Educational Document

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Program tables

1st Year - Scientific section	Volumes (in sessions)							Marks Lab/Prj	Coeft	ECTS Credits
	Total	Lect.	Tut	Lab	Proj	Lab test	Spvised test			
Semester 1	264	53	120	64	10	6	11	2	30	30
Systems and Networks	57	18	18	16		2	3		7	10
Boolean algebra	13	6	6				1		2	
Computer Architecture	20	6	6	6		1	1		2	
Bases system	2			2						
Operating system	22	6	6	8		1	1		3	
Development	97	24	26	32	10	4	1	1	11	10
Object Oriented Programming	58	12	14	20	10	2		1	6	
SQL	17	5	5	6		1			2	
Analysis and design of information systems	22	7	7	6		1	1		3	
Engineering Sciences	49	5	26	16			2	1	5	5
Linear programming	19	5	5	8			1	1	2	
Électronics 1	30		21	8			1		3	
Economic & Social Sciences	44	6	35				3		5	5
Accounting	19	6	12				1		2	
Written communication	9		8				1		1	
Second language (s1)	16		15				1		2	
English	17		15				2		2	0
English (s1)	17		15				2		2	
Semester 2	279	47	107	54	55	7	9	6	30	30
Computing	119	19	13	38	42	6	1	3	11	10
Java advanced	26	6	6	12		2			3	
Development of information systems	37	2		6	28	1		2	3	
Data base	33	3	4	10	14	2		1	3	
Networks - norms and protocols	23	8	3	10		1	1		2	
Engineering Sciences	77	24	37	12		1	3	1	8	10
Signal mathematics	31	12	14	4			1	1	3	
Probability and statistics	25	12	12				1		2	
Electronic 2	21		11	8		1	1		3	
Economic & Social Sciences	64	4	40	4	13		3	2	9	10
Knowledge of the company	14		13				1		2	
Project management techniques	13	4	4	4			1	1	2	
Oral communication	8		8						1	
Participatory and personal commitment									1	
International culture	13				13			1	1	
Second language (s2)	16		15				1		2	
English	19		17				2		2	0
English (s2)	19		17				2		2	

2nd Year - Classic section	Volumes (in sessions)							Marks Lab/Prj	Coeft	ECTS Credits
	Total	Lect.	Tut	Lab	Proj	Lab test	Spvised test			
Semester 1	227	38	89	48	37	6	9	4	30	30
Computing	72	22	7	24	14	4	1	1	10	10
Object oriented analysis	19	7	7	4			1		3	
C Language	21	7		12		2			3	
Web Development	32	8		8	14	2		1	4	
Engineering Sciences	69	15	22	24	4	2	2	2	8	10
Numerical analysis	26	10		14		2			3	
Graph theory	17	5	5	6			1	1	2	
Signal processing	26		17	4	4		1	1	3	
Economic & Social Sciences	71	1	47		19		4	1	10	10
Research work	19				19			1	2	
Predictive management	17		16				1		2	
Project Management	14		13				1		2	
Marketing and customer listening	7	1	5				1		2	
Second language (s1)	14		13				1		2	
English	15		13				2		2	0
English (s1)	15		13				2		2	
Semestre 2	199	31	63	38	51	3	9	7	30	30
Computing	67	24	11	26		3	3		10	10
IT security	9	8					1		2	
System programming	26	6	8	10		1	1		3	
Unix	11	4		6		1			2	
Networks : implementation	21	6	3	10		1	1		3	
Engineering Sciences	46	5	28	10			3	3	6	5
Modeling & system analysis	15	5	5	4			1	1	2	
Propagation	17		14	2			1	1	2	
Modulation	14		9	4			1	1	2	
Economic & Social Sciences	19	2	16				1		4	5
Health & Security at Work	6	2	4							
Second language (s2)	13		12				1		2	
Participatory and personal commitment									2	
Projects & Internship	53			2	51			4	8	10
Project	53			2	51			1	4	
Internship (12 weeks)								3	4	
English	14		12				2		2	0
English (s2)	14		12				2		2	

3rd Year – Classic Section	Volumes (in sessions)							Marks Lab/Prj	Coeft	ECTS Credits
	Total	Lect.	Tut	Lab	Proj	Lab test	Spvised test			
Semester 1	240	XX	XX	XX	72	XX	XX	XX	30	30
Economic & Social Sciences	60	22	34				4		8	10
Business Information System	8	7					1		1	
Engineering career	9	8					1		1	
Quality	9	2	6				1		1	
Law	17	5	11				1		2	
Meeting conduct	8		8						1	
Preparing for recruitment	9		9						1	
Participatory and personal commitment									1	
Project	72				72			2	8	10
Project	72				72			2	8	
Optional modules										
Module 1	46	XX	XX	XX		XX	XX	XX	6	5
Module 2	46	XX	XX	XX		XX	XX	XX	6	5
English	16		15				1		2	0
English	16		15				1		2	
Semester 2								3	30	30
Internship								3	30	30
End-of-course internship (24 weeks)								3	30	

3rd Year –Optional Modules	Volumes (in sessions)							Marks Lab/Prj	Coeft	ECTS Credits
	Total	Lect.	Tut	Lab	Proj	Lab test	Spvised test			
Module: Innovate & Undertake	45	20	22				3		6	5
Legal and social environments	14	8	5				1		2	
Innovation and strategy	12	6	5				1		2	
Business plan elaboration and project construction	19	6	12				1		2	
Module: Professional Java	46	13		30		3			6	5
Software Engineering tools for Java	11	2		8		1			2	
Web development on Java	16	5		10		1			2	
Application servers Java EE	19	6		12		1			2	
Module: Web et Mobile Technologies	46	16		26		2	2	1	6	5
Internet service management	16	6		8		1	1		2	
Frameworks	17	6		10		1			2	
Web and mobile technologies	13	4		8			1	1	2	
Module: Visual & 3D Interfaces	48	13		30		2	3	1	6	5
Graphics Interfaces Development	16	5		10			1	1	2	
.Net Development	16	4		10		1	1		2	
3D Development	16	4		10		1	1		2	
Module: Robotics and Embedded Systems	47	13		30		1	3	4	6	5
Mobile robotics	16	2		12		1	1	1	2	
Embedded systems	14	3		10			1		2	
Artificial Intelligence	17	8		8			1	3	2	
Module: Cyber Security	47	20	2	20		2	3	1	6	5
System security	14	4		8		1	1		2	
Network security	17	7		8		1	1		2	
Cryptography	16	9	2	4			1	1	2	
Module: Network Solutions	47	26		16		2	3	3	6	5
Advanced networks: basis	14	6		6		1	1		2	
Operator networks	9	6		2			1	1	1	
Internet access networks	14	8		4		1	1		2	
Multimedia	6	4		2				1	0,5	
Virtualisation	4	2		2				1	0,5	

Boolean algebra (I1 S1)

TOTAL	Lectures	Tutorial	Laboratory	Project	Lab Test	Exams	Erasmus Code
13 s.	6 s.	6 s.				1 s.	2349
1 mark						1 mark	

Targeted skills

- Understand the basic concepts of counting. Convert a decimal number to any base and vice versa.
- Simplify logical equations thanks to Boolean algebra theorems.
- Synthesize and analyze a combinatorial logic circuit.
- Synthesize and analyze a sequential logic circuit (register, synchronous and asynchronous counters).

Synthetic program

Coding and representation of information
- Encoding data. Physical representation.
- Representation of signed integers.
- Representation of fractional numbers. Decimal representation.
- Error correction codes.

Boolean algebra
- Properties of logical operators.
- Truth tables and logical equations.
- Combinatorial and sequential logic circuits.

Computer architecture (I1 S1)

TOTAL	Lectures	Tutorial	Laboratory	Project	Lab Test	Exams	Erasmus Code
20 s.	6 s.	6 s.	6 s.		1 s.	1 s.	2095
2 marks					1 mark	1 mark	

Targeted skills

- Use conversion methods between the various databases and be able to describe the different types of coding.
- Identify the main components of a computer and their operating principles at low levels.
- Design, realize and execute MASM assembler programs.
- Debug, assemble, and disassemble an .exe file

Synthetic program

Notions of electronic technology
- Doping of silicon. Manufacture of integrated circuits.
- Evolution of integration. Different technologies.

Main organs of a computer
- Von Neumann architecture. Principle of operation.
- The main memory. The central processor.
- Intel 80x86 family of microprocessors.
- Peripheral units.

Hierarchy of memories
- Different types of access.
- Semiconductor memories.
- Problem due to the difference in CPU and MC speeds.

The central processor
- The control unit. The sequencer.
- The CPU registers. Addressing Modes.
- The Arithmetic and Logical Unit.
- Types of instructions.

Input /output & peripherals
- Modes of exchange.
- Common peripheral units.
- Printers.
- Interactive terminals: graphic display and keyboard.

Bases system (I1 S1)

TOTAL	Lectures	Tutorial	Laboratory	Project	Lab Test	Exams	Erasmus Code
2 s.			2 s.				2220
0 mark							

Targeted skills

- Use the VirtualPC / VirtualBOX workstation environment
- Install, set and customize the Windows and Linux operating systems in a virtual environment.
- Perform the system manipulations necessary to carry out laboratories under Windows and Linux (shell commands and command window, registry, environment variables, basic access rights).
- Set up Windows and Linux systems to access corporate network resources with simple shares, Samba and WebDAV.

Synthetic program

Custom installation and configuration of a Windows (workstation) and Linux environment

Getting started with a virtual environment Virtual PC / Virtual Box

Setting access to shared network resources, notions of access rights

Introduction to the command window, basic commands, environment variables

Operating system (I1 S1)

TOTAL	Lectures	Tutorial	Laboratory	Project	Lab Test	Exams	Erasmus Code
22 s.	6 s.	6 s.	8 s.		1 s.	1 s.	0077
2 marks					1 mark	1 mark	

Targeted skills

- Describe the different types of operating systems, and their usefulness in a computer system.
- Understand the relationship between the system kernel and the physical infrastructure of the server.
- Design and administer a Unix-based computer system.
- Design a data security policy, guarding against breakdown, intrusion and non-confidentiality.

Synthetic program

Definition and history of Operating Systems

Elements of an Operating System
- Process,
- Interruptions
- Scheduling and scheduling algorithms

The Memory Management System
- Virtual memory: logical address and physical address
- Segmentation and pagination
- Page Replacement Algorithms

The File Management System
- File system types (FAT16, FAT32, NTFS, Ext2, Ext3, ...)

File Allocation

Object Oriented Programming (I1 S1)

TOTAL	Lectures	Tutorial	Laboratory	Project	Lab Test	Exams	Erasmus Code
58 s.	12 s.	14 s.	20 s.	10 s.	2 s.		0002
3 works				1 mark	2 marks		

Targeted skills

- Design an algorithm using simple data types (integers, real, characters, strings and arrays) and translate, execute and debug it in Java.
- Write Java programs by using the main concepts of object-oriented programming: classes, objects, encapsulation, inheritance, polymorphism, abstract classes, interfaces, packages.

Synthetic program

Introduction
- Computer, processor, machine language
- Programming languages
- Java
- Program
- Programming
- A first example

Variables and expressions
- Variables
- Types
- The primitive types
- Variable declaration
- Conversions
- The assignment
- The operators
- The combined assignment operators
- Input / output operations

Conditions and loops
- The blocks
- Conditional Instruction
- Multiple connections?
- Buckles

A few OOPs
- Switch from simple variables to a class
- Object creation, access to properties
- First method
- Constructor
- Accessors

References and Tables
- Differences between primitive types and objects
- Concept of reference
- Tables

- Some algorithms on tables
- Multi-dimensional tables

Character strings
- Algorithmic Chains
- Java and strings
- String Class
- StringBuilder class
- Classes, Objects, Properties and Methods
- The properties of a class
- The methods
- This
- The builders
- Accessors

UML notation, inheritance
- UML notation (class diagram)
- Inheritance
- The relation "is one" and the polymorphism
- Inheritance and Visibility
- Inheritance and Builders
- The Object class

Abstraction and Statics
- Abstract class
- Class variables and methods
- Constants

Interfaces and Packages
- Simple inheritance, multiple inheritance
- The interfaces
- Packages

SQL (I1 S1)

TOTAL	Lectures	Tutorial	Laboratory	Project	Lab Test	Exams	Erasmus Code
17 s.	5 s.	5 s.	6 s.		1 s.		2345
1 mark					1 mark		

Targeted skills

- Extract and modify data from a relational database by using the SQL language.
- Implement a database from an existing scheme, with the implementation of data integrity constraints which must respect database.
- Configure access rights to a database.

Synthetic program

The SQL language
- History
- SQL and relational algebra
  - The 4 primitive operators on the sets (union, intersection, difference, product)
  - The 4 operators specific to the tables (projection, selection, join, division)
- The 2 types of SQL statements
  - DDL Data Definition Language
  - DML Data Manipulation Language
- SQL
  - Definition of DDL data
  - Manipulation of DML data
  - SQL ANSI and SQL Access.
  - The SQL language
    - Constraints
    - Edit table (ALTER - DROP - INSERT - UPDATE - DELETE)
    - Selection
    - Statistical functions
    - Sorting and grouping
    - Sub-queries
    - Views
    - Index
    - Joins

Analysis and design of information systems (I1 S1)

TOTAL	Lectures	Tutorial	Laboratory	Project	Lab Test	Exams	Erasmus Code
22 s.	7 s.	7 s.	6 s.		1 s.	1 s.	0001
2 marks					1 mark	1 mark	

Targeted skills

- Use a database generation and back-design tool.
- Adapt an application by using a database to the evolution of its scheme.

Synthetic program

Fundamentals of the method
- The information system. Project Management
- State of the Art of Methods

The basic concepts of Merise
- Modeling principles
- The abstraction cycle
- The life cycle. The 7 steps of Merise.
- The design process

Design of the Organizational Information System
- Study of flows
  - Context model
  - Flow model
  - Process cutting
- Conceptual modeling
  - Data: MCD
  - Treatments: MCT
- Organizational modeling
  - Treatments: MOT
  - Data: MOD
- Lifecycle of objects and business objects
- Confrontation data / treatments

Computerized IT Design
- Logic modeling
  - Treatments: MLT
  - Data: MLD
- Optimization of data models
- The user interface

Implementation of Merise
- Players
- The reference cycle: the 7 steps
- Adaptation of the approach
- Software engineering workshops
- Evolutions from Merise to Merise 2

Linear programming (I1 S1)

TOTAL	Lectures	Tutorial	Laboratory	Project	Lab Test	Exams	Erasmus Code
19 s.	5 s.	5 s.	8 s.			1 s.	2558
2 marks			1 mark			1 mark	

Targeted skills

- Modeling problems of various origins (economic, production, flow, ...) in the form of a linear program.
- Use a numerical calculation library to solve a given linear program.
- Analyze the sensitivity of an optimal solution in case of modification of the parameters of the problem (details on costs or adjustment of the constraints).

Synthetic program

Main definitions
- Definition of a linear program and examples
- Polytopes and polyhedra of constraints
- Basics and baseline
- A first algorithm

Simplex algorithm
- Characterization of an optimal basis
- Simplex algorithm
- Illustration on an example

Duality
- Definition of a dual problem
- Theorems of duality and complementarity

Electronic 1 (I1 S1)

TOTAL	Lectures	Tutorial	Laboratory	Project	Lab Test	Exams	Erasmus Code
30 s.		21 s.	8 s.			1 s.	1712
3 marks		2 marks				1 mark	

Targeted skills

- Explain the operating principles of the diode and the bipolar transistor and describe their characteristics.
- Analyze circuits using these semiconductors operating in linear regime.
- Master the design stages of a power supply and transistor amplifiers.

Synthetic program

The diode and its applications
- Characteristics of a diode
- Load line - polarization point
- Modeling of the diode
- Limiting circuits
- Rectifying circuits
- Application to the realization of a stabilized power supply

The bipolar transistor and the amplification
- Characteristics of the bipolar transistor
- Principle of operation
- Load line - polarization point
- Positioning in the various operating modes
- Polarization circuits of a bipolar transistor
- Definition, characteristics and modeling of an amplifier
- Application to the production of a bipolar transistor amplifier.

Accounting (I1 S1)

TOTAL	Lectures	Tutorial	Laboratory	Project	Lab Test	Exams	Erasmus Code
19 s.	6 s.	12 s.				1 s.	0027
1 mark						1 mark	

Targeted skills

- Appreciate the management of the company facing its environment (banks, suppliers, customers ...) and by taking into account the different legal structures at its disposal.
- Design the management documents (annual accounts) of the company, such as the Balance Sheet and the Profit and Loss Account, and know how to handle them.
- Establish an accounting management to enable the cost analysis (cost and margin calculation): a fundamental element for decision-making.

Synthetic program

Business approach
- Definition - Purposes
- The legal criteria for classifying companies

General accounting
- General presentation
- Balance sheet and income statement
- Accounting principles
- Stocks
- The depreciation
- Provisions
- Regularization entries

Cost accounting
- Objectives of cost accounting
- General Organization of Accounting
- Treatment of expenses
- Costing

Written communication (I1 S1)

TOTAL	Lectures	Tutorial	Laboratory	Project	Lab Test	Exams	Erasmus Code
9 s.		8 s.				1 s.	0023
2 marks						2 marks	

Targeted skills

- Apply the methodology of written expression, ie the definition of the objective, a research, an organization and a prioritization of ideas and the choice of a plan.
- Write a document according to the rules of written expression (the choice of the words, the syntax, the spelling, the punctuation ...).
- To present in a powerful and appropriate manner various writings (letters, emails, reports, CV ...) respecting the standards for each of them.

Synthetic program

The problem of written communication.
- The different types of writing.
- Writing for which objectives, which recipients?
- Writing, formatting.
- Exercises: vocabulary, spelling, grammar, punctuation ...

Application to look for an internship and employment.
- Recommendations; Methodology approach of tools
- Construction of an application file: CV and letter, from a job offer
- Exercise: correction of an application file

Application to the writing of the internship report.
- Objectives.
- Structuring and Writing
- Formatting.
- Exercise: introduction and conclusion

Application to the drafting of professional documents
- The administrative letter and the professional mail: preparation, writing, presentation
- Exercise: business situations

Application to users
- Which target? What messages? which form ?
- Exercise

Application to report
- Different reports and their objectives
- Rules to be respected; Standards to be used
- Exercise

Methodology of taking marks
- Some reminders and methods to use
- Exercises

Second language (s1) (I1 S1)

TOTAL	Lectures	Tutorial	Laboratory	Project	Lab Test	Exams	Erasmus Code
16 s.		15 s.				1 s.	1149
2 marks		1 mark				1 mark	

Targeted skills

- Practice a foreign language other than English.
- Know the culture of at least one region where the language is spoken.

Synthetic program

Taking into account the level.
Unlike English, students are not required to achieve a minimum level that would be the same for an entire promotion.
Thus, students are divided into groups of levels.
The objective assigned to them is to have progressed correctly at the end of the school year in proportion to the hourly volume devoted to the second language.

- For beginners :
  - Have assimilated the grammar rules and vocabulary in common use.
  - Master the pronunciation and writing rules of the language.
  - Be able to read and write simple text by using a dictionary.
  - Know the characteristics of the culture of a region where the language is spoken.

- For intermediate level:
  - Have addressed all the grammatical rules and conjugations of the language.
  - Be able to read a press article, participate in a conversation, write a letter.
  - Be able to present a region where the language is spoken.

- For advanced level:
  - Master the most grammatical rules and conjugations of the language.
  - Be able to write a professional writing, conduct an interview, make an oral presentation, read a short story.
  - Know several regions where the language is spoken and be able to present and compare them

Method used

- Systematic study of the rules of grammar and conjugation.
  Exercises of application.
- Learning vocabulary related to a theme.
  Reading and analyzing a text.
- Work of oral expression
  Listening to tapes.
  Discussions.
- Work of written expression. Writing.
- Cultural Awareness
  Search for information (Internet, reading documents).
  Presentations.

English (s1) (I1 S1)

TOTAL	Lectures	Tutorial	Laboratory	Project	Lab Test	Exams	Erasmus Code
17 s.		15 s.				2 s.	0006
3 marks		1 mark				2 marks	

Targeted skills

- Understand conversations about common events, one-on-one explanations on a common professional nature.
- Read relatively simple technical documentation. Read by using the dictionary, news articles and more literary extracts. Identify misconceptions.
- Talk about common topics by using simple structures. Participate in discussions about practical problems. Organize planned events by telephone. Make short presentations (20 min.) prepared (without reading).
- Write e-mails using the past, present or future. Write instructions, short service marks, a meeting report, cover letters and a targeted resume.

Synthetic program

Listening training (listening comprehension)
- Image analysis.
- Questions - answers.
- Short conversations.
- Monologues.

Practice in reading (reading comprehension)
- Sentences to be completed.
- Identification of errors.
- Understanding texts.

General English language learning
- Rules of grammar, agreements, words order, syntax rules, conjunctions, prepositions, determination ...
- Conjugation: construction and use of tenses, irregular verbs ...
- Vocabulary by themes.
- Idiomatic turns and false friends.
- Study of texts, individual work, in pairs or in small groups; Oral report in class or written report

Awareness to Anglophone or international culture:
- Study of press articles, following the news.
- Discussions, presentations, debates. Individual or group oral presentations.

Java advanced (I1 S2)

TOTAL	Lectures	Tutorial	Laboratory	Project	Lab Test	Exams	Erasmus Code
26 s.	6 s.	6 s.	12 s.		2 s.		0003
2 marks					2 marks		

Targeted skills

- Use the main features of the Java language to efficiently produce a professional-quality program: exception handling, manipulating object collections, reading and writing in files containing objects or configuration parameters.
- Build graphical interfaces with the Java Swing library.

Synthetic program

Exceptions
- Bloc try - catch - finally
- Bloc try with resources
- Intercept an exception
- Trigger an exception, Throwable class
- Customized Exception

File Management
- Overview of file types and contents
- File class, access to files and directories
- Classes representing input or output streams
- Access to text files
- Access to binary files
- Serialization

2D Graphics
- Graphical interface / console
- Create a window with Swing
- 2D graphics, basic shapes, fonts, colors, images
- Mouse, keyboard events

Collections
- General information about the collections provided by the JDK
- Collections from the Set interface
- Collections from the List interface
- Collections from the Map interface, dictionaries

Graphic Interfaces with Swing
- Generalities on graphical interfaces in Java
- Swing Designer
- Containers
- Layout Managers
- Main components
- Event management
- JDK dialog boxes
- A full example

Development of information systems (I1 S2)

TOTAL	Lectures	Tutorial	Laboratory	Project	Lab Test	Exams	Erasmus Code
37 s.	2 s.		6 s.	28 s.	1 s.		0052
5 marks				2 marks	1 marks		

Targeted skills

- Identify a common frame of reference for validating models among representative users.
- Contribute to the design, the general functional specification and the man-machine interfaces.
- Contribute to the development, with the Access software, of an application allowing its users to exploit data contained in a database, via a graphical interface.
- Take into account its own actions (as project manager) and those of third parties (team members) to ensure the correct integration of the application in a complex environment and in accordance with the needs of users / customers.

Synthetic program

Analysis phase
- Presentation of the modalities and of the subject of the project
- Preliminary study (preparation of the observation report)
  - Introduction
  - Context Model (CM)
  - Data Flow Diagram (DFD)
  - Diagnosis of the existing (positive, negative, dysfunctional)
  - Future directions proposed by the project team
  - Production of an observation report (corrected and evaluated)
- Detailed study (General Functional Specifications file (GFS))
  - Introduction (Scope of Study)
  - Objectives and orientations selected:
    - Risk assessment of the use of a service
    - Determination of the tests necessary for the validation of a service
    - Definition of entitlement levels associated with a service
  - Diagram of future data flows
  - Conceptual Data Model
  - Organizational model of treatment (provide one model per activity defined in the DFD)
  - Logical Model of MLD Data
  - Production of an SFG report (corrected and evaluated)

Application Development with Access
- Access features
  - Interface, project concept, creation of tables, relationships and hierarchical data,
  - Shared front-end and back-end database with attached tables
  - Forms and states with conditional formatting,
  - Distribution of reports (.snp)
  - Web pages with interactive data access
- Access' VBA programming language
  - DAO - ADO (explanations of the 2 models - VBA access code to the tables)
  - Creating Menu Bars

        - Use of OCX (toolbars, status bars, scrollbars, etc.)

Realization phase
- Software production
- Documentation
    - Realization file
        - PDM (Access' Table Scheme)
        - MLT (software architecture)
        - Standards (Ergonomics, HMI, naming conventions in Development)
    - Extract from the operating file
        - Detailed descriptions of screens
    - User manual (excerpt)
        - Plan
        - Procedure (Extract: 5 pages maxi)

Evaluation of the project
- Start-up of a service with demonstration (test game):
    - Integration and Acceptance Test of a service
    - Definition of the necessary elements for the continuity of a service
    - Accompaniment in the implementation of a new service
    - Deployment of a service
- Work in project mode
    - Participation in a project, taking turns as project leader and performer
    - Evaluation of project monitoring indicators and justification of deviations
    - Management of technical and human resources

Data base (I1 S2)

TOTAL	Lectures	Tutorial	Laboratory	Project	Lab Test	Exams	Erasmus Code
33 s.	3 s.	4 s.	10 s.	14 s.	2 s.		2557
3 marks				1 mark	2 marks		

Targeted skills

- Design and build a relational database (tables, integrity constraints and triggers) using SQL and PL / SQL languages.
- Realize complex queries to display calculated data.
- Design, implement and execute procedures and functions to simplify user programs.

Synthetic program

Introduction to databases
- Concept of databases
- The different functions of a DBMS
- The different levels of representation of a DB
- Implementation of a DBMS and environment of a DB
- The different DBMS (Hierarchical, networks and relational)

The relational model and data manipulation language
- Objective of a relational model
- SQL language: reminders and advanced functions.
- Validation of changes (COMMIT / ROLLBACK)

Integrity constraints
- Definition of an integrity constraint
- Creating, editing, and deleting a table with the SQL language
- Static integrity constraints
- Dynamic integrity constraints (Triggers)

Integrity problems
- Definition and modeling of a transaction
- Problems of competition
- Mutual exclusion and deadlock problem
- The different locks and their compatibility
- The LOCK TABLE command
- Safe operation and transaction logging
- Safety of use

Pro * C and PL / SQL
- Creating a C + SQL Program
- Precompilation
- Procedures - Functions - PL / SQL packages
- Procedures calling in C and PL / SQL
- The different CURSORS

Networks - norms and protocols (I1 S2)

TOTAL	Lectures	Tutorial	Laboratory	Project	Lab Test	Exams	Erasmus Code
23 s.	8 s.	3 s.	10 s.		1 s.	1 s.	2556
2 marks					1 mark	1 mark	

Targeted skills

- Build a network and justify the choice of its hardware or protocol elements.
- Deploy and configure the necessary services in an exchange between machines.

Synthetic program

The concepts of network interconnection
- Definition of the OSI model
- The notion of source, destination, packet, media and protocol
- Encapsulation
- The functioning of routers, hubs and switches
- Topologies (Bus, ring and star)

TCP / IP protocols
- TCP / IP:
  - History, definition and organization
  - Infrastructure of interconnected TCP / IP networks
- Addressing, routing, ARP, ICMP, TCP, UDP, DHCP
- TCP / IP services: FTP, TFTP, SMTP, POP3, IMAP, DNS, Web, Telnet

LAN Networks
- Definition (shared Ethernet, switched Ethernet)
- Ethernet standards
- How to optimize the operation of a LAN?

Addressing
- Basis of addressing
- Format of an IP address
- Different address classes
- The notion of mask and the address of brodacast
- The sub-networks
- How to calculate an addressing plan?

Routing
- Definition and functioning
- The notion of route, routing table and metric
- Routing protocols by distance vector
- RIP, IGRP and OSPF
- Configuration

Signal mathematics (I1 S2)

TOTAL	Lectures	Tutorial	Laboratory	Project	Lab Test	Exams	Erasmus Code
31 s.	12 s.	14 s.	4 s.			1 s.	0046
2 marks			1 mark			1 mark	

Targeted skills

- Calculate the spectral representation of a signal defined in the temporal space, in the periodic and aperiodic cases.
- Study a signal modeled by using distributions.
- Use numerical calculation tools to perform frequency analysis of a signal.

Synthetic program

Introduction to Fourier series
- Semi-standard and hermitian product
- Harmonic analysis
- Harmonic synthesis
- T-periodic functions

Fourier Transform
- Intuitive presentation
- Definition and existence
- Inversion formula
- Properties
- Energy aspects
- Derivation
- Fourier transform in dimension two

Discrete Fourier Transform and FFT
- Introduction to sampling
- Discretization of the Fourier transform
- FFT algorithm

Distributions
- Concept of distribution
- Operations on distributions
- Convergence in D '

Fourier Transform of Distributions
- Introduction - temperate distributions
- Fourier transform of temperate distributions

Probability and statistics (I1 S2)

TOTAL	Lectures	Tutorial	Laboratory	Project	Lab Test	Exams	Erasmus Code
25 s.	12 s.	12 s.				1 s.	0075
1 mark						1 mark	

Targeted skills

- Calculate and interpret the main position and dispersion parameters in a one-character data distribution. Compare multiple distributions.
- Study of a two-character data set. Study of the independence between two characters (linear correlation and Khi² test)
- Calculate probabilities from factual data. Use conditional probabilities (including Bayes theorem), the law of total probabilities and the law of composite probabilities.
- Know and apply the main discrete and continuous probability laws and the central limit theorem.
- Estimate an average or a proportion per confidence interval, compare 2 averages or proportions per confidence interval.
- Know how to perform and interpret a statistical test.

Synthetic program

Descriptive statistics
- Definitions, mathematical bases
- 1-character statistics
  - Data clusters, tables, distribution functions and dispatching
  - Quantitative, qualitative, discrete, continuous characters
  - Graphical representations and special features
- Summary of data: positional parameters and dispersion
- 2-character statistics
  - Dependency / independence between 2 characters
  - Adjustment, regression and correlation
  - Khi² method

Probability calculations
- Combinatory analysis review
- Probability calculations, relations with sets, total and composite probabilities
- Conditional probability, Bayes theorem
- Probability law of a random variable

Probability Distribution
- Binomial Distribution
- Poisson Distribution
- Uniform Distribution
- Exponential Distribution
- Normal Distribution
- Limit central theorem

Sampling and estimation (Inferential statistics)
- Point estimate
- Confidence interval estimation

Statistical tests (Inferential statistics)
- Compliance tests

- Homogeneity tests
- Efficacy tests

Excel Statistics notions

- Overview of the features offered
- Some exercises treated in laboratory, taken from Excel

Electronic 2 (I1 S2)

TOTAL	Lectures	Tutorial	Laboratory	Project	Lab Test	Exams	Erasmus Code
21 s.		11 s.	8 s.		1 s.	1 s.	0032
2 marks					1 mark	1 mark	

Targeted skills

- Explain the operational principles of the operational amplifier and describe its characteristics.
- Analyze and use amplifier circuits and filter circuits with bipolar transistors and / or operational amplifiers.
- Analyze the operation of a cascade association of the assemblies described above.

Synthetic program

Bipolar transistor amplifiers
- Linear Amplifier
- Coupling and decoupling capacitors
- Small Signal Amplification - Equivalent Model
- The three fundamental assemblies in class A

Perfect Operational Amplifier (POA)
- Definition and properties
- POA Linear Circuits
- POA non-linear circuits (trigger)
- Real operational amplifier

Active filters
- Introduction
- Filters specification
- Example: low-order filter of order 2
- Active circuits used
- 1st order active filters
- 2nd order active filters

Analog/digital and digital/analog converters.
- Scanning of a periodic signal
- Reconstitution of the initial signal from the sampled signal

Knowledge of the company (I1 S2)

TOTAL	Lectures	Tutorial	Laboratory	Project	Lab Test	Exams	Erasmus Code
14 s.		13 s.				1 s.	2608
1 mark							

Targeted skills

- Know the company
- Understand the concept of strategy
- Discover the different types of business environment
- Make contacts
- Set up an interview
- Gather testimony and transcribe it
- Editorial skills
- Oral presentation

Synthetic program

Business typology
- Definition
- Classification of enterprises
  - Sector / activity
  - Dimension
  - Legal form
    - Individual business
    - Company
    - Public sector company

Organization and structure of enterprises
- Definition
- Business structures
- Functions of the company
- Work organization

Company strategy
- The environment
- The strategy

Company Testimonials

Implementation of the reverse pedagogy. Students work in small groups of 6 or 7. Based on a plan and keywords, they must prepare a report that addresses all the points cited by using digital resources at their disposal. To support their comments, they have to contact the company of their choice (alone or with the help of the teacher to find a contact). Teaching ends with an oral presentation to the entire tutorial group on a very specific point of the course and restoration of the company's testimony. An individual questionnaire will close the session.

The course takes place in the form of tutorials framed or autonomous. At the beginning of each supervised session, the teacher asks a new student (the raporteur) about the progress of the group's work and its knowledge, but some questions can also be asked to the whole group.

Project management techniques (I1 S2)

TOTAL	Lectures	Tutorial	Laboratory	Project	Lab Test	Exams	Erasmus Code
13 s.	4 s.	4 s.	4 s.			1 s.	1689
2 marks			1 mark			1 mark	

Targeted skills

- Develop a project schedule, in the form of a Gantt chart, from a task list, a set of resources and constraints associated with them.
- Develop the project budget by enhancing the planning tasks.
- Highlight the discrepancies between the reference planning and the actual data observed during the implementation phase.
- Plan a project on the Microsoft Project software. Customize the software to highlight the relevant information.

Synthetic program

Culture project: phasing and staking of the project

Structuring a project: from PBS to CBS

The basics of planning

Schedule by durations

Schedule the resources

Establish the estimated budget

Manage the project: tools for monitoring progress

Oral communication (I1 S2)

TOTAL	Lectures	Tutorial	Laboratory	Project	Lab Test	Exams	Erasmus Code
8 s.		8 s.					1424
2 marks		1 mark					

Targeted skills

- Build a discourse by correctly introducing the theme after a good catch to generate interest, highlighting the problem, and developing, based on a suitable plan, well-founded and hierarchized arguments for an oral intervention of about ten minutes.
- Manage one's behavior in order to express in front of an audience of 20 to 30 people and convince them by good gestures, voice and look control.
- Know and dare to assert oneself in front of one's peers by oral interventions in improvisation in order to manage stress.

Synthetic program

Make an oral presentation: the basic principles
- Personal presentation exercise
- The difficulties of public speaking
- The tools of the preparation:
  - the objective
  - the subject
  - the public
  - the environment
- The strong ideas
- Checklist
  - design
  - use
- The visual supports:
  - design
  - use

Conducting a presentation: practical aspects
- The defense :
  - Clarity of presentation
- Exercise on intonation and articulation
- How to express yourself clearly?
  - Is the audience listening?
  - Does the audience understand?
- The gesture
- The move
- The style
- Preparing the exam means training oneself
- A good oral presentation
- Structuring ideas
- The conclusion

Contextualization
- - Simulation of presentations (based on the research work done in international culture)
- - Assessment and evaluation of the training.

International culture (I1 S2)

TOTAL	Lectures	Tutorial	Laboratory	Project	Lab Test	Exams	Erasmus Code
13 s.				13 s.			0021
2 marks				1 mark			

Targeted skills

- Show an interest in the international environment.
- Research, analyze and synthesize bibliographic data on a topic of international dimension.
- Present the subject orally with an imposed duration.

Synthetic program

Research work
- Bibliographical research on a topic related to an international theme.
- Development of an oral presentation support (slides).
- Presentation to a jury of professors.

The topics covered are divided into three families:
- International organization and institution
- Business and Economy
- Daily Life and Society

International stay
- Information on the nature of international stays.
- Information on the partnerships proposed by the school, as well as the referenced organizations.

Second language (s2) (I1 S2)

TOTAL	Lectures	Tutorial	Laboratory	Project	Lab Test	Exams	Erasmus Code
16 s.		15 s.				1 s.	1711
2 marks		1 mark				1 mark	

Targeted skills

- Practice a foreign language other than English.
- Know the culture of at least one region where this language is spoken.

Synthetic program

Taking into account the level.
Unlike English, students are not required to achieve a minimum level that would be the same for an entire promotion.
Thus, students are divided into groups of levels.
The objective assigned to them is to have progressed correctly at the end of the school year in proportion to the hourly volume devoted to the second language.

- For beginners :
  - Have assimilated the grammar rules and vocabulary in common use.
  - Master the pronunciation and writing rules of the language.
  - Be able to read and write simple text by using a dictionary.
  - Know the characteristics of the culture of a region where the language is spoken.

- For intermediate level:
  - Have addressed all the grammatical rules and conjugations of the language.
  - Be able to read a press article, participate in a conversation, write a letter.
  - Be able to present a region where the language is spoken.

- For advanced level:
  - Master the most grammatical rules and conjugations of the language.
  - Be able to write a professional writing, conduct an interview, make an oral presentation, read a short story.
  - Know several regions where the language is spoken and be able to present and compare them

Method used

- Systematic study of the rules of grammar and conjugation.
  Exercises of application.
- Learning vocabulary related to a theme.
  Reading and analyzing a text.
- Work of oral expression
  Listening to tapes.
  Discussions.
- Work of written expression. Writing.
- Cultural Awareness
  Search for information (Internet, reading documents).
  Presentations.

English (s2) (I1 S2)

TOTAL	Lectures	Tutorial	Laboratory	Project	Lab Test	Exams	Erasmus Code
19 s.		17 s.				2 s.	1710
3 marks		1 mark				2 marks	

Targeted skills

- Understand conversations about common events, one-on-one explanations on a common professional nature.
- Read relatively simple technical documentation. Read by using the dictionary, news articles and more literary extracts. Identify misconceptions.
- Talk about common topics by using simple structures. Participate in discussions about practical problems. Organize planned events by telephone. Make short presentations (20 min.) prepared (without reading).
- Write e-mails using the past, present or future. Write instructions, short service marks, a meeting report, cover letters and a targeted resume.

Synthetic program

Listening training (listening comprehension)
- Image analysis.
- Questions - answers.
- Short conversations.
- Monologues.

Practice in reading (reading comprehension)
- Sentences to be completed.
- Identification of errors.
- Understanding texts.

General English language learning
- Rules of grammar, agreements, words order, syntax rules, conjunctions, prepositions, determination ...
- Conjugation: construction and use of tenses, irregular verbs ...
- Vocabulary by themes.
- Idiomatic turns and false friends.
- Study of texts, individual work, in pairs or in small groups; Oral report in class or written report

Awareness to Anglophone or international culture:
- Study of press articles, following the news.
- Discussions, presentations, debates. Individual or group oral presentations.

Object oriented analysis (I2 S1)

TOTAL	Lectures	Tutorial	Laboratory	Project	Lab Test	Exams	Erasmus Code
19 s.	7 s.	7 s.	4 s.			1 s.	0009
1 mark						1 mark	

Targeted skills

- Interpret the main UML models from an existing project file.
- Design the class architecture of an application and create a UML class diagram describing it.
- Describe the internal functioning of an application on a given scenario, by choosing the appropriate UML diagram (s) to support this description (eg activity, sequence or usage diagram).
- Adopt a user-centric, iterative, and incremental design method.

Synthetic program

Introduction:
- Object Oriented: Concepts
- Introduction to UML

Use Case Diagrams

Class and Object Diagrams

Interaction Diagrams
- Sequence Diagrams
- Other Interaction Diagrams

Behavior Diagrams
- State-of-transition diagrams
- Activity diagrams
- Other Behavioral Digraphs

Structure diagrams

Recommended methods

C Language (I2 S1)

TOTAL	Lectures	Tutorial	Laboratory	Project	Lab Test	Exams	Erasmus Code
21 s.	7 s.		12 s.		2 s.		0049
2 marks					2 marks		

Targeted skills

- Design, write and execute a program in C language.
- Know how to make declarations of variables, types, functions, function pointers and I / O management.
- Master pointers and dynamic memory management to manipulate dynamic structures such as lists, stacks, and queues.

Synthetic program

C Language Basics
- Structure of a C program
- Basics: comments, identifiers and literals, instruction blocks
- Data types
- Declaration and use of variables: simple variables, tables and objects
- Operators and expressions.
- Control structures
- Conversion and cast

The structures
- Declaration of variables
- Defining new types
- Strings

File Management
- Handling of text and binary files

Web development (I2 S1)

TOTAL	Lectures	Tutorial	Laboratory	Project	Lab Test	Exams	Erasmus Code
32 s.	8 s.		8 s.	14 s.	2 s.		1150
3 marks				1 mark	2 marks		

Targeted skills

- Design web interfaces structured in HTML / CSS, by using common techniques and practices.
- Develop PHP-based server scripts with the implementation of the main techniques for retrieving and filtering form data, PHP sessions and dialog with a MySQL database.
- Develop JavaScript-based client interactivity supplemented by Ajax / jQuery, with the implementation of DOM manipulations, event handlers, form validation, and the use of JSON encoding.
- Architect complete web applications around a PHP MVC model while applying the basic Web security rules.

Synthetic program

HTML
- Web Development Overview
- The main elements and philosophy of HTML
- The future with HTML5

CSS
- General concepts
- The different ways to integrate stylesheets
- Enforcement mechanism
- The selectors
- Layout with CSS.
- The future with CSS3

PHP
- Principle of PHP.
- PHP language (variables, types, strings, tables, instructions, inclusions, functions).
- PHP in practice (forms, sessions, access database).
- Development framework with MVC architecture.

JavaScript
- General on JavaScript.
- JavaScript language (reserved words, values, instructions, functions, objects, tables).
- Client-side JavaScript (window object, document, forms, events).
- DOM manipulations.
- Non-intrusive JavaScript

Ajax
- Principle of Ajax.
- XMLHttpRequest
- JSON rating
- Framework jQuery (basic, manipulations DOM, effects, Ajax)

Numerical analysis (I2 S1)

TOTAL	Lectures	Tutorial	Laboratory	Project	Lab Test	Exams	Erasmus Code
26 s.	10 s.		14 s.		2 s.		0005
2 marks					2 marks		

Targeted skills

- Understand the mechanisms inherent in solving mathematical problems using numerical tools (sampling, analog-to-digital conversion).
- Program an algorithm for solving linear and nonlinear equations by using direct or iterative methods.
- Manipulate experimental data (interpolation, least-squares method).
- Program algorithms to realize complex integrals.
- Program algorithms to numerically evaluate differential equations.

Synthetic program

Linear algebra
- Some reminders: Matrices - determinants.
- Linear systems, direct methods and iterative methods.

Resolution of non-linear equations by iterative methods
- Method of dichotomy or bisection.
- Newton Raphson methods: General case, applications.
- Newton Raphson methods with two variables: principle and examples of applications

Polynomial Interpolation
- Linear, quadratic interpolation.
- Lagrangian Interpolation.
- Newton Interpolation.

Digital Approximation
- Approximation in the least squares sense.

Digital Integration
- Trapeze formula
- Simpson Formula
- Note on error
- Examples
- Generalized Method: Formula of Newton-Cotes
- Monte-Carlo Method: 1D, 2D and 3D.

Resolution of differential equations. Digital and Analytical Methods
- First order equation: analytical and numerical methods
- Second order equation: analytical and numerical methods
  - Euler method
  - Runge-Kutta method
  - Taylor Method
- Resolution of a differential equations system
  - Runge-Kutta Method
  - Taylor Method

Graph theory (I2 S1)

TOTAL	Lectures	Tutorial	Laboratory	Project	Lab Test	Exams	Erasmus Code
17 s.	5 s.	5 s.	6 s.			1 s.	1418
2 marks			1 mark			1 mark	

Targeted skills

- Model a problem in the form of a set of interconnected objects.
- Solve an optimization problem in graphs such as: calculation of the shortest path, calculation of the scheduling of tasks and the critical path resulting from it, calculation of an optimal covering tree.
- Solve a problem of graph theory by using a programming language (Java or C language for example).

Synthetic program

Elements of graph theory
- Definitions
- Connectivity and strong connectivity
- Methods of calculating related and strongly related components
- Method of dividing a graph into levels
- Data structures for graphs

Trees and Tree structures
- Definitions
- Examples of applications
- Methods of calculating a minimum covering tree
- Methods of calculating a minimum covering tree structure: Prim and Kruskal methods

Problem of the shortest path in a directed graph
- Presentation of the different types of problems
- Presentation of the tag-fixing method: Djikstra method
- Presentation of the variable tag method: Belleman method

Signal processing (I2 S1)

TOTAL	Lectures	Tutorial	Laboratory	Project	Lab Test	Exams	Erasmus Code
26 s.		17 s.	4 s.	4 s.		1 s.	0070
3 marks		1 mark	1 mark			1 mark	

Targeted skills

- Use Fourier transformation to study deterministic signals and to understand its utility for the analysis and the transformation of these signals: calculation and the possible reduction of the bandwidth.
- Use the convolution product for its application to time and frequency filtering: to evaluate the modification of signals after filtering.
- Sample a signal and analyze the obtained result by using the frequency space: Shannon's theorem. Rebuild the starting signal from the sample and analyze the obtained result.

Synthetic program

Analog signal processing
- Representation
- Spectral analysis
- Transmission systems, frequency filtering, time windowing

Digital signal processing
- Sampling, restitution (Shannon theorem)
- Discrete Fourier Transform (FFT)

Laboratory :
- Calculation and interpretation of the discrete transform of simple signals.
- Digital filtering.

Research work (I2 S1)

TOTAL	Lectures	Tutorial	Laboratory	Project	Lab Test	Exams	Erasmus Code
19 s.				19 s.			0085
2 marks				1 mark			

Targeted skills

- Search for information on a scientific or technical topic (bibliographic search and on the Internet).
- Synthesize most of the knowledge gathered on the subject.
- Transmit a synthetic knowledge of the subject treated through an oral presentation.
- Develop an effective visual support (slideshow) to accompany an oral presentation.

Synthetic program

Organization

- Work done in pairs.
- The subjects, defined by the teachers, concern technical or scientific fields.
- The subjects are assigned randomly.
- A teacher is responsible for monitoring the groups and a schedule of appointments is set to:
  - Define the topic and guide the research.
  - Assess the the work done orally.

Work to be done

- Search for information on a selected scientific or technical subject: bibliographic search and on the Internet.
- Development of an oral presentation support (slideshow).
- Presentation to a jury of professors, aiming to make a synthetic and didactic presentation of the subject.

Predictive management (I2 S1)

TOTAL	Lectures	Tutorial	Laboratory	Project	Lab Test	Exams	Erasmus Code
17 s.		16 s.				1 s.	0034
1 mark						1 mark	

Targeted skills

- Perform a financial reading of the company's accounting documents.
- Make a judgment on the solvency (financial balance) and the profitability (performance) of a company.
- Evaluate the financial risk in an enterprise through different indicators such as break-even point.
- Build and follow the different aspect of a budget.
- Justify economically an investment decision and know the impact of its financing

Synthetic program

Analysis of the income statement
- Profitable level
- Interim management balances
- Self-financing capacity

Budget management
- Presentation
- Flexible budget
- Calculation and analysis of deviations

Balance sheet analysis
- Total net working capital
- The need for working capital

The choice of investment and its financing
- The choice of investment
- The choice of financing
- The financing plan

Project management (I2 S1)

TOTAL	Lectures	Tutorial	Laboratory	Project	Lab Test	Exams	Erasmus Code
14 s.		13 s.				1 s.	1690
1 mark						1 mark	

Targeted skills

- Animate a project review by correctly manipulating the vocabulary of the discipline, such as notions of perimeter, context, purpose, milestones, objectives, resources, deliverables ...
- Describe, from the project's reference system (planning and budget), the consequences on the continuation of the project of any hazard such as the delay or the extra cost of a task or the unavailability of a scarce resource.
- From the project request expressed by a project owner, gather the necessary information and then build a coherent project plan and finally present it to a steering committee.
- Describe the need for the future user of a system in the form of a functional specification.
- Propose the piloting structure, the working method and the type of contract adapted to the typology of a project.

Synthetic program

Culture projects

The actors of the project

The management of the project team

Economic aspects

Project Risk Management

The project at the service of strategy

Define the project

The feasibility review

Structuring the project

Project management tools

Reporting tools

The innovation project approach

Functional analysis of the need

Agile methods

Cross-functional management and collaborative tools

Closing the project and feedback

Marketing and customer listening (I2 S1)

TOTAL	Lectures	Tutorial	Laboratory	Project	Lab Test	Exams	Erasmus Code
7 s.	1 s.	5 s.				1 s.	2389
1 mark						1 mark	

Targeted skills

- Strengthen the understanding of the client's business approach in order to forge links and optimize business performance.
- Understand the fundamentals of the marketing approach in order to position customer relations within an adapted market strategy.

Synthetic program

Marketing approach, fundamentals
- The characteristics of the marketing
- Strategic marketing; diagnosis, synthesis, segmentation, targeting and positioning
- Operational marketing; Product policy, price, distribution, communication
- The life cycle of the product

Understanding the customer experience
- From a transactional point of view
- Customer life cycle
- The individual customer
- The operational and personal needs of the individual customer
- The customer itinerary

Listen to the voice of the customer
- The forms of expression of the customer
- The approach of customer listening
- In situ observation

Relational skills
- Assertiveness, one's development
- The ability to understand the other; Active listening, unnatural process
- The art of questioning; Maieutics; Knowing how to ask the right questions, questioning technique
- Levers to improve human relationship

The collection of information on demand, qualitative and quantitative
- Methods of collecting information
- The study of demand
- The questionnaire survey

Define customer strategy
- - Principles of customer loyalty
- - Know one's customers and choose the targets
- - Trading strategies
- - Understanding the issues of commercial negotiation

Educational tools:
- Customer life cycle
- Soncas Method
- The customer itinerary

- The pyramid of attitudes
- The approach of listening the customer
- The expectations chart
- Satisfaction surveys
- The notion of customer value
- The life cycle of the product
- SWOT Matrix
- PESTEL Matrix
- BCG Matrix
- MIX

Second language (s1) (I2 S1)

TOTAL	Lectures	Tutorial	Laboratory	Project	Lab Test	Exams	Erasmus Code
14 s.		13 s.				1 s.	0042
2 marks		1 mark				1 mark	

Targeted skills

- Practice a foreign language other than English.
- Know the culture of at least one region where this language is spoken.

Synthetic program

Taking into account the level.
Unlike English, students are not required to achieve a minimum level that would be the same for an entire promotion.
Thus, students are divided into groups of levels.
The objective assigned to them is to have progressed correctly at the end of the school year in proportion to the hourly volume devoted to the second language.

- For beginners :
  - Have assimilated the grammar rules and vocabulary in common use.
  - Master the pronunciation and writing rules of the language.
  - Be able to read and write simple text by using a dictionary.
  - Know the characteristics of the culture of a region where the language is spoken.

- For intermediate level:
  - Have addressed all the grammatical rules and conjugations of the language.
  - Be able to read a press article, participate in a conversation, write a letter.
  - Be able to present a region where the language is spoken.

- For advanced level:
  - Master the most grammatical rules and conjugations of the language.
  - Be able to write a professional writing, conduct an interview, make an oral presentation, read a short story.
  - Know several regions where the language is spoken and be able to present and compare them

Method used

- Systematic study of the rules of grammar and conjugation.
  Exercises of application.
- Learning vocabulary related to a theme.
  Reading and analyzing a text.
- Work of oral expression
  Listening to tapes.
  Discussions.
- Work of written expression. Writing.
- Cultural Awareness
  Search for information (Internet, reading documents).
  Presentations.

English (s1) (I2 S1)

TOTAL	Lectures	Tutorial	Laboratory	Project	Lab Test	Exams	Erasmus Code
15 s.		13 s.				2 s.	0007
3 marks		1 mark				2 marks	

Targeted skills

- Understand conversations about common events, one-on-one explanations on a common professional nature.
- Read relatively simple technical documentation. Read by using the dictionary, news articles and more literary extracts. Identify misconceptions.
- Talk about common topics by using simple structures. Participate in discussions about practical problems. Organize planned events by telephone. Make short presentations (20 min.) prepared (without reading).
- Write e-mails using the past, present or future. Write instructions, short service marks, a meeting report, cover letters and a targeted resume.

Synthetic program

Listening training (listening comprehension)
- Image analysis.
- Questions - answers.
- Short conversations.
- Monologues.

Practice in reading (reading comprehension)
- Sentences to be completed.
- Identification of errors.
- Understanding texts.

General English language learning
- Rules of grammar, agreements, words order, syntax rules, conjunctions, prepositions, determination ...
- Conjugation: construction and use of tenses, irregular verbs ...
- Vocabulary by themes.
- Idiomatic turns and false friends.
- Study of texts, individual work, in pairs or in small groups; Oral report in class or written report

Awareness to Anglophone or international culture:
- Study of press articles, following the news.
- Discussions, presentations, debates. Individual or group oral presentations.

IT security (I2 S2)

TOTAL	Lectures	Tutorial	Laboratory	Project	Lab Test	Exams	Erasmus Code
9 s.	8 s.					1 s.	2568
1 mark						1 mark	

Targeted skills

- Estimate the accidental and intentional risks associated with an information system and apply the basic rules of computer security.
- Participate in the development and implementation of an IT security policy in an enterprise context.
- Participate or implement a logic of intelligence and protection of the company's information with reference to the concepts of computer security and economic intelligence.

Synthetic program

Introduction to Computer Security, Disasters and Security Panoramas
- Situational analysis
- Contexts of risks and threats
- Consequences and impacts
- Safety means and devices
- Security and Economic Intelligence

Security Policy: Design and Implementation
- IT Security Issues
- Establish a security policy, methods, models and classifications
- Example of Countermeasures

Safety of operation
- Context of risks
- Physical Security
- Hardware and software continuity of service solutions
- Backup data protection

The security of a workstation
- Vulnerabilities of workstations
- Physical and application risks
- The problem of security breaches
- Risks due to Internet browsing
- Risks related to email services
- Malware, Viruses and other parasites
- Securing a workstation

Computer security: tools and security technology
- Authentication
- Computer encryption methods
- Strong authentication systems
- The compartmentalisation of an information system
- The VPN
- Security of Wi-Fi networks
- Some tools for advanced network protection

Conference: Economic Intelligence

System programming (I2 S2)

TOTAL	Lectures	Tutorial	Laboratory	Project	Lab Test	Exams	Erasmus Code
26 s.	6 s.	8 s.	10 s.		1 s.	1 s.	0078
2 marks					1 mark	1 mark	

Targeted skills

- Design programs in C based on the fundamental notions of system programming: creation of processes and threads for multitasking and multithreading programs.
- Use communication structures between processes: signals, tubes (anonymous and named) and shared memories.
- Use IPC (Inter-Process Communication) such as shared memories and semaphores that implement systems programming concepts: atomicity, critical resource, mutual exclusion ...
- Design and program semaphore-based applications to solve synchronization problems such as producer-consumer, philosophers, etc.

Synthetic program

Communication by tubes
- Anonymous Tubes
- Named Tubes

Shared Memory Segments
- Creation
- Attachment
- Detachment of a segment
- Destruction of a segment
- Example of shared memory between two processes

Competitor access
- Definitions
- Synchronization by sending messages
- Synchronization by Semaphores
- Synchronization algorithms
- Active standby synchronization

Unix (I2 S2)

TOTAL	Lectures	Tutorial	Laboratory	Project	Lab Test	Exams	Erasmus Code
11 s.	4 s.		6 s.		1 s.		0089
1 mark					1 mark		

Targeted skills

- Use the main functions of the Unix command language, in particular process manipulation and file management.
- Have an overview of the operation of the operating system.
- Master the development of Shell scripts on Unix.

Synthetic program

History and evolution of the Unix system

Unix System Architecture

The file system

Basic commands

Redirections

Unix protections

The main filters

Writing shell scripts

Unix Administration
- System activation and shutdown: boot, / etc / rc *
- Main Demons
- The / etc / passwd / file: adding users
- Group definition
- Environmental settings
- Disk space control
- Adding Devices

Networks : implementation (I2 S2)

TOTAL	Lectures	Tutorial	Laboratory	Project	Lab Test	Exams	Erasmus Code
21 s.	6 s.	3 s.	10 s.		1 s.	1 s.	0063
3 marks					1 marks	1 mark	

Targeted skills

- Optimize the addressing plan by different techniques (calculation, NAT, DHCP, ...)
- Define the operation of Ethernet LANs and their variants.
- Know the functionality of WANs and the protocol approach.
- Understand how routing protocols work

Synthetic program

WAN Networks
- Definition
- WAN terminology (synchronous, asynchronous, CPE, PE, ...)
- Physical Standards (X21, V35, ...)
- Different WAN disconnection methods (point-to-point, circuit switching and packet switching)
- WAN protocols (HDLC, PPP, ATM, Frame Relay)
- The Frame Relay
- Example: back-to-back configuration of two routers

Design
- The basic concepts of local area networks
- What is a local network?
- The protocols
- Implement a network
- Bandwidth, switched network, throughput, Full Duplex
- Security, VLAN, Administration

Assembly and Wiring
- Project planning
- Installing wall and RJ-45 outlets
- Cable Installation Basics
- Installation of structured cables
- Basics of technical rooms and switchboards
- Test equipment for structured cabling projects

Description and hardware study of a router
- Router configuration source
- Internal architecture of a router
- Starting a router

Installation and configuration of equipments
- Presentation of the different modes
- Enable IP on interfaces
- Enable routing between routers
- How to check the configuration on a router
- Configuration files: running-config and startup-config
- The backup

Network troubleshooting
- Common Symptoms
- Solutions
- Microsoft Tools
- Show and debug command

Modeling & system analysis (I2 S2)

TOTAL	Lectures	Tutorial	Laboratory	Project	Lab Test	Exams	Erasmus Code
15 s.	5 s.	5 s.	4 s.			1 s.	2198
2 marks			1 mark			1 mark	

Targeted skills

- Study a Markov chain: define the matrix and the graph of the transitions of a stochastic system.
- Evaluate the characteristic elements of a Markov chain: periodicity, nature of states, type of chain, etc.
- Model a system using a Markov model (modeling the operation of a printer and determining performance parameters such as: utilization rate, average time of an interruption).
- Program the three basic problems of hidden Markov models: evaluation, recognition (decoding) and learning.
- Model and implement a language identification system using a hidden Markov model.

Synthetic program

Markov chains
- Stochastic processes
- Markov process
  - Probabilities of transition
  - Markov property
  - Matrix of transitions
- Matrix of transitions of order n
- Probabilities of state
- Date of first change from state i to state j
- Classification of states
- Absorbent states and probabilities of absorption.

Hidden Markov Chains (MMC)
- Introduction and motivations
- Definitions
- Calculation of the probability of an observation
- Search for the most probable path (Viterbi algorithm)
- Estimation of parameters of an MMC

Propagation (I2 S2)

TOTAL	Lectures	Tutorial	Laboratory	Project	Lab Test	Exams	Erasmus Code
17 s.		14 s.	2 s.			1 s.	0087
2 marks			1 mark			1 mark	

Targeted skills

- Give the physical meaning of the primary and secondary parameters of a transmission line (two-wire line, coaxial cable). Identify the modifiable values and determine how they can be varied.
- Be able to graph the propagation of a pulse along a transmission line, in HF, in total reflection and in total transmission.
- Determine the operation of a line by knowing the value of its load or the value of the reflection coefficient on its load.

Synthetic program

High Frequency Propagation

Harmonic regime

Pulse regime

Problems of adaptation

Laboratory :
- Study of a two-wire line

Modulation (I2 S2)

TOTAL	Lectures	Tutorial	Laboratory	Project	Lab Test	Exams	Erasmus Code
14 s.		9 s.	4 s.			1 s.	1496
2 marks			1 mark			1 mark	

Targeted skills

- Explain the need for modulation in signal transmission: the notion of carrier and occupied bandwidth.
- Determine the spectrum, the occupied bandwidth and the performance according to the type of modulation used: amplitude modulation and argument modulation (frequency and phase).
- Demodulate a signal by minimizing the loss of information with respect to the signal before modulation.

Synthetic program

Analog amplitude, frequency and phase modulations

Baseband Transmission

Digital modulations

Frequency, Time and PCM Multiplexing

Laboratory :

- - Amplitude modulation.
- - Frequency modulation.

Occupational Health & Safety (OHS) at Work (I2 S2)

TOTAL	Lectures	Tutorial	Laboratory	Project	Lab Test	Exams	Erasmus Code
6 s.	2 s.	4					2616
0 mark					1 mark		

Targeted skills

Identify the human, social, economic and legal issues of health - safety at work

Integrate occupational health and safety into the management of one's activities and project management

Sensitize the students to these problems, in particular through practical cases

Put these issues in line with their future position as employees, managers, or managing directors

Contribute to the management of health - safety at work in the company

Synthetic program

Safety at work

Introduction

Elements on the business world

Evolutions and texts of laws related to OHS

Actors and services involved

Indicators and methods of evaluation

Issues and consequences related to OHS

Psychosocial risks

Introduction (Definitions, received ideas, links with OHS, global issues, rapid history)

Presentation of indicators

Focus on management

Evaluation methods and tools presentation

Issues and consequences

Second language (s2) (I2 S2)

TOTAL	Lectures	Tutorial	Laboratory	Project	Lab Test	Exams	Erasmus Code
13 s.		12 s.				1 s.	1693
2 marks		1 mark				1 mark	

Targeted skills

- Practice a foreign language other than English.
- Know the culture of at least one region where this language is spoken.

Synthetic program

Taking into account the level.
Unlike English, students are not required to achieve a minimum level that would be the same for an entire promotion.
Thus, students are divided into groups of levels.
The objective assigned to them is to have progressed correctly at the end of the school year in proportion to the hourly volume devoted to the second language.

- For beginners :
  - Have assimilated the grammar rules and vocabulary in common use.
  - Master the pronunciation and writing rules of the language.
  - Be able to read and write simple text by using a dictionary.
  - Know the characteristics of the culture of a region where the language is spoken.

- For intermediate level:
  - Have addressed all the grammatical rules and conjugations of the language.
  - Be able to read a press article, participate in a conversation, write a letter.
  - Be able to present a region where the language is spoken.

- For advanced level:
  - Master the most grammatical rules and conjugations of the language.
  - Be able to write a professional writing, conduct an interview, make an oral presentation, read a short story.
  - Know several regions where the language is spoken and be able to present and compare them

Method used

- Systematic study of the rules of grammar and conjugation.
  Exercises of application.
- Learning vocabulary related to a theme.
  Reading and analyzing a text.
- Work of oral expression
  Listening to tapes.
  Discussions.
- Work of written expression. Writing.
- Cultural Awareness
  Search for information (Internet, reading documents).
  Presentations.

Participatory and personal commitment (I2 S2)

TOTAL	Lectures	Tutorial	Laboratory	Project	Lab Test	Exams	Erasmus Code
0 s.							2483
1 mark							

Targeted skills

- Ability to communicate.
- Work independently.
- Meet the requirements of a specification.
- Have the culture of the result.
- Adapt oneself to different audiences.
- Develop and / or defend a project.
- Drive the innovation.
- Participate in a human, multicultural, social, ecological (in the broad sense of the term) and ethical environment.

Synthetic program

Choose one action at the beginning of the year.

Possible actions are those that aim to enhance, promote and / or develop:

- The associative student life,
- The transmission of know-how and know-how-to-be,
- The development of new skills,
- The trainings offered within the 3iL Group

Pre-registration to:

- Verify the feasibility of the action
- Verify the eligibility of the requested action
- Apply for a budgetary commitment

Acceptance and Definitive Registration to:

- Specify the referring teacher if necessary
- Retrieve the instructions sheet + follow-up / validation

Carry out the steps of the action.

Fill in and return the documents corresponding to the action (minutes, photos, supporting documents, etc.)

Project (I2 S2)

TOTAL	Lectures	Tutorial	Laboratory	Project	Lab Test	Exams	Erasmus Code
53 s.			2 s.	51 s.			0051
2 marks				1 mark			

Targeted skills

- Apply to a real (or close to reality) case the knowledge and skills acquired during the training.
- Acquire by yourself, complementary skills according to a given situation.
- Teamwork: get involved, collaborate, organize, coordinate, manage unforeseen or sensitive situations.
- Plan one's activities (or those of the team) and monitor the progress.

Synthetic program

Organization

- Work carried out by teams of 6 to 10 students to implement the project management.
- A list of subjects for projects is proposed by the teachers. Some subjects may correspond to the actual needs of a company that is in contact with the school and which will benefit from the solution realized at the end of the project.
- Each team is monitored throughout the project by two technical teachers and one teacher in project management. They intervene both as clients (or customer's representative) and as experts in their field.
- In addition to the daily follow-up, two formal points of progress are organized during the project.
- The project ends with a presentation of the obtained results in the presence of the teachers as well as students of the other teams.
- The notation includes a collective part (overall mark of the project) and an individual part (personal involvement of each participant).

Work to be done

- The aim is to deal with a problem whose solution involves a computerization and whose scope justifies the setting up of a team of 6 to 10 people.
- The main steps are:
  - A preliminary study aimed at choosing the technology to be used and / or the strategy to be implemented.
  - The search for information and the acquisition of additional skills necessary for the realization of the project.
  - Designing the solution with the drafting of the file defining and justifying the solution.
  - The achievement of the solution and the drafting of associated documentation.

The proportion of time spent between the different steps can be very variable depending on the nature and the aim of the project.

Internship (12 weeks) (I2 S2)

TOTAL	Lectures	Tutorial	Laboratory	Project	Lab Test	Exams	Erasmus Code
0 s.							0074
4 marks				3 marks			

Targeted skills

- Participate in the implementation of an IT solution through analysis, design and / or realization work within a professional team.
- Report on a lived experience - in writing and orally - and highlight one's involvement in the work carried out.

Synthetic program

Business stay (8 weeks minimum)

- Conduct a computer study and / or implementation, putting into practice at least one of the main lessons of the 2nd year (web, databases, networks, operating systems, etc.).
- - The student must be supervised by a computer scientist.

Internship report

- - Report of the training-course (context, subject, progress and assessment).
- - Development of one of the concepts addressed during the course. The student has to introduce a particular aspect of his work, highlighting the way in which he has been involved: by the choices he has made and / or the points he has deepened.

Support

- - Oral presentation of the report content to a jury of professors.

English (s2) (I2 S2)

TOTAL	Lectures	Tutorial	Laboratory	Project	Lab Test	Exams	Erasmus Code
14 s.		12 s.				2 s.	1691
3 marks		1 mark				2 marks	

Targeted skills

- Understand most professional situations. Understand most stakeholders in international meetings.
- Read almost everything with rare dictionary uses, even in technical areas. Understand a wide range of long and demanding texts, as well as grasp implicit meanings.
- Speak spontaneously and fluently without seemingly having to look for words. Participate in job interviews in their own field of expertise. Support a conversation with ease and accuracy in familiar records.
- Write a cover letter without any help. Write a detailed complaint letter.

Synthetic program

Listening training (listening comprehension)
- Image analysis.
- Questions - answers.
- Short conversations.
- Monologues.

Practice in reading (reading comprehension)
- Sentences to be completed.
- Identification of errors.
- Understanding texts.

General English language learning
- Rules of grammar.
- Conjugation: tenses and irregular verbs.
- Vocabulary by themes.
- Idiomatic turns and false friends.

Awareness to Anglophone or international culture:
- Study of press articles, following the news.
- Discussions, debates.

Business Information System (I3 S1)

TOTAL	Lectures	Tutorial	Laboratory	Project	Lab Test	Exams	Erasmus Code
8 s.	7 s.					1 s.	2342
1 mark						1 mark	

Targeted skills

- Understand, analyze, describe and explain an enterprise information system in its various aspects, be it by its own architecture, application architectures, and identification of the different software components (ERP, CRM, EDM, BI , Intranet, ...).
- Understand and describe the issue of an IS, its purpose and concept of information lifecycle, concepts and methods of IS management.
- Implement or participate in a technological and strategic monitoring in relation to its field of activity

Synthetic program

The data at the heart of the information system: structuring, architectures, security

The information system in the company: Issue, purpose, composition, architecture, urbanization and management

Application architectures (C / S, SOA, Cloud)

The software elements of an IS (ERP-PGI, Decisional and BI, Intranets, EDM, ECM, Workflow)

The legal obligations on the IS related to the accessibility of the disabled

Conference: Strategic and technological monitoring

Engineering career (I3 S1)

TOTAL	Lectures	Tutorial	Laboratory	Project	Lab Test	Exams	Erasmus Code
9 s.	8 s.					1 s.	1562
1 mark						1 mark	

Targeted skills

- Consider the impact of one's activity and choices at a more global level than the current operational level, especially at the human, social and environmental levels, with a long-term perspective and by taking into account the risk.

Synthetic program

Management of homes.

Career development.

Risk management.

Sustainable development.

Quality (I3 S1)

TOTAL	Lectures	Tutorial	Laboratory	Project	Lab Test	Exams	Erasmus Code
9 s.	2 s.	6 s.				1 s.	2226
1 mark						1 mark	

Targeted skills

- Describe the main requirements of ISO 9001 standards.
- Participate in a .c certification process
- Collaborate in the establishment of a quality management system.

Synthetic program

The quality approach
- Quality management
  - Non-quality.
  - Different approaches and strategies.
  - Tools.
  - Quality assurance.
- The certification
  - ISO 9000 standards.
  - The process approach.
  - The quality management system.

Law (I3 S1)

TOTAL	Lectures	Tutorial	Laboratory	Project	Lab Test	Exams	Erasmus Code
17 s.	5 s.	11 s.				1 s.	0029
1 mark						1 mark	

Targeted skills

- Make professional use of the specifications as a tool for dialogue and competition for IT services.
- Evaluate the responsibilities on information technology.
- Apprehend an employment contract in order to evaluate stipulated contractual clauses.

Synthetic program

Law of obligations and information technology.

- Study of the pre-contractual phase.
  - The specifications.
  - The bid solicitation.
  - Pre-contractual obligations of the parties.
  - The particularity regarding public procurement
- Presentation and study of different types of contracts in computer science.
  - Contracts on equipment.
  - Contracts on softwares.
  - The maintenance contract.
  - Insurance contracts.
  - Internet-related contracts.

Criminal law and computer science.

- General principles of criminal law.
  - The elements of the offense.
  - The different categories of offenses in French criminal law.
- Computer fraud.
  - Fraudulent actions on computer systems.
  - Computerized attacks on individual freedoms.
  - General offenses applicable to computers.

Labor law

- General principles of labor law.
  - The employment contract, including the cddod for engineers and managers.
  - The execution of the employment contract.
  - The termination of the employment contract, including the breach of contract resulting from the law of June 2008 and the jurisprudence issued on this subject.
- Labor law in computer science.
  - The computer work contract.
  - Working conditions in computer science.
  - The notion of a computer charter (definition, legal value, practical and professional uses).
- Salaries
  - The composition of the gross salary
  - Wages and the Syntec Convention
  - Different social contributions

Meeting conduct (I3 S1)

TOTAL	Lectures	Tutorial	Laboratory	Project	Lab Test	Exams	Erasmus Code
8 s.		8 s.					0065
2 marks		1 mark					

Targeted skills

- Organize, manage and facilitate a meeting in front of an audience of 20 people.
- Know how to plan a meeting in time and space to inform or make a decision (agenda management, room management, time management).
- Practice active listening to participants, manage questions and provide appropriate responses.
- Manage a group to prepare for teamwork on project management.

Synthetic program

Introduction
- The different types of meetings
- The role of the animator

The different times of a meeting
- The PEOPLE method
- The reception of participants
- Opening of the meeting
- Presentation of the subject (object and purpose) ¨
- Working methods

Key points
- Implementation
- Questions to be asked
- Make everyone express themselves
- The conclusion of the meeting
- Evaluation of the meeting

The roles
- The qualities of the animator
- The golden rules
- Participants: their expectations, their roles ... ¨
- Reports

Practical application
- Simulation exercises.
- Assessment and evaluation of the training

Preparing for recruitment (I3 S1)

TOTAL	Lectures	Tutorial	Laboratory	Project	Lab Test	Exams	Erasmus Code
9 s.		9 s.					0088
3 marks		1 mark				1 mark	

Targeted skills

- Evaluate whether a job proposal is appropriate to one's profile, listing skills and measuring gaps.
- Develop an application file for the proposed job position. Present the required competencies in an appropriate and convincing way.
- Prepare for a job interview, ie to learn about the company, the missions, know one's skills, anticipate and answer the questions, and identify one's added value.
- In situations, to highlight the coherence of his / her career path and project, to enhance his or her successes in a factual manner and in relation to the position in question, to show his / her motivation and to make optimal use of the tools of oral communication by working on attitudes , voice, emotionality ...

Synthetic program

First part: The job search process

Construction of the application file
- From a professional project: search for offers and companies, matching supply and demand, elaboration of the curriculum vitae and a letter adapted

Preparation for recruitment interview
- What is an interview? Who recruits ? How? ...
- Preparation of the interview (reflection on his project, the sector of activity, the company, preparation of questions and argumentation ...)
- General plan of the interview
- Communication: arguing, illustrating ...
- The conduct to be held (politeness, holding ...)
- Recovery and follow-up

Exercises and scenarios
- Correction of a clumsy application file
- Ping-pong (spontaneous answers to questions)
- Roleplaying: recruiting / recruiting

Second part : Setting up a recruitment interview with professionals (30 ')
- The interview
  - Introduce yourself.
  - Argument your application.
  - Answer questions.
  - Be interested in the position and the company.
  - Show motivation
  - Respect the rules of communication and courtesy ...
- Debriefing
  - strengths / weaknesses

Project (I3 S1)

TOTAL	Lectures	Tutorial	Laboratory	Project	Lab Test	Exams	Erasmus Code
72 s.				72 s.			0055
3 marks				2 marks			

Targeted skills

- Apply to a real (or close to reality) case the knowledge and skills acquired during the training.
- Acquire by yourself, complementary skills according to a given situation.
- Teamwork: get involved, collaborate, organize, coordinate, manage unforeseen or sensitive situations.
- Plan one's activities (or those of the team) and monitor the progress.

Synthetic program

Organization

- Work carried out by teams of 6 to 10 students to implement the project management.
- A list of subjects for projects is proposed by the teachers. Some subjects may correspond to the actual needs of a company that is in contact with the school and which will benefit from the solution realized at the end of the project.
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The proportion of time spent between the different steps can be very variable depending on the nature and the aim of the project.

English (I3 S1)

TOTAL	Lectures	Tutorial	Laboratory	Project	Lab Test	Exams	Erasmus Code
16 s.		15 s.				1 s.	0041
3 marks		1 mark				2 marks	

Targeted skills

- Understand conversations about common events, one-on-one explanations of a common professional nature.
- Read relatively simple technical documentation. Read by using the dictionary, news articles and more literary extracts. Identify misconceptions.
- Talk about common topics by using simple structures. Participate in discussions on practical issues. Organize planned events by telephone. Make short presentations (20 min.) prepared (without reading).
- Write e-mails by using the past, present or future. Write instructions, short service memos, a meeting report, cover letters and a targeted resume.

Synthetic program

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- Short conversations.
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Practice in reading (reading comprehension)
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- Identification of errors.
- Understanding texts.

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- Rules of grammar.
- Conjugation: tenses and irregular verbs.
- Vocabulary by themes.
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Awareness to Anglophone or international culture:
- Study of press articles, following the news.
- Discussions, debates.

Advanced networks : basis (I3 Module: Network Solutions)

TOTAL	Lectures	Tutorial	Laboratory	Project	Lab Test	Exams	Erasmus Code
14 s.	6 s.		6 s.		1 s.	1 s.	2424
2 marks					1 mark	1 mark	

Targeted skills

- Design a network architecture based on a need or a problem.
- Describe and define new Internet services and applications: VoIP, XDSL, Multicast, Mobility, ...
- Deploy a network and configure the hardware according to a specific problem.
- Have a technology watch on new services and network applications.

Synthetic program

TCP / IP Basic

The transition to the second generation

Evolutions in the IP world

Ethernet and Optimization Techniques

Architecture and service: IPV6 routing and addressing

IP Mobility

The MPLS architecture.

Operator networks (I3 Module: Network Solutions)

TOTAL	Lectures	Tutorial	Laboratory	Project	Lab Test	Exams	Erasmus Code
9 s.	6 s.		2 s.			1 s.	2425
2 marks			1 mark			1 mark	

Targeted skills

- Understand the concepts and technologies implemented by operators within their communication infrastructures.
- Acquire a global vision of the operator networks' architecture.
- Understand how key protocols are used in access networks and core networks (SONET / SDH, DWDM, ATM, MPLS).
- Design an operator network (IP / MPLS backbone) under GNS3, allowing to experiment the main functionalities of the MPLS: LDP routing, automatic label distribution, construction of switching tables, switching by labels.
- Implement Virtual Private IP Networks (VPNs) of Level 3 GNS3 and dynamips.

Synthetic program

Introduction: a panorama of technologies
- Definition: the network of an operator.
- Role of operators.
- Evolution of operators' networks.
- The market for operators.
- Architecture of the network of operators.

Transmission networks (WDM, DWDM, SONET / SDH)
- Plesiochron Hierarchy: PDH (Plesiochronous Digital Hierarchy).
- Synchronous hierarchy: SONET / SDH.
- WDM and DWDM multiplexing.
- Optical networks.

ATM (Asynchronous Transfer Mode)
- What is ATM?
- The main objectives of the ATM.
- General characteristics of the ATM.
- Operating principles of the ATM.
- Virtual circuits and conduits.
- ATM architecture.
- The ATM Adaptation Layer (AAL).

MPLS and GMPLS
- - Introduction: What is MPLS?
- - The main objectives of the MPLS and the reasons for its success.
- - Principles of MPLS technology.
- - Switching Labels.
- - MPLS encapsulation.
- - Labels distribution: the LDP protocol.
- - Applications: MPLS VPN and Traffic Engineering.
- - Generalization of the MPLS: the GMPLS.

High-speed Ethernet

- - Ethernet switching and its positioning in operator networks.
- - New metropolitan and extended techniques: Ethernet 10 and 100 GbE, IEEE 802.17.
- - Ethernet Carrier Grade.
- - Ethernet as access network.

Internet access networks (I3 Module: Network Solutions)

TOTAL	Lectures	Tutorial	Laboratory	Project	Lab Test	Exams	Erasmus Code
14 s.	8 s.		4 s.		1 s.	1 s.	2426
2 marks					1 mark	1 mark	

Targeted skills

- Define the different types of access (Fiber, ADSL, ...)
- Know the architecture of optical networks.
- Describe an ADSL Internet access operation.
- Understand the transport mechanisms of information in wireless networks (modulation, coding, duplexing, antennas, propagation).
- Understand the functioning of the main protocols used in wireless networks (WiFi, WiMax, GSM, UMTS).

Synthetic program

Land access networks
- Fiber optic and different connection solutions
- xDSL modems and the different options.
- The carrier currents on the access network. Is there a future?

Wireless networks:
- The 3G mobile Internet (3G + and LTE) and 4G (LTE-A and WiMAX phase 2)
- The Wi-xx range
- Wireless
- New advances towards mobility

Multimedia (I3 Module: Network Solutions)

TOTAL	Lectures	Tutorial	Laboratory	Project	Lab Test	Exams	Erasmus Code
6 s.	4 s.		2 s.				2427
1 mark			1 mark				

Targeted skills

- Present the evolution of the world of telephone communications during the last decades.

Synthetic program

Quality of Service.
- Control techniques
- Resource control (DiffServ, IntServ, ...)

Multimedia
- The services of ToIP, VoD, IPTV in the company.
- Coding. Standards for video and audio coding
- ToIP
- The transfer of the voice. Internet telephony and voice over IP.
- VoIP applications
- The SIP session protocol
- Implementation (Asterisk)
- The Peer to peer.

Virtualisation (I3 Module: Network Solutions)

TOTAL	Lectures	Tutorial	Laboratory	Project	Lab Test	Exams	Erasmus Code
4 s.	2 s.		2 s.				2428
1 mark			1 mark				

Targeted skills

- Configure the various components of virtualized networks (VirtualNIC, VirtualSwitch, VirtualRouter, Virtual Hosts, Virtual Machines).
- Designed virtualization scenarios in LAN or VLAN network configurations, and in public / private Cloud configurations (IaaS, PaaS).
- Install and configure Hypervisors, and deploy integrated virtualization management platforms.
- Automate the deployment of virtual networks through the management interface or through Scripting.

Synthetic program

Topology of virtual networks

Components of a virtualized network: VirtualNIC, VirtualSwitch, VirtualRouter

Network Virtualization Scenarios (DMZ, VLANS)

Hypervisors, server environments and VDI infrastructures

Implementation of a private Cloud infrastructure

Implementation of Integrated Virtualization Management Tools (SCVVM)

Mobile robotics (I3 Module: Robotics and embedded systems)

TOTAL	Lectures	Tutorial	Laboratory	Project	Lab Test	Exams	Erasmus Code
16 s.	2 s.		12 s.		1 s.	1 s.	2437
3 marks			1 mark			1 mark	

Targeted skills

- Know the main components of a mobile robot: actuators, sensors.
- Understand the principles of navigation, optimization and control law.
- Design and implement a program to control a mobile robot and use sensors and actuators.

Synthetic program

Introduction
- History,
- Use of mobile robots,
- Different types of mobile robots

Positioning and location
- Odometry,
- Radar,
- Rangefinder, ...

Robot movements
- Actuators,
- Control law,
- Trajectory planning

Environmental modeling
- Visibility graph,
- Discretization,
- Fields of potential

Laboratory
- Discovery and implementation of the various sensors and actuators
- Practice on a mobile robot

Embedded systems (I3 Module: Robotics and embedded systems)

TOTAL	Lectures	Tutorial	Laboratory	Project	Lab Test	Exams	Erasmus Code
14 s.	3 s.		10 s.			1 s.	2438
2 marks						1 mark	

Targeted skills

- Define and justify the choice of the most appropriate operating system to answer the problem of implementing and deploying an embedded platform according to the various hardware constraints (processor, memory capacity and speed, etc.).
- Develop, implement and deploy a Microsoft Embedded Operating System (Windows Embedded or Standard Embedded) by using the appropriate development tools.
- Carry out, implement and deploy an embedded Linux operating system using Linux sources.

Synthetic program

Introduction to Embedded and Mobile Systems
- Generality,
- Panorama of embedded and mobile operating systems,
- Mobile phone solutions

Windows systems
- Microsoft Windows Embedded Solutions: Windows Embedded Compact, Windows Embedded Standard, .Net µFramework, Windows Mobile and Windows Phone,
- Realization of Windows Embedded Compact on Ebox 3350

Linux Systems
- Creation of a Linux From Scratch,
- Linux on Ebox platform 3350,
- Linux on Filesystem Read Only

Artificial Intelligence (I3 Module: Robotics and embedded systems)

TOTAL	Lectures	Tutorial	Laboratory	Project	Lab Test	Exams	Erasmus Code
17 s.	8 s.		8 s.			1 s.	2439
5 marks			3 marks			1 mark	

Targeted skills

- Choose a solution among the main techniques of AI (Artificial Intelligence) according to the problem and the expected goal.
- Implement supervised and unsupervised learning mechanisms for neural networks. Know the limits of these techniques and their applications.
- Design and develop a handwriting recognition tool based on the Hidden Markov Model (HMM).
- Design and develop a motion detection tool based on a Bayesian network.
- Model an artificial intelligence problem using the Prolog language, when appropriate.

Synthetic program

Neural networks
- Synthetic course on AI and its basic techniques
- Presentation of the principles of neural networks.
- Supervised and unsupervised learning.
- Practice on reverse kinematics and character recognition.

Hidden Markov Model
- General presentation of a recognition system.
- Stages of learning and recognition
- Performance measure of a classifier.
  - Classification by using Hidden Markov Models (HMM).
  - Modeling of a recognition system using an HMM
  - Evaluation problem: probability of observing a sequence.
  - Decoding or recognition problem.
  - Training problem (Learning): estimation of the parameters of an HMM.
- Application to the recognition of isolated handwritten figures.

Bayesian network
- Motion detection by two different methods
- Bayesian network: definition + examples.
- Example of use of the Bayesian network in motion detection

Constraint programming
- Presentation of the course
- Imperative Programming vs Logic Programming
- Prolog Language
- Examples of programs
- Cut-off predicate
- Lists
- Constraint logic programming

System security (I3 Module: Cyber Security)

TOTAL	Lectures	Tutorial	Laboratory	Project	Lab Test	Exams	Erasmus Code
14 s.	4 s.		8 s.		1 s.	1 s.	0885
2 marks					1 mark	1 mark	

Targeted skills

- Understand the various issues and their solutions related to the security of systems and directories.
- Install and set up an Active Directory or LDAP directory in a graphical or command line environment.
- Manipulate the various objects of a directory (creation, modification, deletion, rights management, inheritance, on users, groups, OU, etc.).
- Implement NTFS security and GPOs.

Synthetic program

System security:

- User management in Windows
  - Management of SAM and Active Directory
  - Group strategy
  - Management of users and groups
  - NTFS security, quota management and access to resources
  - Cloning a Windows station
- Unix User Management
  - The traditional model
  - Shadow accounts
  - Distributed model, NIS / NFS services
- Sharing resources
  - Access to Unix resources through Microsoft SFU
  - Integration of SAMBA 3 into a Microsoft domain
  - SAMBA 3 as a domain controller

Directory security:

- LDAP directories, the X500 protocol
- Centralizing accounts and resources in an LDAP directory
- Installation, configuration and administration of OpenLDAP
- OpenLDAP as a UNIX account directory
- Secure communications and access to OpenLDAP
- OpenLDAP ACLs

Network security (I3 Module: Cyber Security)

TOTAL	Lectures	Tutorial	Laboratory	Project	Lab Test	Exams	Erasmus Code
17 s.	7 s.		8 s.		1 s.	1 s.	0886
2 marks					1 mark	1 mark	

Targeted skills

- Audit a network to determine its weaknesses from the point of view of its security, both from a human and a material point of view.
- Secure an enterprise network by implementing basic techniques.
- Understand technical and human security developments in order to be able to collaborate with other professionals in the field.

Synthetic program

Objectives of a Corporate Security Policy

Legal Responsibilities of the Company and the Network Administrator

Risk typology

Techniques for collecting sensitive information

Analysis of the risks associated with the actions of network users

Analysis of the risks related to the network technologies (cutting according to the layers and protocols)

Analysis of attack mechanisms

Sources of useful information, CERTS

Securing techniques (proxies, packet filtering, address and port translation, software fault monitoring)

Choice of a network architecture allowing an optimal implementation of these techniques.

Intrusion detection, network monitoring

Reactions following an attack or intrusion.

Cryptography (I3 Module: Cyber Security)

TOTAL	Lectures	Tutorial	Laboratory	Project	Lab Test	Exams	Erasmus Code
16 s.	9 s.	2 s.	4 s.			1 s.	0887
3 marks			1 mark			1 mark	

Targeted skills

- Understand the basic principles of cryptography.
- Implement simple cryptographic algorithms or protocols.
- Identify situations of insecure use of cryptography.

Synthetic program

Introduction: Motivations 1h
- Confidentiality. Encryption, decryption, cryptanalysis.
- Identification. Authentication. Integrity. Commitment.

Classical encryption
- Principles
  - Encryption by substitutions and permutations
  - Cryptanalysis
  - Disposable mask, perfect safety
- Algorithms
  - Block encryption.
  - DES, 3DES, RC4, IDEA, Blow / TwoFish, AES ...
  - Chaining Modes.

Public key encryption 3h
- Exchange of keys (Diffie-Hellman).
- Asymmetric encryption (RSA, El Gamal).
- One-way functions.
- Symmetrical / asymmetrical combination.

Digital Signatures 3h
- Signature properties
- Asymmetric signatures (RSA, DSA, OSS)
- Cipher / signature combinations

Hash functions 1h
- SHA-1, MD5, Ripemd-160, ...
- Resistance to collisions

Identification 3h
- Kerberos (identification and exchange of keys).
- Passwords. Lamport.
- Zero-knowledge (Fiat-Shamir, Schnorr, Guillou-Quisquater)
- Smart cards.

Standards 1h
- RFCs.
- ISO.
- PKCS.

Software Engineering tools for Java (I3 Module: Professional Java)

TOTAL	Lectures	Tutorial	Laboratory	Project	Lab Test	Exams	Erasmus Code
11 s.	2 s.		8 s.		1 s.		0891
1 mark					1 mark		

Targeted skills

- Write a script for the Ant software to optimize repetitive file generation operations. For example: compiling, packaging, and deploying a Java application to run on a server.
- Use the Java Logging API to incorporate a trace mechanism into a Java program. Configure it by using a configuration file.
- Design, realize and execute a unit testing program for a Java class, by using the JUnit framework. Generate the report in HTML format.

Synthetic program

Ant
- Automation of the build process.
- Structure of an Ant script: project, targets and tasks.
- Syntax of the most common tasks.

Java Logging API
- Trace of execution of a software. Criticality levels.
- API components: loggers and handlers.
- Configuration of the execution.

JUnit
- Automation of unit tests with JUnit ..
- Creation of test methods with annotations.
- Running tests from Eclipse and with Ant .

Web development on Java (I3 Module: Professional Java)

TOTAL	Lectures	Tutorial	Laboratory	Project	Lab Test	Exams	Erasmus Code
16 s.	5 s.		10 s.		1 s.		1416
1 mark					1 mark		

Targeted skills

- Understand n-tier architectures with JEE technology. Develop and deploy a dynamic web site with JSP / Servlet on a web server and a servlet container. Know the advanced features of JSP / Servlet, Filters and Listeners.
- Develop a Web application that allows access to a database via the JDBC API.
- Configure and use the Struts Framework for rapid creation of a Web application based on the MVC paradigm.

Synthetic program

Servlet
- Introduction
- Overview of the Tomcat server.
- Creating and deploying a servlet.
- Servlet life cycle.
- Link with HTML forms.

JSP
- Introduction
- Composition of a page
- Script elements
- Guidelines

JDBC
- Different types of drivers
- Connection to a BDD
- Querying different types using servlets

Struts Framework
- - Principle
- - Installation
- - Development of an application under Struts

Application servers Java EE (I3 Module: Professional Java)

TOTAL	Lectures	Tutorial	Laboratory	Project	Lab Test	Exams	Erasmus Code
19 s.	6 s.		12 s.		1 s.		1752
1 mark					1 mark		

Targeted skills

- Use the JPA API to construct feature classes corresponding to a relational database. Use these classes to perform read and write access to the database.
- Design and build an application based on low-coupling components, applying the design pattern "dependency injection" and using the Spring framework.
- Design and build a client-server application based on EJB business components, involving access to a database and execution of transactions.

Synthetic program

Supplements on the Java language
- Naming convention.
- Annotations.

Java Persistence API (JPA)
- Object-relational mapping.
- O-R mapping syntax with JPA: entities, primary key, relations.
- Access to data, use of the Entity Manager.
- Queries with the JPQL language.

The IoC design pattern
- Case study showing the interest of IoC (inversion of control) and injection of dependence.
- Design patterns: overview and example of the singleton.
- Injection of dependence: by mutator, by constructor.

The Spring IoC framework
- Overview of the Spring framework.
- Basic syntax, use of an ApplicationContext and an XML file.
- Nested definitions, injection of collections, modes of instantiation.

Application servers
- Context of appearance.
- Multi-tier architectures (n-tier) and services provided.
- The Java EE standard is its APIs.

Enterprise Java Beans (EJB)
- Business components running on the server side. Typology.
- Practical implementation. Basic syntax.
- Deployment and use by a customer.
- Transaction management. Commits to 2 phases.

Internet service management (I3 Module: Web & Mobiles Technologies)

TOTAL	Lectures	Tutorial	Laboratory	Project	Lab Test	Exams	Erasmus Code
16 s.	6 s.		8 s.		1 s.	1 s.	0892
2 marks					1 mark	1 mark	

Targeted skills

- Set up a large website: reserve and manage a domain, reserve and manage IP addresses, reserve and manage a stand-alone system.
- Implement a secure website: secure the web server, create and host certificates, implement the HTTPS protocol.
- Set up various protocols and software so that they can collaborate with web servers.

Synthetic program

Organization and governance of the Internet
- The various bodies, the delegations
- Administrative procedures
  - Procedures for the filing of a domain name (fr, others, ...), for obtaining an address class, for obtaining an AS number

The basic protocols

Reminder on network interconnection
- Architectures: Lan, backbone networks, Wan
- Switched links, permanent links
- Connection types: Analog, ISDN, LS, ADSL, Frame Relay

The Internet
- General architecture: interconnection of AS plates
- The 3 levels: ISP AS, ISP non AS, end customers
  - ISP Autonomous systems
    - Definition, strategy, technical and administrative obligations (BGP4, DNS, peering ...), general supply (hosting, provision of access (POP, ...), professionals and individuals, … connexion with other AS), example of architecture
  - ISP non Autonomous systems
    - Definition, strategy, technical and administrative obligations, supply in general
  - End customers
    - Objectives and offers (notion of IP ports, ...), available means.
- Security
  - filtering techniques (ports, addresses, ..), encryption techniques (public key, private key, VPN).

Frameworks (I3 Module: Web & Mobiles Technologies)

TOTAL	Lectures	Tutorial	Laboratory	Project	Lab Test	Exams	Erasmus Code
17 s.	6 s.		10 s.		1 s.		0893
1 mark					1 mark		

Targeted skills

- Mastering the writing of a Web application using a modern framework.

Synthetic program

Basic Components

Injection of dependence

ORM

Template engine

Application life (log + cache)

Internal Authentication + Basic ACL

Routing queries

Creating forms

Web and Mobiles Technologies (I3 Module: Web & Mobiles Technologies)

TOTAL	Lectures	Tutorial	Laboratory	Project	Lab Test	Exams	Erasmus Code
13 s.	4 s.		8 s.			1 s.	1751
3 marks			1 mark			1 mark	

Targeted skills

- Ability to handle tools helping to develop web applications.
- Ability to select the most appropriate tools for different situations
- Understand the specificities of the Web on mobile

Synthetic program

Panorama of Web technologies
- HTML5 API (websockets, geolocation)
- JavaScript framework for templating (Mustache, Twig)
- Application JavaScript framework (Angular, Ext JS)
- Preprocessor CSS (LESS, SASS)
- Testing tools (Selenium)
- PHP unit tests
- Dependency Management PHP (Composer)
- SEO Optimization
- Securing applications
- API social networks (Twitter)

Mobile Web Development
- Specificities of Mobile Web
- Responsive design / media queries
- JavaScript Framework Mobile (jQuery Mobile or Sencha Touch)
- Hybrid mobile application with Adobe Phonegap / Apache Cordova

Graphics Interfaces Development (I3 Module: Visual & 3D Interfaces)

TOTAL	Lectures	Tutorial	Laboratory	Project	Lab Test	Exams	Erasmus Code
16 s.	5 s.		10 s.			1 s.	2308
3 marks			1 mark			1 mark	

Targeted skills

- Support and implement the manufacturing and deployment processes of a software graphical user interface in fixed or mobile heavy clients.
- Perform and justify the choice of the technology (IDE and associated language) the most adapted to answer a problem of development of a software GUI of heavy client type.
- Perform and justify the choice of the technology (IDE and associated language) the most adapted to answer a problem of development of a GUI on mobile.

Synthetic program

General: architecture, compilation, libraries, graphic interfaces

Office applications: from APIs to libraries
- Win32, XLib API
- C libraries, software components
- High level IG: Java and .Net
- The main IDE
- Case study: Qt

Mobile development
- Owner development
- Multiplatform development

.Net Development (I3 Module: Visual & 3D Interfaces)

TOTAL	Lectures	Tutorial	Laboratory	Project	Lab Test	Exams	Erasmus Code
16 s.	4 s.		10 s.		1 s.	1 s.	2190
2 marks					1 mark	1 mark	

Targeted skills

- Perform a software development under the .Net platform by using WindowsForm technologies in C # or VB.Net.
- Select and implement one of the data access technologies offered by the .Net platform (ADO.Net, Link, WebService, WCF)
- Perform graphical software development under the .Net platform using WPF-XAML-based technology (WPF, Silverlight, Universal App).
- Understand and know how to implement Linq with a SQL Server database, the advantages and limitations of Linq in C #

Synthetic program

Introduction to the .Net platform (architecture, API and languages)

Access to data in .Net: Ado.Net, Web services, WCF

WPF - Silverlight - Metro / WinRT - Universal App

Linq

3D Development (I3 Module: Visual & 3D Interfaces)

TOTAL	Lectures	Tutorial	Laboratory	Project	Lab Test	Exams	Erasmus Code
16 s.	4 s.		10 s.		1 s.	1 s.	2191
2 marks					1 mark	1 mark	

Targeted skills

- Understand the principles of 3D design.
- Design and realize a program implementing a 3D graphic zone in C #.
- Use DirectX to display 3D shapes, with color, texture and lighting management.

Synthetic program

Introduction to 3D with DirectX and more specifically Managed DirectX in C #

Integrating a 3D drawing area into a standard graphical interface

Creating and displaying 3D shapes, color management, textures, ...

Installation of lighting and camera.

Interactions with the user.

Legal and social environments (I3 Module: Innovate & Undertake)

TOTAL	Lectures	Tutorial	Laboratory	Project	Lab Test	Exams	Erasmus Code
14 s.	8 s.	5 s.				1 s.	0896
1 mark						1 mark	

Targeted skills

- Choose a legal status for the creation of a business. Arguing the reasons for this choice based on its administrative and social implications.

Synthetic program

The legal structure
- The different legal statuses.
- The criteria of choice.

The file of the company
- Who can we address with ?
- Constitution of the file.

Social security cover
- The leader.
- The employee.

Insurance
- The company's obligations
- Other insurances

Innovation and strategy (I3 Module: Innovate & Undertake)

TOTAL	Lectures	Tutorial	Laboratory	Project	Lab Test	Exams	Erasmus Code
12 s.	6 s.	5 s.				1 s.	0897
1 mark						1 mark	

Targeted skills

- Evolve in a competitive world to develop one business
- Choose the most appropriate means to protect an innovation.
- Look for innovation support or the creation of an innovative company.

Synthetic program

Economic intelligence

Strategic organization

Patents and trademarks. Intellectual property

Industrial Property Strategy

Aid for innovation

Business plan elaboration and project construction (I3 Module: Innovate & Undertake)

TOTAL	Lectures	Tutorial	Laboratory	Project	Lab Test	Exams	Erasmus Code
19 s.	6 s.	12 s.				1 s.	0898
1 mark						1 mark	

Targeted skills

- Determine whether a project is realistic given the market and capital requirements.
- Identify all steps to build a complete business plan.
- Identify the different sources of funding and study the cost-effectiveness of a project.
- Understand the purpose of a project and reflect on its different aspects, anticipating in an optimized way the implementation of the action.

Synthetic program

The project, Business model; General operating logic

Market analysis

The environmental analysis

Strategic choices for the company

Market research; A key step for the future implementation of the project
  - - Marketing strategy

The plan of promotion-sales plan

The Business Plan

Educational tools:
  - Gantt chart
  - Causes and Effects Diagram
  - The life cycle of the product
  - SWOT Matrix
  - PESTEL Matrix
  - BCG Matrix
  - MIX
  - Deming Wheel

End-of-course internship (24 weeks) (I3 Semester 2)

TOTAL	Lectures	Tutorial	Laboratory	Project	Lab Test	Exams	Erasmus Code
0 s.							0931
4 marks				3 marks			

Targeted skills

- Carry out an engineering assignment.
- Assume responsibility for both technical and project management.
- Deepen one aspect of the experience so that the content and the lessons learned can be transmitted in writing and orally.

Synthetic program

Business stay (24 weeks minimum)

- Realization of a mission that would normally be entrusted to a computer engineer.
- Assume the responsibility for this mission both on the technical level and on the project management
- The student must be supervised by an engineer or a person of equivalent qualification.

Graduate dissertation

- Report of the course (context, subject, progress and assessment).
- Thorough reflection on one of the subjects covered during the course.
  - Presentation of the concepts and means implemented.
  - Discussion of the debating points: the questions that arise, the different points of view (including that of the student from his / her own experience)
  - A return from the experience: confrontation of the theory with its implementation, assessment of the choices made and solutions chosen, extension to other contexts.

Support

- Oral presentation of the contents of the dissertation to a jury composed of professionals and professors.