative content and adapt it to the receiver in order to leverage its effect.

2. Implement all the knowledge acquired in order to further the image and reputation of the school at events organized by the communication service.

3. Help to showcase the school's various voluntary societies initiatives and classroom projects (whether science-related or personal development projects).

Learning objectives	Students will be assessed on their ability to...

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Contents:

The module addresses:
- Theoretical aspects of communication techniques
- Basic principles of Neurolinguistic programming
- Elaboration probability model, Maslow pyramid, cognitive theory, perception channels (emotional and rational)
- Persuasive rhetoric and communication: basic principles, methods and processes. Rhetorical discourse construction, credibility enhancing factors, formulation principles, laws of influence, etc.
- Non-verbal communication: attitude, body language and synchronisation
- Practical advice and general factors in ESIEA student communication situations
- Semester assessment

The assessment is based on both quantitative and qualitative criteria (bonus or penalty points).

Each student must take part in at least one communication initiative promoting the School, putting into practice the techniques and advice provided in the course.
- Participating in a school careers event, either in their former high school or in a high school near to his/her campus;
- Presenting the engineering profession in a high school classroom;
- Taking part in open days or mock examination days;
- Taking an active part in one of the careers exhibitions where the School has a stand;
- Writing articles (communication correspondent), producing photo or video reports, taking part in the School's web team;
- Helping to organize any promotional event organized by the School's Communication Service.

Pre-requisites:

Learning methods: Lectures and projects

Assessment:

Media:

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Bibliography:

Keywords: