# Integrated Preparatory Cycle (CPI)

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# Programs

**(January 2012)**

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# Distribution of courses - 1st year

| 1ère Year CPI - SEMESTER 1 (15 weeks) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Teaching Unit** | | **Material** | **Material Code** | **Course (hours)** | **TD (hours)** | **TD/TP (hours)** | **Weekly volume (hours)** | **Semester volume (hours)** | **Coef.** | **Credits** |
| Fundamental Unit **UEF1** | UEF1.1 | Algorithms and static data structures | ALSDS | 2 | | 4 | 6 | 90 | 5 | 6 |
| | UEF1.2 | Architecture of computers1 | ARCH1 | 3 | | 2 | 5 | 75 | 4 | 5 |
| | UEF1.3 | Introduction to the Operating System1 | SYST1 | | | 2 | 2 | 30 | 3 | 3 |
| Fundamental Unit **UEF2** | UEF2.1 | Mathematical analysis1 | ANA1 | 3 | 3 | | 6 | 90 | 5 | 6 |
| | UEF2.2 | Algebra 1 | ALG1 | 1 | 2 | | 3 | 45 | 3 | 3 |
| | UEF2.3 | Electricity | ELECT | 2 | 2 | | 4 | 60 | 3 | 4 |
| Transversal Language Unit **UET1** | UET1.1 | Written expression technique | TEE | | 2 | | 2 | 30 | 2 | 2 |
| Unit of Discovery **UED1** | UED1.1 | Office and Web | BW | | | 2 | 2 | 30 | 1 | 1 |
| **TOTALS** | | | | **11** | **9** | **10** | **30** | **450** | **26** | **30** |

| 1st Year CPI - SEMESTER 2 (15 weeks) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Teaching Unit** | | **Material** | **Material Code** | **Course (hours)** | **TD (hours)** | **TD/TP (hours)** | **Weekly volume (hours)** | **Semester volume (hours)** | **Coef.** | **Credits** |
| Fundamental Unit **UEF3** | UEF3.1 | Algorithms and data structures dynamics | ALSDD | 2 | | 4 | 6 | 90 | 5 | 6 |
| | UEF3.2 | Introduction to the System of operation2 | SYST2 | 1 | | 2 | 3 | 45 | 3 | 3 |
| Fundamental Unit **UEF4** | UEF4.1 | Mathematical analysis2 | ANA2 | 3 | 3 | | 6 | 90 | 5 | 6 |
| | UEF4.2 | Algebra 2 | ALG2 | 2 | 2 | | 4 | 60 | 3 | 4 |
| Methodology Unit **UEM1** | EMU1.1 | Point Mechanics | MECA | 1 | 2 | | 3 | 45 | 3 | 3 |
| | EMU1.2 | Fundamental Electronics1 | ELECF1 | 2 | 2 | | 4 | 60 | 4 | 4 |
| Transversal Language Unit **UET2** | UET2.1 | Speaking skills | TEO | | | 2 | 2 | 30 | 2 | 2 |
| | UET2.2 | English 1 | ENG1 | | 2 | | 2 | 30 | 2 | 2 |
| **TOTALS** | | | | **11** | **11** | **8** | **30** | **450** | **27** | **30** |

# Distribution of courses - 2nd year

| 2ème Year CPI - SEMESTER 3 (15 weeks) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Teaching Unit** | | **Material** | **Material Code** | **Course (hours)** | **TD (hours)** | **TD/TP (hours)** | **Weekly volume (hours)** | **Semester volume (hours)** | **Coef.** | **Credits** |
| Fundamental Unit **UEF5** | UEF5.1 | Structure Files and Structures of Data | SFSD | 2 | | 2 | 4 | 60 | 4 | 4 |
| | UEF5.2 | Architecture of Computers2 | ARCH2 | 2 | | 2 | 4 | 60 | 4 | 4 |
| Fundamental Unit **UEF6** | UEF6.1 | Mathematical Analysis3 | ANA3 | 3 | 3 | | 6 | 90 | 5 | 6 |
| | UEF6.2 | Algebra3 | ALG3 | 1 | 2 | | 3 | 45 | 3 | 3 |
| Methodology Unit **UEM2** | EMU2.1 | Fundamental Electronics2 | ELECF2 | 2 | | 2 | 4 | 60 | 4 | 4 |
| | EMU2.2 | Probability and Statistics1 | PRST1 | 2 | 2 | | 4 | 60 | 4 | 4 |
| Discovery Unit **UED2** | UED2.1 | Business Economics | ECON | 3 | | | 3 | 45 | 2 | 3 |
| Transversal Language Unit **UET3** | UET3.1 | English 2 | ENG2 | | 2 | | 2 | 30 | 2 | 2 |
| **TOTALS** | | | | **15** | **9** | **6** | **30** | **450** | **28** | **30** |

| 2nd Year CPI - SEMESTER 4 (15 weeks) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Teaching Unit** | | **Material** | **Material Code** | **Course (hours)** | **TD (hours)** | **TD/TP (hours)** | **Weekly volume (hours)** | **Annual volume (hours)** | **Coef.** | **Credits** |
| Fundamental Unit **UEF7** | UEF7.1 | Programming Object oriented | OOP | 2 | | 2 | 4 | 60 | 4 | 4 |
| | UEF7.2 | Introduction to Systems Information | SINF | 1 | | 2 | 3 | 45 | 3 | 3 |
| Fundamental Unit **UEF8** | UEF8.1 | Analysis Mathematics4 | ANA4 | 3 | 3 | | 6 | 90 | 5 | 6 |
| | UEF8.2 | Mathematical Logic | LOGM | 2 | 2 | | 4 | 60 | 4 | 4 |
| | UEF8.3 | Optics and electromagnetic waves | OOE | 1 | 2 | | 3 | 45 | 3 | 3 |
| Methodology Unit **UEM3** | EMU3.1 | Multidisciplinary Project | PRI | | | 4 | 4 | 60 | 4 | 4 |
| Methodology Unit **UEM4** | EMU4.1 | Probability and Statistics2 | PRST2 | 2 | 2 | | 4 | 60 | 4 | 4 |
| Transversal Language Unit **UET4** | UET4.1 | English 3 | ENG3 | | 2 | | 2 | 30 | 2 | 2 |
| **TOTALS** | | | | **11** | **11** | **8** | **30** | **450** | **29** | **30** |

# Detailed programs

**UEF 1.1 - ALGORITHMS AND STATIC DATA STRUCTURES**

| EU Code | Module title | Credits |
|---|---|---|
| UEF 1.1 | ALGORITHMICS and STATIC DATA STRUCTURES | 6 |

| Hourly volumes | | | | |
|---|---|---|---|---|
| Course | TD / TP | TP | Other (specify) | TOTAL |
| 30 h. | 60 h. | | | 90 h. |

| Semester: | 1 |
|---|---|

| Prerequisite: | No |
|---|---|

**OBJECTIVES:**

**Acquisition of a methodological approach based on modularity allowing the design and the realization of a small software using elementary objects and static structured data (one- and two-dimensional tables, strings, sets, records)**

**be able to, starting from the statement of a problem, to :**

- **to proceed to its modular division**
- **Analyze and build separately the different modules (main and secondary).**
- **validate each module**
- **program the various algorithms corresponding to the modules (main and secondary) separately**
- **prepare a technical programming file**

**MODULE CONTENT :**

I. BASIC ELEMENTS (~3 hours)
- Algorithm, processor, action
- Programs and programming languages
- from problem to result
- Analysis of a problem

II. PRESENTATION OF ALGORITHMIC FORMALISM (~7 hours)
- Need for an algorithmic formalism
- Presentation of the adopted algorithmic formalism
  - Structure of an algorithm
  - the environment - elementary objects
    - Objects in an environment
    - Statements
    - Declaration of constants
    - Declaration of simple types (standard - non-standard)
    - Variable declarations
  - The body of the algorithm:
    - Control structures:
    - other basic actions (Assignment - Arithmetic, logical, relational and mixed expressions - Reading - Writing)

III. BASIC ELEMENTS OF THE PASCAL LANGUAGE

**Very important note**: The programming language will not be taught at the course level but through a documentation that will be given to the student. Its implementation will be done at the level of the TD/TP sessions. At this level of the course, only the fundamental elements of the language will be given in order to apply the knowledge acquired in chapter I and II. Complements of the language will be provided as the course progresses and according to the various concepts discussed.

- STRUCTURE OF A PROGRAM
- THE BODY OF THE PROGRAM
  - The assignment
  - The expressions
  - The block
  - The IF (if) statement
  - The CASE OF statement (case among)
  - The FOR ( for ) statement
  - The WHILE instruction (as long as)
  - The REPEAT (repeat
  - Entry procedures: READ and READLN
  - The exit procedures: WRITE and WRITELN
  - Program documentation
- THE PROGRAM ENVIRONMENT
  - Definition of an identifier
  - Declaration of constants
  - Type declaration
  - Declaration of variables
- LIST OF RESERVED WORDS
- EXAMPLE OF A PROGRAM IN PASCAL

IV. MODULARITY (~15 hours)

- fundamental concepts and benefits of modularity
- Types of modules
  - Examples
  - Communication mechanism
  - Passing parameters
- The functions.
  - User functions
    - Structure of a function
    - Calling a function.
    - Declaration of a function
  - standard functions
  - functions in the Pascal language
  - how to catalog a module in Pascal
- The procedures
  - User procedures
    - Structure of a procedure
    - Appeal of a procedure
  - Standard procedures
  - Procedures in the Pascal language
- internal and external modules
- local objects and global objects

- side effects
- Modular approach and formalism
- the library concept (application to the Pascal language)

V STATIC DATA STRUCTURES (~5 hours)

- One-dimensional tables
- Sorting (selection, transposition, bubbles, by count, Shell)
- Two-dimensional tables
- strings of characters
- the sets
- the recordings

**PERSONAL WORK:**

- Three (3) practical exercises must be carried out, two (2) of which must be on modularity. The practical exercises consist of the implementation of the studied approach and the preparation of practical files including: the statement, the possible modular division, the analyses and algorithms of the various modules, the test set, the program listings and the results.

**METHODS OF TESTING KNOWLEDGE**

2 intermediate tests + 3 practical tests + 1 quick test grade + 1 participation bonus

**RECOMMENDATIONS:**

- It is recommended to use the video projector for the course and to distribute handouts on the important parts of the course and the programming language
- tutorials and practical work must be done in classrooms equipped with computer equipment
- The emphasis must absolutely be placed on the methodological approach and respect for the formalism adopted
- The programming language used is Pascal. It is introduced as the algorithmic course progresses and is learned by self-study through the use of brochures.

**BIBLIOGRAPHY**


- N. WIRTH, Introduction to systematic programming
- N. WIRTH, Algorithms and data structures
- B. MEYER & C. BAUDOUIN, Programming methods
- L. GOLDSHLAGER & A. LISTER, Computer Science and Algorithms

We do not give references concerning the Pascal language because of the richness of these references.

**UEF 1.2 - COMPUTER ARCHITECTURE 1**

| EU Code | Module title | Credits |
|---|---|---|
| UEF 1.2 | COMPUTER ARCHITECTURE 1 | 5 |

| Hourly volumes | | | | |
|---|---|---|---|---|
| Course | TD / TP | TP | Other (specify) | TOTAL |
| 45 h. | 30 h. | | | 75 h. |

| Semester: | 1 |
|---|---|

| Prerequisite: | No |
|---|---|

**OBJECTIVES:**

- To popularize all the basic concepts of a computer;
- Know the representation of numbers ;
- Know the main components of a computer;
- To know the methods of synthesis of combinatorial and sequential logic systems;
- Acquire a low-level knowledge of programming.

**MODULE CONTENT :**

I BASIC ELEMENTS (~ 3 hours)
- Numeration and coding, conversion, number representation
- Boolean algebra

II COMBINATORY AND SEQUENTIAL LOGIC (~ 15 hours)
- Basic functions
- Synthesis of combinatorial functions
- Elements of memorization
- Synthesis of sequential circuits
- Programmable logic networks

III COMPUTER OVERVIEW (~ 6 hours)
- Memory function
- Communication function
- Execution function

IV STUDY OF A PEDAGOGICAL MACHINE (~ 6 hours)

**PERSONAL WORK:**
- Personal work (lectures, practical work, case studies, simulations) must be done.

**METHODS OF TESTING KNOWLEDGE**
- 2 Intermediate tests + 2 practical work/lectures + 1 participation note

**RECOMMENDATIONS :**
- It is recommended to use the video projector for the course and to distribute a course support or handout.

- Tutorials and practical work must be done in classrooms equipped with computer equipment.

**BIBLIOGRAPHY**


- P. Zanella, Y. Ligier : " Architecture et technologie des ordinateurs ", Dunod, 2005
- A. Tanenbaum : " Architecture of the computer ", Dunod, 2001
- W. Stallings: "Organization and Architecture of the Computer", Pearson Education
- A. Cases, J. Delacroix : " Architecture des machines et des systèmes informatiques ", Dunod, 2003
- Donald D.Givone : " Digital Principles and Design ", Mc GrawHill, 2003
- D. Roux, M.Gindre : " Electronique numérique ", T1, T2, T3, Mc GrawHill, 1987
- J.M. Bernard, J. Hugon : " Pratique des circuits logiques ", Eyrolles, 1990

**UEF 1.3 - INTRODUCTION TO THE OPERATING SYSTEM 1**

| EU Code | Module title | Credits |
|---|---|---|
| UEF 1. 3 | INTRODUCTION TO THE OPERATING SYSTEM 1 | 3 |

| Hourly volumes | | | | |
|---|---|---|---|---|
| Course | TD/TP | TP | Other (specify) | TOTAL |
| | 30 | | | 30h. |

| Semester: | 1 |
|---|---|

| Prerequisite | No |
|---|---|

**OBJECTIVES:**

- Introduce students to the Unix system.
- At the end of the course the student should be able to work in a Unix environment (at user level) and install a Unix system (Linux)

**MODULE CONTENT :**

I- INTRODUCTION

- DEFINITION AND FUNCTIONS OF AN OPERATING SYSTEM
- HISTORY OF THE UNIX OPERATING SYSTEM

II- PRESENTATION OF THE UNIX SYSTEM

- UNIX USERS
- THE MAIN FUNCTIONS
- STRUCTURE OF THE UNIX SYSTEM
- THE SHELL

III- LOGIN AND LOGOUT

- LOGIN
- CREATE/CHANGE PASSWORD
- CLOSING A SESSION

IV- UNIX COMMANDS

- COMMAND SYNTAX
- THE BASIC COMMANDS

V- REDIRECTION AND PIPE

- INPUTS AND OUTPUTS
- REDIRECTION OF INPUTS AND OUTPUTS
- ERROR REDIRECTION
- THE PIPES

VI- UNIX DIRECTORIES AND FILES

- FILE TYPES
- REACH A FILE
  - Naming a file
  - The access path

- VIEWING FILES
- DIRECTORY MANAGEMENT COMMANDS
- FILE MANAGEMENT COMMANDS
- LINKS (PHYSICAL AND SYMBOLIC)
- THE INODES
- METACHARACTERS
- ACCESS RIGHTS
  - User identification
  - Definition of user rights
    1. Case of a classic file
    2. Case of a directory
- RELATED COMMANDS
  - Change the rights : chmod
  - Change the default rights: umask
  - Change the owner and the group

VII- UNIX FILTERS

- MODIFY DATA IN A FILE
  - Cut a file into pieces: split
  - Sorting files: sort
  - String conversion :tr
- FILE EDITING WITH CRITERIA
  - Editing a file from the end: tail
  - Edit a file from the beginning: head
  - Count the lines of a file : wc
  - Editing a field in a file: cut
  - File merge : paste
  - Extraction of common lines from two files: comm
- FILE COMPARISON
  - Compare two files: cmp
  - Edition of the differences between two files: diff

VIII- GREP AND FIND COMMANDS

- REGULAR EXPRESSIONS
- THE GREP COMMAND
- THE FIND COMMAND

IX- PROCESS MANAGEMENT

- CHARACTERISTICS OF A PROCESS
- VISUALIZE PROCESSES
- PROCESS MANAGEMENT COMMANDS
  - Launch a process in the background
  - Stop a process

X- INTRODUCTION TO ADMINISTRATION

- INSTALLATION OF A UNIX SYSTEM (LINUX)
- USER ACCOUNT MANAGEMENT

| **METHODS OF TESTING KNOWLEDGE** |
| --- |
| • At least 1 continuous assessment grade<br>• At least 1 TP note<br>• a final test grade at the end of the module |

**RECOMMENDATIONS** :

- The courses, TD and TP are done in the TP room.
- For the administration chapter, it is desirable to have individual machines to learn how to install a LINUX system

## BIBLIOGRAPHY


- J.M. Rifflet, La programmation sous Unix 3ème édition - McGraw-Hil 1993
- J.P. Armspach, P. Colin, F. Ostré-Waerzeggers, "Linux initiation et utilisation", Dunod 2000.

**UEF 2.1 - MATHEMATICAL ANALYSIS 1**

| EU Code | Module title | Credits |
|---|---|---|
| UEF 2.1 | MATHEMATICAL ANALYSIS 1 | 6 |

| Hourly volumes | | | | |
|---|---|---|---|---|
| Course | TD | TP | Other (specify) | TOTAL |
| 45h | 45h | | | 90h |

| Semester: | 1 |
|---|---|

| Prerequisite: | Analysis and Algebra for Secondary Education. |
|---|---|

**OBJECTIVES:**

the central theme is the concept of real function with one real variable. The program is organized around three objectives:

- Consolidation of the knowledge of differential and integral calculus acquired in high school.
- Study of the asymptotic behavior.
- Introduction of new integration techniques.

**MODULE CONTENT :**

I- Some properties of IR (~ 9 h)

- Algebraic structure of R.
- The order in IR, majoring, minoring, upper bound, lower bound.
- Interval, neighborhood, accumulation point, adherent point.

**II-** Limit and Continuity of Real Functions of one real variable (~ 13 h 30)

- Limit: definition, operations on limits, indeterminate forms.
- Continuity: definition and fundamental theorems.
- The uniform continuity, the Lipchitzian functions.

III- Derivable and usual functions (~ 13 h 30)

- Derivability and its geometrical interpretation.
  - Operations on derivable functions, extremums, Rolle's theorem, finite increments theorem, Hospital's rule and Taylor's formula.
- Functions trigonometric and reciprocal functions, functions hyperbolic reciprocal hyperbolic functions.

IV- Asymptotic comparison (~ 27 h)

- Landau's symbols and notion of equivalent functions.
- Polynomial limited expansions (L.D.), and operations on L.D.
- Generalization of limited developments.
- Application to the calculation of limits and the study of infinite branches.

V- Integration in dimension (~ 27 h)

- Riemann integral.
- Properties of the Riemann integral.
- Indefinite integral.
- Theorems of the mean.

- Integration techniques.
- Calculation of Primitives**.**

**PERSONAL WORK:**

Regular homework assignments are provided to work on the assimilation of lessons and the deepening of concepts

**METHODS OF TESTING KNOWLEDGE**

written exams + homework + a final exam

**BIBLIOGRAPHY**


- E. Azoulay, J. Avignant, G. Auliac, " Les mathématiques en licence ", Tomes 1 à 4, Edi Science.
- J. Dixmier, " Cours de mathématiques ", Cycle préparatoire, 2 volumes, Dunod.
- J. Monier, " Cours de mathématiques ", Analyse 1, 2, 3 et 4, Dunod.
- J. Lelong-ferand, J.M. Arnaudies, " Cours de mathématiques ", Cycle préparatoire, Analyse, tome3, Géométrie et cinématique, tome 4 équations différentielles et intégrales multiples, Dunod.
- B. Calvo, A. Calvo, J. Doyen, F. Boschet, " Cours d'analyse de I à , 1$^{er}$ Cycle et Classes préparatoires aux grandes Ecoles. Armand Colin, Collection U.
- R. Couty, J. Ezra, " Analyse ", Armand Colin, Collection U.

**UEF 2.2 - ALGEBRA 1**

| EU Code | Module title | Credits |
|---|---|---|
| UEF 2.2 | ALGEBER 1 | 3 |

| Hourly volumes | | | | |
|---|---|---|---|---|
| Course | TD | TP | Other (specify) | TOTAL |
| 15h | 30 | | | 45h |

| Semester: | 1 |
|---|---|

| Prerequisite: | Analysis and algebra in secondary education |
|---|---|

**OBJECTIVES:**

- To consolidate high school knowledge of general algebra.
- Acquire techniques for decomposing rational fractions.
- Exploit the results obtained for the study of linear structures in the units algebra2 and analysis2.

**MODULE CONTENT :**

I- Reminders and complements (~ 11 h)

- Logic and Sets
- Relationships and Applications

II- Algebraic Structures (~ 11 h)

- Groups and group morphism.
- Rings and ring morphism.
- The Bodies.
- Linear structures.

**III-** Polynomials and Rational Fractions (~ 22 h 30**)**

- Notion of a one-indeterminate polynomial with coefficients in a ring.
- Algebraic operations on polynomials.
- Arithmetic in the ring of polynomials.
- Derivative polynomial and Taylor formula.
- Notion of root of a polynomial and order of multiplicity of a root.
- 6-Notion of rational fraction with an indeterminate.
- 7-Decomposition of rational fractions into simple elements.

**PERSONAL WORK:**

Regular homework assignments are provided to work on the assimilation of lessons and the deepening of concepts

**METHODS OF TESTING KNOWLEDGE**

2 written exams+note assignment+final exam

**BIBLIOGRAPHY**

- E. Azoulay, J. Avignant, G. Auliac, " Les mathématiques en licence ", Tomes 1 à 4, Edi Science.
- J. Dixmier, " Cours de mathématiques ", Cycle préparatoire, 2 volumes, Dunod.
- J. Monier, "Cours de mathématiques", Algebra 1 and 2, Dunod.
- J. Lelong-ferand, J.M. Arnaudies, " Cours de mathématiques ", Cycle préparatoire, Tome1 Algèbre, Dunod.
- M. Queysanne, " Algèbre ", 1er Cycle et Classes préparatoires, Armand Colin, Collection U.

**UEF 2.3 - ELECTRICITY**

| EU Code | Module title | Credits |
|---|---|---|
| UEF 2.3 | ELECTRICITY | 4 |

| Hourly volumes | | | | |
|---|---|---|---|---|
| Course | TD | TP | Other (specify) | TOTAL |
| 30 h. | 26 h. | 4 h. | | 60 h . |

| Semester: | 1 |
|---|---|

| Prerequisite : | no |
|---|---|

**OBJECTIVES:**

The objective of this course is to introduce the basic concepts of electricity in order to approach the electronics courses.

Upon completion of this course, the student will be able to:

- understand and use the concepts of electric force, electric field, electric potential and potential energy at rest,
- determine the current and voltage in an electrical circuit with DC voltage sources, capacitors and resistors,
- understand the principles of electromagnetism and apply them to solve problems involving electricity in the presence of alternating current,
- know how to apply the fundamental laws and theorems of electricity,
- master the matrices associated with the different quadrupoles and their associations,
- make the asymptotic Bode plot,
- know how to apply the Laplace transform to solve a differential equation in order to study a linear circuit,
- represent the amplitude and phase spectrum of a periodic signal by the Fourier method.

**MODULE CONTENT :**

I ELECTROCINETICS (~ 7 hours)

Reminder on electrostatics

Definition of a conductor in electrostatic equilibrium (definition, capacity of a conductor, stored energy), temporary current, direct current, capacitors, association of capacitors, Ohm's law, Joule's law, resistances, association of resistances, Kirchhoff's law, charging and discharging of a capacitor

II- ALTERNATIVE CURRENT (~ 5 hours)

Recall (complex numbers, magnetism, magnetic induction, magnetic flux, self inductance, Faraday's law), alternating current, definition, period of a signal, pulsation, mean value, rms value, complex notation, phase and phase shift, concept of impedance, association of impedances, series and parallel resonance.

III- ELECTRICAL NETWORKS (~ 5 hours)

Definition, laws of voltage divider and current divider, notion of sources (linked and independent), superposition theorem, Thevenin's theorem, Norton's theorem, Millman's theorem, Kennely's theorem.

IV- QUADRIPOLES (~ 6 hours)

Definition, convention of currents and voltages, impedance matrix, admittance matrix, hybrid matrix, chain or transfer matrix, input impedance, output impedance, current transfer and voltage transfer, association of quadrupoles (series, parallel, series input-parallel output).

V- BODE DIAGRAM (~ 2 hours)

Transfer function, cutoff frequency, decibel, Bode shape of a linear system of 1er order, kink frequency, asymptotic Bode plot.

VI- ELEMENTS OF SIGNAL THEORY (~ 5 hours)

Laplace Transform (LT), definition, properties (linearity, differentiation, integration, delay theorem, final and initial value theorem), LT of some usual functions (Dirac, unit step, e-at, periodic function), inverse LT (decomposition into simple elements, residue method), study of some linear circuits and application of the LT for the solution of a linear differential equation of order n.
Fourier series, spectral analysis of a periodic signal by the Fourier method.

**PERSONAL WORK:**

- Practical work reports (TPs):
  - TP n°1: RC circuits in direct current.
  - Lab 2: RL-RC circuits in AC (Bode plot)
- Review the material in the lectures and prepare the exercises.

| **METHODS OF TESTING KNOWLEDGE** |
|---|
| 1 intermediate test + 1 participation grade (average of 6 tests) +1 final exam |

**RECOMMENDATIONS :**

- It is recommended to use for courses.
- The practical work must be done in rooms equipped with computer equipment. The objective of the practical work is to illustrate the theoretical electronics courses by the study of analog circuits in simulation.
- Use of an electronic simulation software (Workbench) (initiation to the software, application on Bode in S1)

**BIBLIOGRAPHY**


- ALONSO and FINN, " Physique générale 2, champs et ondes ", Inter Editions, 1986.
- ALVIN HALPEN, "Physics 2, solved problems", Mc Graw-Hill, 1989.
- BEAUVILLAIN, " Electricité 1 ", Hachette bookstore, 1979.
- BOUDOUANE, GRIB and SMARA, "Problems of electricity", OPU, 1999.
- KHENE S., "Electricité, rappels de cours et exercices corrigés", OPU, 2003.
- LADJOUZE, CAUBARERE and FOURNY, "Electricity and waves", OPU, 2006.
- MAALEM MS, "Electricity, corrected exercises with course reminders", Hiwarcom, 1994.
- MILSANT, " Cours d'électronique ", Tome 1, Chihab
- EDWIN, "Electronic circuits, courses and problems", Schaum series

**UET 1.1 - WRITTEN EXPRESSION TECHNIQUE**

| EU Code | Module title | Credits |
|---|---|---|
| UET 1.1 | WRITTEN EXPRESSION TECHNIQUE | 2 |

| Hourly volumes | | | | |
|---|---|---|---|---|
| Course | TD / TP | TP | Other (specify) | TOTAL |
| 15 h. | 15 h. | | | 30 h. |

| Semester: | 1 |
|---|---|

| Prerequisite: | No |
|---|---|

**OBJECTIVES:**

Objectives sought:

- master the fundamentals of written communication
- the acquisition of methods and tools to facilitate the realization of its writings.
- Improving the editorial quality of various types of documents

**MODULE CONTENT :**

I - INTRODUCTION TO WRITTEN COMMUNICATION (9 hours)

- Definitions
- Mastery of grammar and spelling rules
- How to write an introduction?
- How to write a conclusion?
- How to write an abstract?

II - EFFECTIVE NOTE TAKING (3 hours)

- Mastering note-taking techniques
- Identify and retain the essential information.
- Transcribe through an objective, concise and communicative reformulation.

III - BEING SYNTHETIC (3 hours)

- To be synthetic while preserving the essential.
- Prioritize your information with relevance.
- Effectively convey information in writing

**PERSONAL WORK:**

- Synthesize a report
- Building a CV
- Writing a cover letter

| METHODS OF TESTING KNOWLEDGE |
|---|
| 2 intermediate controls |

**RECOMMENDATIONS :**

- It is recommended to use texts related to the corporate and IT culture for better profitability.

- The choice of texts could be made in consultation with the teachers of the Business Administration course.

**BIBLIOGRAPHY**


- Camus B. "Reports of the training courses and memoirs", Chihab Editions, Editions of Organization, Collection of the student, Algiers 1995
- Eckenschwiller M. " L'écrit universitaire ", Les Editions d'organisations, 1994
- Gingras, F. " Comment citer des sources sur Internet dans un travail scientifique ", available at http://aix1.uottawa.ca/~fgingras/metho/citation.html**,** page updated on 21/03/2005
- R. Simonet, " Les techniques d'expression et de communication - Évolution, fondements, pratiques ", l'Harmattan, 1994
- R. Simonet, J. Simonet, "Savoir argumenter", Editions d'organisation, 2004.

**UED 1.1 - OFFICE AND WEB**

| EU Code | Module title | Credits |
|---|---|---|
| **UED 1.1** | **OFFICE AND WEB** | **1** |

| Course / TD/ TP | Personal work | TOTAL |
|---|---|---|
| **30 h.** | | **30 h .** |

| | |
|---|---|
| **Semester:** | **1** |

| | |
|---|---|
| **Prerequisite:** | **No** |

**OBJECTIVES:**

The student must be able to:

- Use office automation tools efficiently (Word, Powerpoint, Excel,..)
- master the specificities of e-mail communication, manage your e-mail efficiently.
- to use efficiently the tools of research o f relevant information (collection, sorting) in front of the heterogeneity of the documentary sources (books, magazines, Internet, ...)?

**MODULE CONTENT :**

I- BASIC OFFICE TOOLS (~9 hours)

- Word
- Powerpoint
- Excel
- Gateways between tools

II- INTERNET, THE DIFFERENT SERVICES (~ 3 hours)

- General information about the Internet
  - A little history
  - The authorities
  - Typology of Internet service providers
- Internet services, general operating principles :
  - Mail, HTTP, FTP, News
  - Search engines (and referencing process)
  - Java technology, assets, PHP, Flash
  - Browsers
- Use email effectively

IV - Searching for information on the Internet (~3 hours)

- Issue
- The Web (visible and invisible)
- Information search strategy
- Web tools
- Evaluate the reliability and validity of the resources on the Net

**PERSONAL WORK:**

- They must allow to verify the degree of personal efficiency or the degree of appropriation of the basic tools. That is to say;
  - Texts to be written
  - Design of an Animated Presentation
  - Google search on a specific theme

- ...

| METHODS OF TESTING KNOWLEDGE |
| --- |
| Continuous testing + final exam |

**RECOMMENDATIONS** :

- Planned loads will be done in the PT room. It should be verified that students improve their personal efficiency in using office automation tools on selected examples.

**UEF 3.1 - ALGORITHMS AND DYNAMIC DATA STRUCTURES**

| EU Code | Module title | Credits |
|---|---|---|
| UEF 3.1 | ALGORITHMICS and DYNAMIC DATA STRUCTURES | 6 |

| Hourly volumes | | | | |
|---|---|---|---|---|
| Course | TD/TP | TP | Other (specify) | TOTAL |
| 30 h. | 60 h. | | | 90 h. |

| Semester: | 2 |
|---|---|

| Prerequisite | UEF1.1 : Algorithms and static data structures |
|---|---|

**OBJECTIVES:**

- Globally they remain the same as those of the course of algorithmic (UEF1.2) namely: the acquisition of a methodological approach, the validation of the solutions, the programming of the solutions and the preparation of technical files of programming
- Mastering dynamic data structures
- Use of recursion

**MODULE CONTENT :**

INTRODUCTION TO POINTERS (5 hrs.)

- Introduction to the Pascal language
- Static and dynamic allocations
- Relationship between arrays and

II CHAIN LINES (6 h.)

- definitions, basic functions and manipulations (length, access, deletion, insertion,), list sorting, list implementation with contiguous representation

III PILES AND WIRES (3 h.)

- Definitions, basic functions, uses,

IV RECURRENCE (6 h.)

- Principle
- Recursive algorithm designs
- Semantics of recursion
- Switching from recursive to iterative algorithms
- Recursion in the c language

V THE TREES (9 h.)

- Definition, basic functions
- Binary trees
  - Definition, basic functions, tree path
  - Binary search trees (manipulation)
- M-trees
  - Definition, basic functions, tree path
  - Binary tree transformation

VI COMPLEXITY (6 h.)

- Time and space efficiency
- Landau's notation (O-notation)
- Rules for calculating the complexity of an iterative algorithm

**PERSONAL WORK:**

- Two (2) practicals must be completed plus one (1) project that will be completed over the last three (3) months of the semester.
- The TPs as well as the project must be the subject of programming files.
- The project grade will be based on the written report and a demonstration of the work performed.

**METHODS OF TESTING KNOWLEDGE**

**RECOMMENDATIONS :**

- It is recommended to use the video projector for the course and to distribute a course support or handout.
- the TDs/TPs must be done in classrooms equipped with computer equipment
- The emphasis must absolutely be placed on the methodological approach and respect for the formalism adopted
- The programming language used is the C language. It is introduced as the course progresses. It will be learned by self-study through brochures.

**BIBLIOGRAPHY**


- The art of computer programming (D.E. KNUTH - Addison Weslay - Vol3: searching and sorting)
- Data structures and algorithms (A. & J.D. ULLMAN, A.V. AHO, J.E. HOPKROFT- Addison Weslay)
- Data and file structures (D.E. ZEGGOUR - Chihab)
- www-ipst.u-strasbg.fr/pat/program/algo.htm -
- ftp://ftp-developpez.com/rmdiscala/livres/basesinfo4.pdf
- introduction to recursion and trees - course material - P CL. SCOLL- programming institute-GRENOBLE
- The C language (T. ZHANG S &SM)
- Introduction to the C language (B. CASSAGNE IMAG Grenoble)
- C language course (P. JACOBINI)
- Programming in C (A. ESNARD ENSERB Informatique)
- T. H. Cormen, C. E. Leiserson, R. L. Rivest, Introduction to Algorithms, MIT Press, McGraw-Hill, 1990.
- File structures (M.J. Folk, B. Zoellick & G. Riccardi, Addison-wesley, 1998)

**UEF 3.2 - OPERATING SYSTEM 2**

| EU Code | Module title | Credits |
|---|---|---|
| UEF 3.2 | OPERATING SYSTEM 2 | 3 |

| Hourly volumes | | | | |
|---|---|---|---|---|
| Course | TD/TP | TP | Other (specify) | TOTAL |
| 15h. | 30h. | | | 45h. |

| Semester: | 2 |
|---|---|

| Prerequisite | UEF1.1, UEF1.2 (Algorithms and Computer Architecture) |
|---|---|

**OBJECTIVES:**

Enabling understanding:

- the operation of the machine ;
- execution of programs in machine language;

At the end of this module, the student is able to write programs in machine language.

**MODULE CONTENT :**

I- PRESENTATION OF THE MACHINE

- Functional description of the machine
- Internal code and internal format of an instruction
- Internal structure of a program
- Description of the symbolic language (general syntax of the language)

II- PRESENTATION OF THE ASSEMBLY LANGUAGE

- General structure of a source program (symbolic)
- The guidelines
- Transfer instructions
- Arithmetic instructions
- Instructions for comparison, loops (repetitions) and branches
- Bit manipulation instructions (logic and shifts)
- Battery instructions
- Procedural instructions and interruptions
- String processing instructions and prefix

**III-** MACROS INSTRUCTIONS

**IV-** Extended instructions (multi media instructions,...)

**PERSONAL WORK:**

In addition to the classroom time, at least one personal work (TP with detailed report).

**METHODS OF TESTING KNOWLEDGE**

2 intermediate tests + practical work + 1 participation grade (TD/TP)

**RECOMMENDATIONS** :

- Tutorials and practical work must be done in classrooms equipped with computer hardware with the assembly language.
- Initiation to the development of programs (Debug,...) ;
- Programming of some TD exercises.

## BIBLIOGRAPHY


- Books and brochures of the target machine's assembly language.
- The IA-32 Intel Architecture Software Developer's Manual (3 volumes)
- H. LILEN, 80286 Assembler, Radio edition
- H. LILEN, 80386 Modes of operation Architecture - Program - Feature: Radio edition
- D. J- BRADLEY, " Assembler on IBM PC ", Edition Masson
- R. HYDE, "The Art Of Assembly Language Programming", 2003
- http://webster.cs.ucr.edu/Page_asm/ArtOfAsm.html

**UEF 4.1 - MATHEMATICAL ANALYSIS 2**

| EU Code | Module title | Credits |
|---|---|---|
| UEF 4.1 | MATHEMATICAL ANALYSIS 2 | 6 |

| Hourly volumes | | | | |
|---|---|---|---|---|
| Course | TD | TP | Other (specify) | TOTAL |
| 45h | 45h | | | 90h |

| Semester: | 2 |
|---|---|

| Prerequisite: | UEF2.1 |
|---|---|

**OBJECTIVES:**

- To study the elementary concepts related to numerical series and function sequences, in order to provide a coherent framework for the study of numerical series.
- Establish the criteria of convergence of series and define the usual modes of convergence of series of functions and exploit them to study the conservation of continuity and derivability and integration by limit passage.
- Determine the developments in integer series of the usual functions of analysis in order to implement algorithms of approximation of numbers.
- -Provide methods for solving ODEs for use in other disciplines.

**MODULE CONTENT :**

I- NUMERICAL SEQUENCES AND SEQUENCES OF FUNCTIONS (~18 H)

- Numerical Suites
  - Definition, convergence, operations on convergent sequences.
  - Theorems of convergence, three sequences theorem, sub-sequence. Extension to infinite limits.
  - Cauchy sequence, adjacent sequences and recurrent sequences.
- Suites of Functions
  - 1-Definition, simple convergence and uniform convergence practical rules of convergence.
  - 3-Conservation of continuity, integrability and differentiability.

II- NUMERICAL SERIES AND FUNCTION SERIES (~45 H)

- Numerical series:
  - Definition and basic properties.
  - Positive term series and convergence criteria,
  - Series with any terms and convergence criteria.
- Series of Functions :
  - Definition, simple convergence, uniform convergence and normal convergence.
  - Uniform and normal convergence criteria.
- Whole series:
  - Definitions and properties.
  - Radius of convergence, properties of integer series.
  - Taylor series and usual developments.

III- ORDINARY DIFFRENTIAL EQUATIONS OF THE 1st AND 2nd ORDER (~27 H)

- First order differential equations. Equations with separable variables, techniques for solving certain types of first order equations, linear differential equations of

first order.
- Second order linear differential equations with constant coefficients.
- Second order differential equations with any coefficients.

**PERSONAL WORK:**
Regular homework assignments are provided to work on the assimilation of the lessons and the deepening of the notions.

| **METHODS OF TESTING KNOWLEDGE** |
| --- |
| 4 written exams + homework note + final exam. |

**BIBLIOGRAPHY**


- E. Azoulay, J. Avignant, G. Auliac, "Les mathématiques en licence (Tomes 1 à 4)", Science.
- J.Dixmier, "Cours de mathématiques. Cycle préparatoire (in two volumes)", Dunod.
- J.Monier, " Cours de mathématiques (Analyse 1, 2,3 et 4 ) ", Dunod.
- J.lelong-ferand, J.M.Arnaudies, " Cours de mathématiques. Cycle préparatoire ", (tome 2 Analyse, tome 3 Géométrie et cinématique, tome 4 équations différentielles et intégrales multiples) Dunod.
- B. Calvo, A. Calvo, J. Doyen, F. Boschet, " Cours d'analyse de I à V ", 1er Cycle et Classes préparatoires aux grandes Ecoles, Armand Colin, Collection U.
- R.Couty, J.Ezra, " Analyse ", Armand Colin, Collection U.

**UEF 4.2 - ALGEBRA 2**

| EU Code | Module title | Credits |
|---|---|---|
| UEF 4.2 | ALGEBRE 2 | 4 |

| Hourly volumes | | | | |
|---|---|---|---|---|
| Course | TD | TP | Other (specify) | TOTAL |
| 30 h. | 30 h. | | | 60 h. |

| Semester: | 2 |
|---|---|

| Prerequisite: | UEF2.2 |
|---|---|

**OBJECTIVES:**

The program is organized around two objectives:

- Study of the fundamental concepts related to finite dimensional vector spaces such as base, dimension, rank, and teach the student the scaling procedure which will be very useful later on.
- Learn linear algebra and assimilate the basics of matrix calculus in order to acquire sufficient knowledge to approach UEF12.

**MODULE CONTENT :**

I- VECTOR SPACE (~18 H)

- Definition of a vector space and a sub-vector space, direct sum.
- Generating family, generated subspace.
- Linear independence, basis and dimension.
- Rank and stagger.

**II-** APPLICATION LINEIARE (~9H)

- Definition and properties of linear applications in finite dimension.

**III-** MATRIX (~18H)

- Notion of matrix.
- Matrices associated with a linear application and properties.
- The ring of square matrices and properties.
- Rank of a matrix, regular matrices and some inversion methods.
- Similar matrices and equivalent matrices.

**PERSONAL WORK:**

Regular homework assignments are provided to work on the assimilation of the lessons and the deepening of the notions.

**METHODS OF TESTING KNOWLEDGE**

written exams + homework grade + final exam.

**BIBLIOGRAPHY**


- E.Azoulay , G.Auliac : Les mathématiques en licence (Tomes 1 à 4) Edi Science.
- J.Dixmier : Cours de mathématiques. Cycle préparatoire (in two volumes) Dunod.
- J.Monier : Cours de mathématiques (Algèbre 1 et2) Dunod.
- J.lelong-ferand, J.M.Arnaudies: Cours de mathématiques. Cycle préparatoire (Tome1 Algèbre). Dunod
- M. Queysanne: Algèbre. 1er Cycle et Classes préparatoires. Armand Colin, CollectionU.

**EMU 1.1 - POINT MECHANICS**

| EU Code | Module title | Credits |
|---|---|---|
| EMU 1.1 | POINT MECHANICS | 3 |

| Hourly volumes | | | | |
|---|---|---|---|---|
| Course | TD | TP | Other (specify) | TOTAL |
| 15 | 30 | - | - | 45 h. |

| Semester: | 2 |
|---|---|

| Prerequisite: | No |
|---|---|

**OBJECTIVES:**

The main objective of this course is to introduce the methods of study and modeling of physical phenomena for analysis and design based on computer simulation.

Upon completion of this course, students will have acquired scientific skills related to:

- knowledge of the assumptions of classical mechanics,
- the isolation of an object assimilated to a material point,
- describing and writing the motion of a material point in different coordinate systems,
- the understanding and ability to calculate the velocities and accelerations of a mobile for any path,
- description, writing and analysis of external actions on a material point,
- understanding, writing and solving the equations of dynamics governing the motion of a material point.

**MODULE CONTENT :**

I. CINEMATICS: (3 p.m.)
- Elements of vector analysis
- Study of rectilinear motion in the plane and in space.
- Movement in Cartesian and polar coordinates.
- Circular, cylindrical and elliptical movements.
- Any movement.
- Relative movements.
- Recording of the movement.

II. DYNAMICS : (12h)
- Notions of Galilean reference frames.
- Principle of inertia and momentum.
- Newton's laws and their applications: gravitation, contact and strong forces, elastic forces.
- Kinetic moment.
- Fundamental principle of dynamics in a non-galilean reference frame.

III. WORK AND ENERGY: (12 h)
- Power, Work, Energy (kinetic, potential, ...).
- Conservation laws.
- Particle in a gravitational field.
- Particle in an elastic force field, conservative and non-conservative forces.
- Shock between particles.

IV. OSCILLATORS : (6 h)

- Harmonic oscillators. Damped oscillators.
- Forced oscillations. Resonance. Impedance.

**METHODS OF TESTING KNOWLEDGE**

- Continuous assessment of knowledge
- Final test.

**BIBLIOGRAPHY**


- A. Gibaud, M. Henry, " Mécanique du Point : Cours et Exercices Corrigés ", Dunod, 2007.
- R.A. Carregal, I. Junier, " Mécanique du Point et du Solide ", Ed. Bréal, 1999.
- F. Viot, " Mécanique du Point : Cours et Problèmes résolus ", Dunod, 2005.
- S. Devillard, " Mécanique du Point : Fiches, Méthodes et Exercices Corrigés ", Ed. Ellipses, 2005.
- H. Lumbroso, "Problèmes de Physique : Mécanique du Point - 114 Problèmes résolus", Dunod, 2002.
- D. Teyssier, " Mécanique du Point : Exercices Corrigés ", Ellipses, 2005.

**EMU 1.2 - FUNDAMENTAL ELECTRONICS 1**

| EU Code | Module title | Credits |
|---|---|---|
| EMU 1.2 | FUNDAMENTAL ELECTRONICS 1 | 4 |

| Hourly volumes | | | | |
|---|---|---|---|---|
| Course | TD | TP | Other (specify) | TOTAL |
| 30 h. | 24 h. | 6 h. | | 60 h. |

| Semester: | 2 |
|---|---|

| Prerequisite | UEF2.3 |
|---|---|

**OBJECTIVES:**

The main objective of this course is to study the operation of electronic components such as diodes, bipolar transistors and field effect transistors and their applications.

Upon completion of this course the student will be able to:

- Understand the principle of conduction in semiconductors and in PN junctions.
- Know the operating characteristics of electronic components (diodes, bipolar and field effect transistors).
- Use electronic components in concrete applications (rectifiers, clipping, stabilization, transistor amplification, switching, logic gates, .... etc.).
- Understand and compare the different families of logic circuits.

**MODULE CONTENT :**

I SEMICONDUCTOR DIODES (~ 5 hours)

- Semiconductor (SC): generalities, intrinsic SC, extrinsic SC type P and type N, non polarized PN junction, polarized PN junction.
- The junction diode: polarization and characteristic of the diode, diode in continuous, load line and operating point, AC diode (full and half wave rectification, clipping, peak detector).
- The Zener diode: definition, polarization and current-voltage characteristic, the Zener diode in DC (voltage stabilization) and in AC.

II THE BIPOLAR TRANSISTOR (~ 12 hours)

- Presentation, convention of the currents (PNP and NPN), the transistor effect, the currents of the transistor, the various assemblies of a transistor (EC, DC, BC), characteristics
  The transistor in dynamic regime at low frequencies, dynamic load line, power efficiency and classes of amplifiers, study of an amplifier in common emitter, characteristics of the transistor in dynamic regime at low frequencies, dynamic load line, power efficiency and classes of amplifiers, study of an amplifier in common emitter, characteristics of an amplifier in common emitter, characteristics of an amplifier in common emitter. The transistor in dynamic regime at low frequencies, dynamic load line, power efficiency and classes of amplifiers, study of an amplifier in common emitter, characteristics
  EC, BC and CC amplifiers, associations of amplifier stages, the switching transistor.

III FIELD EFFECT TRANSISTORS (~ 8 hours)

- Introduction, the junction field effect transistor (JFET): principle of a JFET, operation, characteristics, electrical models in amplification, assemblies

amplifiers (SC, DC, GC). The insulated gate field effect transistor (MOSFET), depletion MOSFET, enhancement MOSFET, switching MOSFET, applications of MOSFET.

IV LOGIC GATE TECHNOLOGY (~ 5 hours)

- Classification of integrated circuits, characteristics of logic gates, DL, DTL, TTL and ECL logic gates, NMOS and CMOS logic gates, BiCMOS logic, comparison between bipolar and CMOS technology, interfacing logic gates

**PERSONAL WORK:**

- Practical work reports (TPs):
  - TP n°1 : diodes.
    - Normal diode: characteristic plot, operating point,
      - recovery.
    - Zener diode: trace of the characteristic, operating point,
      - voltage stabilization.
  - TP n°2 : Bipolar transistors and TEC in static.
    - Plotting of feature networks
    - Operating point
- Review the material in the lectures and prepare the exercises.

**METHODS OF TESTING KNOWLEDGE**

1 intermediate test + 2 practical exercises + 1 participation grade + 1 final exam

**RECOMMENDATIONS :**

- It is recommended to use the video projector for the course and to distribute a course support or handout.
- The practical work must be done in rooms equipped with computer equipment. The objective of the practical work is to illustrate the theoretical electronics courses by studying analog circuits in simulation.
- Use of an electronic simulation software (Workbench)

**BIBLIOGRAPHY**


- COEURDACIER S, " Amplification basses fréquences - commutation ", Dunod, 1990.
- LADJOUZE H, " Cours d'électronique ", OPU, 2005.
- TAYEB CHERIF R. " Electronique de base ", Berti editions, 1990.
- HARAOUBIA B., " Electronique générale ", OPU, 2006.
- BORNAND M., " Exercises and problems with solutions ", ELECTRONIQUE Tome 1, Vuibert, 1990.
- COEURDACIER S, " Les composants discrets linéaires ", ELECTRONIQUE 1, Dunod, 1990
- MALVINO, "Principles of Electronics", Mc Graw-Hill, 2004.
- BORNAND M., " Problèmes d'électronique ", ELECTRONIQUE Tome 2, Vuibert, 1990.

**UET 2.1 - ORAL EXPRESSION TECHNIQUE**

| EU Code | Module title | Credits |
|---|---|---|
| **UET 2.1** | **SPEAKING TECHNIQUE** | **2** |

| Hourly volumes | | | | |
|---|---|---|---|---|
| **Course** | **TD / TP** | **TP** | **Other (specify)** | **TOTAL** |
| **15 h.** | **15 h.** | | | **30 h.** |

| | |
|---|---|
| **Semester:** | **2** |

| | |
|---|---|
| **Prerequisite:** | **No** |

**OBJECTIVES:**

- Develop interpersonal skills in all circumstances.
- To become more efficient in one's function through better communication.
- Putting communication at the service of its action.

**MODULE CONTENT :**

II - INTRODUCTION TO COMMUNICATION THEORY (3 hours)

- Definitions
- Need for communication
- Analysis of brakes and obstacles to communication
- fundamentals of oral communication

II - USE OF SIMPLE TECHNIQUES (6 hours)

- importance of listening,
- The challenge of questioning and rephrasing
- necessary coherence between verbal and non-verbal
- Use your skills: concentration, classification, imagination,
- strength of voice, look, posture
- Valuing your ideas

III- COMMUNICATING IN DIFFICULT SITUATIONS (6 hours)

- How to prepare before the presentation?
- Structure your messages
- Adapting communication to the audience
- Choose the appropriate words
- overcome your stress?
- Dare to say "no

**PERSONAL WORK:**

- To bring students to discover the stakes of communication; to allow them to experiment and enrich their own modes of expression by putting them in a situation (collective and public presentation), and to develop their relational competence.
- Role-playing: active training in inter-individual communication

**METHODS OF TESTING KNOWLEDGE**

2 intermediate controls

**RECOMMENDATIONS** :
Ensure that a personalized assessment is made of each student's strengths and areas for improvement

**BIBLIOGRAPHY**


- "ABC of successful presentations", Chair of Pedagogy and Didactics, EPA, Lausanne
- "30 exercises to acquire good reflexes", Edition d'organisation, 2008
- "Practical Guide to Behavioral Change", Edition d'organisation, 2000

**UET 2.2 - ENGLISH 1**

| EU Code | Module title | Credits |
|---|---|---|
| UET 2.2 | ENGLISH 1 | 2 |

| Hourly volumes | | | | |
|---|---|---|---|---|
| Course | TD | TP | Other (specify) | TOTAL |
| | 30 h. | | | 30h. |

| Semester: | 2 |
|---|---|

| Prerequisite | |
|---|---|

**OBJECTIVES:**

This English as a Foreign Language course focuses on the assimilation of the elements of speech. These elements are the essential components of sentence formation. Their knowledge will enable the learner to use these components to communicate ideas in both written and spoken form.

**MODULE CONTENT :**

- Study of Compound Nouns;
- Contextual Reference (Pronouns) ;
- Sequence of Adjectives (Adjectives) ;
- Exceptions with Adverbs (Confusion: adverbs/adjectives with " ly " endings).
- Study of texts for the appropriation of vocabulary specific to the computer field.

**PERSONAL WORK:**

**METHODS OF TESTING KNOWLEDGE**

02 evaluations on the contents of the unit

1. mid-semester evaluation (+/- after 15 hours)
2. at the end of the semester

**RECOMMENDATIONS** :

- The four semesters (UET1.1 -UET4.1) represent the upgrading of the learners as they come from different institutions and have different levels of knowledge.
- Using the Data Show
- The courses will be carried out in the form of TDs

**BIBLIOGRAPHY**


- Mohammed BELLAL, "The Parts of Speech: A Workbook", OPU, 2000.

**UEF 5.1 - FILE AND DATA STRUCTURES**

| EU Code | Module title | Credits |
|---|---|---|
| **UEF 5.1** | **FILE AND DATA STRUCTURES** | **4** |

| Hourly volumes | | | | |
|---|---|---|---|---|
| **Course** | **TD / TP** | **TP** | **Other (specify)** | **TOTAL** |
| **30 h.** | **30 h.** | | | **60 h.** |

| **Semester:** | **3** |
|---|---|

| **Prerequisite** | **UEF3.1 :** Dynamic Data Structures |
|---|---|

**OBJECTIVES:**

Very often the essential knowledge about files is diluted in different courses (machine structure, algorithms, information systems, analysis, databases, operating systems...) with different approaches that make that the synthesis, essential, between these various knowledge is not always done. This is why we have gathered them in a single course, so that the student can :

- Design efficient file structures that meet the needs of all types of applications.
- Master all the terminology and fundamental concepts of files
- Have sufficient knowledge of magnetic media technology so that they are not seen as mere black boxes
- Know the different types of file organization, their representation, their operation and how to make choices
- To perceive all of these elements as a coherent and complete whole, which will be a necessary prerequisite for other courses and for professional life.

**MODULE CONTENT :**

I- GENERAL INFORMATION ON FILES (6 h.)

- basic concepts
- file, record, field, character
- activity of a file, consultation rate, renewal rate, stability typology of files
- (permanent or basic, movement, maneuver, intermediate, archive, historical, single volume file, multi volume, multi files, table,
- fundamental file operations (create, update, merge, split, sort, merge, extract, copy) difference between Ram and Secondary Memory
- physical files and logical files
- logical and physical registration
- types of records (fixed, variable, undefined length) the
- blocking factor, its interest
- static and dynamic files
-

II- MEDIA TECHNOLOGY (4 hrs.)

- The magnetic tape
- the magnetic disk
- the optical disk

(description, physical recording, recording density, recording mode, theoretical and practical storage capacity, read/write time)

- evolution of magnetic media

III- FILE ORGANIZATION (17 h.) SIMPLE

- STRUCTURES (3 h.)
  - Contiguous organization
  - Chain organization
  - Classification of simple structures
- INDEX METHODS (3 h.)
  - Primary Index
  - Secondary Index
  - Multi-level index
- TREE STRUCTURES (5 h.)
  - Tree file
  - Tree index
  - B-Trees
- HATCHING (4 h.)
  - Hash function
  - Collision resolution methods
  - Static chopping
  - Dynamic chopping
- CHOICE OF AN ORGANIZATION (2 h.)
  - parameters of choice
  - example of application

IV- INTRODUCTION TO DATABASES (3 hrs)

- Why a database?
- Definition
- Basic concepts common to all databases
- Main functions of a DBMS

**PERSONAL WORK:**

- Two to three practical exercises in C language and a case study

| **METHODS OF TESTING KNOWLEDGE** |
| --- |
| Written exam + Practical work + Case study |

**RECOMMENDATION**:

- Some TD sessions must be held in machine rooms.

**BIBLIOGRAPHY**


- Jouffroy - Létang, "Les fichiers - organisation des données", Bordas.
- M.J. Folk, B. Zoellick & G. Riccardi, "File structures", Addison-wesley, 1998
- D.E. Zegour, " Structures de données et de fichiers ", Ed. Chihab, 1996.
- D. Knuth, "The art of computer programming", 3rd Ed. Vol. 3, Addison-wesley, 1978
- A. Aho, J. Hopcroft & J Ullman, "Data structures and algorithms", Addison-wesley, 1987
- J. AKOKA , Ed. Eyrolles, " les systèmes de gestion de bases de données ".
- S. MIRANDA & JM. BUSTA, Ed. Eyrolles, " introduction to databases ".

**UEF 5.2 - COMPUTER ARCHITECTURE 2**

| EU Code | Module title | Credits |
|---|---|---|
| UEF 5.2 | COMPUTER ARCHITECTURE 2 | 4 |

| Hourly volumes | | | | |
|---|---|---|---|---|
| Course | TD / TP | TP | Other (specify) | TOTAL |
| 30h | 30h | | | 60 h |

| Semester: | 3 |
|---|---|

| Prerequisite: | UEF1.2 : COMPUTER ARCHITECTURE 1 |
|---|---|

**OBJECTIVES:**

At the end of this course, the student should be able to design an elementary calculator. In particular, he/she should:

- know the role of each component in the data path of an ECU.
- master the flow of information in the basic circuits and know the operation of the control unit (sequencer).
- understand the basic mechanisms that allow a computer to communicate (input/output and interrupt systems).

**MODULE CONTENT** :

I- MEMORIES (15 hours)

- Introduction
- Semiconductor memory technology
    - The dead memories
    - ROM (Read Only Memory)
    - PROMs (Programmable ROMs)
    - EPROM (Erasable PROM) and EEPROM (Electrically Erasable PROM)
    - Applications of read-only memories
  - Random access memories
    - *Static RAMs*
    - *Dynamic RAMs*
- Sequential access memories
  - FIFO (First In First Out) memories
  - LIFO (Last In First Out) memories
- Associative memories
  - Description of an associative memory
  - Operations on an associative memory
  - Applications of associative memories
  - Examples of the use of an associative memory
- Cache or buffer memories
  - Principle of cache memories
  - Principle of calculation of physical addresses
  - Replacement of an information
  - Write to cache
  - Cache size

II- ORGANIZATIONS RELATED TO AN IN/OUT OPERATION (3 hours)

- Introduction

- The ring road
    - Main types of peripherals
    - Some examples of peripherals
- The device controller
    - Architecture of a controller
    - Dialog interface with the central unit
    - Dialogue interface with the device
    - Orders executed by a controller

III- INPUT / OUTPUT MODES (3 hours)

- Introduction
- Input / output modes
    - Programmed mode
        - Status test mode
        - Interrupt mode
    - Direct Memory Access (DMA)
        - Input/Output channel
        - Channel program
        - Architecture of the canal
        - Selector channel and multiplexer channel

IV- INTERRUPTION SYSTEMS (3 hours)

- Introduction
- Different causes of interruption
    - Internal interruptions or diversions
    - Input/output interrupts
    - Hardware interruptions
- Detection and handling of an interruption in a simple system
    - Detection of an interruption
    - Save the context
    - Search for the cause of the interruption
    - Acknowledgement of the interruption
    - Treatment of the interruption
    - Restoring the context of the interrupted program
- Hierarchical interrupt systems
    - Inhibition, masking and validation
    - Detection and handling of an interruption in a hierarchical system
    - Coding of levels
    - Vectorized interruptions

V- THE SEQUENCER (3 hours*)*

- Introduction
- The wired sequencer
- The micro-programmed

**PERSONAL WORK:**

- TP on ROM chapter.
- TP on chapter Associative memories.
- Lecture on the chapter I/O devices.
- TP on chapter Interruption.

It would also be interesting to take computers apart and show the different components to students by helping them disassemble and then reassemble

a disk, a memory strip, a power supply, a motherboard...

**METHODS OF TESTING KNOWLEDGE**

2 tests + 3 practical sessions + 2 participation notes + presentation + unscheduled tests.

**RECOMMENDATIONS** :

- In the absence of real development systems, and maps, it is essential to have simulation software to carry out the proposed practical work.
- Continuous assessment should be done in tutorial sessions. Take uncorrected exercises and ask students to solve them in a limited time. It will be possible to encourage students to better prepare their series of exercises and to review their courses before the tutorial session. The final grade would be an average of the written tests, the practical work, and the tutorial grades.

**BIBLIOGRAPHY**


- M. De Blasi, "Computer architecture", Addison Wesley 1991.
- M. Burrell, "Fundamentals of Computer Architecture", Editor: Palgrave Macmillan, 2003.
- B.S. Chalk, Robert Hind and Antony Carter, "Computer Organization and Architecture", Editor: Palgrave Macmillan, 2nd edition, 2003.
- I. Englander, "The Architecture of Computer Hardware and System Software: An Information Technology Approach", Third edition, Bentley College, Wiley Publishers, 2003.
- M. Ercegovac, T. Lang and J. Moreno, "Introduction to Digital Systems", Wiley Publishers, 1999.
- J.L. Henessy and D.A. Patterson, "Architecture of Computers", International Thompson Publishing, 2006.
- Vincent P. Heuring and Harry F. Jordan, "Computer Systems Design and Architecture", International Edition, Editor: Prentice-Hall, 2nd edition, 2003.
- M. Koudil and S.L. Khelifati, "Structure des ordinateurs, autour du processeur", O.P.U., 3ème edition, 2004.
- M. Morris Mano and Charles Kime, "Logic and Computer Design Fundamentals", Editor: Prentice Hall, 3rd edition, 2003.
- J.F. Maquiné, "Comprendre la mémoire cache", 2000. http://www.hardware.fr
- S. Martel, "Architecture des ordinateurs", École Polytechnique de Montréal, 2002
- M. Morris Mano and C.s Kime, "Logic and Computer Design Fundamentals", Editor: Prentice Hall, 3rd edition, 2003.
- E. Sanchez, "Types et performances des processeurs", Ecole Polytechnique de Lausanne, 2003.
- W. Stallings, "Computer organization and Architecture, Designing for performance", Sixth edition, Prentice Hall, 2003.
- A. Tanenbaum, "Architecture of the computer", InterEditions 1991
- S. Tisserant, "Architecture of ordinateurs", 2003.http://marpix1.in2p3.fr/calo/my-web/archi/archi.html

**UEF 6.1 - MATHEMATICAL ANALYSIS 3**

| EU Code | Module title | Credits |
|---|---|---|
| UEF 6.1 | MATHEMATICAL ANALYSIS 3 | 6 |

| Hourly volumes | | | | |
|---|---|---|---|---|
| Course | TD | TP | Other (specify) | TOTAL |
| 45h | 45h | | | 90h |

| Semester: | 3 |
|---|---|

| Prerequisite: | UEF2.1, UEF4.1 |
|---|---|

**OBJECTIVES:**

The objective of this EU is threefold:

- Discover some topological concepts of $IR^2$ and $IR^3$ -Extend the notions of limit continuity and differentiability of functions from $IR^n$ into IR and generalize them to functions from $IR^n$ to $IR^m$ .
- -Exploit the above results to address some optimization problems with or without constraints**.**

**MODULE CONTENT :**

I- Elements of topology (18 h).

- Distances and metric spaces.
- Vector spaces n
- Ball, neighborhood, open and iron
- Notion of topology.
- Interior, adherence, border of a set.
- Case of IRm spaces.

II- The notions of limit and continuity of functions from $IR^m$ to $IR^n$ , for m=2,3 and n=1, 2,3 (22 h 30)

- Limit and continuity of functions from IRm to R.
- Limit and continuity of functions from IRm to IRn.
- Properties.

III- Differentiability of functions in several real variables (40 h)

- Partial derivatives and Schwarz theorem
- Differentiability and properties, implicit functions.
- Taylor's formula.
- Differential forms and notion of exterior differential.

IV- Optimization with or without constraints (9 h)

**PERSONAL WORK:**

Regular homework assignments are provided to work on the assimilation of lessons and the deepening of concepts.

| METHODS OF TESTING KNOWLEDGE |
|---|
| 4 written exams + homework grade + final exam. |

**BIBLIOGRAPHY**


- E. Azoulay, J.Avignant, G.Auliac : Les mathématiques en licence (Tomes 1 à 4) Edi Science.
- J.Dixmier : Cours de mathématiques. Cycle préparatoire (in two volumes) Dunod.
- J.Monier : Cours de mathématiques (Analyse 1, 2,3 et 4) Dunod.
- J.lelong-ferand, J.M.Arnaudies: Cours de mathématiques. Cycle préparatoire (tome 2 Analyse, tome3 Géométrie et cinématique, tome 4 équations différentielles et intégrales multiples) Dunod.
- B.Calvo, A.Calvo, J.Doyen,F.Boschet : Cours d'analyse de I à V. 1er Cycle et Classes préparatoires aux grandes Ecoles. Armand Colin, Collection U.
- R. Couty, J. Ezra: Analysis. Armand Colin, Collection U.

**UEF 6.2 - ALGEBRA 3**

| EU Code | Module title | Credits |
|---|---|---|
| UEF 6.2 | ALGEBER 3 | 3 |

| Hourly volumes | | | | |
|---|---|---|---|---|
| Cours e | TD | TP | Other (specify) | TOTAL |
| 15 | 30 | | | 45h |

| Semester: | 3 |
|---|---|

| Prerequisite: | UEF2.2, UEF4.2 |
|---|---|

**OBJECTIVES:**

- The main objective is to introduce the concept of determinant in its natural framework which is multilinear algebra. This tool allows to solve some problems such as the reduction of endomorphisms and the resolution of linear systems.

**MODULE CONTENT :**

I- Determinants

- Definitions and properties.
- Determinant of a square matrix and properties.
- Methods of calculating the determinant.
- Some applications: inversion of a matrix and solution of the Cramer system.

II- Solving linear systems

- Definitions and properties.
- System of n equations with m unknowns
- Study using column vectors
- Study by means of line vectors.
- Study using determinants.

III- Reduction of endomorphisms

- Definition of an eigenvalue and an eigenvector.
- Characteristic polynomial and properties
- Reduction of an endomorphism.
- Application to the solution of differential systems.

**PERSONAL WORK:**

Regular homework assignments are provided to work on the assimilation of the lessons and the deepening of the notions.

| METHODS OF TESTING KNOWLEDGE |
| --- |
| written exams + homework grade + final exam. |

**BIBLIOGRAPHY**


- E. Azoulay, J.Avignant, G. Auliac, " Les mathématiques en licence " (Tomes 1 à 4) Science.
- J. Dixmier, "Cours de mathématiques. Cycle préparatoire", Two volumes, Dunod.
- J. Monier, "Cours de mathématiques (Algèbre 1 et 2)", Dunod.
- J. Lelong-ferand, J.M.Arnaudies, " Cours de mathématiques. Cycle préparatoire (Tome1 Algèbre)", Dunod
- M. Queysanne, " Algèbre ", 1er Cycle et Classes préparatoires. Armand Colin, Collection U.

**EMU 2.1 - FUNDAMENTAL ELECTRONICS 2**

| EU Code | Module title | Credits |
|---|---|---|
| EMU 2.1 | FUNDAMENTAL ELECTRONICS 2 | 4 |

| Hourly volumes | | | | |
|---|---|---|---|---|
| Course | TD / TP | TP | Other (specify) | TOTAL |
| 30 h. | 30 h. | | | 60 h. |

| Semester: | 3 |
|---|---|

| Prerequisite | UEF2.3 and UEM1.2 |
|---|---|

**OBJECTIVES:**

The purpose of this course is to familiarize students with electronic functions based on integrated circuits. It covers analog and digital functions for communications as well as for continuous and discrete signal processing. It is structured around the following concepts: amplification, analog and digital signal generation, A/D and D/A conversion and modulation.

Upon completion of this course the student will be able to:

- design and analyze circuits centered on the operational amplifier,
- produce analog and digital signals,
- know the different operating principles of A/D and D/A converters,
- choose a converter according to the constraints in resolution, speed and cost,
- understand the operation of the basic assemblies of a data acquisition chain (samplers/blockers, converters, amplifier, clock),
- to master an analog modulation technique

**MODULE CONTENT :**

I OPERATIONAL AMPLIFIER (~ 8 hours)

- Introduction and presentation
- The ideal operational amplifier (O.A.)
- Fundamental assemblies to ideal A.O.
- The real operational amplifier
- Applications of the operational amplifier: Schmitt trigger, Oscillators and active filters

II DIGITAL CIRCUITS (~ 9 hours)

- Introduction
- General notions on electronic scales (multivibrators)
- RC switching circuit
- Bistable transistors and logic gates
- Monostable A.O. assemblies and CMOS logic gates
- Astable A.O. assemblies and CMOS logic gates
- Applications of multivibrators
- The NE555 in bistable, monostable and astable scales

III ANALOGIC - DIGITAL CONVERSION (ADC) AND DIGITAL - ANALOG CONVERSION (DAC (~ 6 hours)

- Introduction

- Analog-to-digital conversion
- Analog-to-digital converters
- Digital-to-analog converters
- Example of an integrated CAN/CNA

IV INTRODUCTION TO AMPLITUDE ANALOGUE MODULATION (~ 7 hours)

- General information transmission
- Principle of amplitude modulation
- Temporal representation of an amplitude modulated signal
- Power carried by an amplitude modulated signal
- Suppressed carrier modulation
- Single sideband modulation
- Amplitude modulation processes
- Amplitude demodulation

**PERSONAL WORK:**

- Practical work reports (TPs):
  - Practical work #1 : The operational amplifier in linear regime
  - Practical work #2: The operational amplifier in saturated mode
  - Practical work #3: A/D and D/A conversion
- Read the material in the course and prepare the exercises.

| **METHODS OF TESTING KNOWLEDGE** |
|---|
| 2 intermediate tests + 3 practical tests + 1 participation note |

**RECOMMENDATIONS** :

- It is recommended to use the video projector for the course and to distribute a course support or handout.
- The practical work must be done in rooms equipped with computer equipment. The objective of the practical work is to illustrate the theoretical electronics courses by studying analog and digital circuits in simulation.
- The simulation software used is the Workbench (Electronics Workbench).

**BIBLIOGRAPHY**


- COEURDACIER S., Amplification basses fréquences - commutation, Dunod, 1990.
- MULLER C, Operational amplifiers and active filters, Mentor, 1984.
- J. MILLMAN and A. GRABEL, Digital Circuits and Systems, Volume 2 and Volume 3, Mc Graw-Hill, 1983.
- D. BELL, Electronic devices and circuits, Prentice-Hall, 1986.
- HARAOUBIA B., General Electronics, OPU, 2006.
- HARAOUBIA B., The main functions of electronics, OPU, 1995.
- MALVINO, Principles of Electronics, Mc Graw-Hill, 2004.
- DORVAL, Pulse techniques, pulse and switching circuits, Mc Graw-Hill, 1983.

**EMU 2.2 - PROBABILITY AND STATISTICS 1**

| EU Code | Module title | Credits |
|---|---|---|
| **EMU 2.2** | **PROBABILITIES AND STATISTICS 1** | **4** |

| Hourly volumes | | | | |
|---|---|---|---|---|
| **Course** | **TD / TP** | **TP** | **Other (specify)** | **TOTAL** |
| **30 h.** | **30 h.** | | | **60 h .** |

| **Semester:** | **3** |
|---|---|

| **Prerequisite:** | **S1 and S2 (analysis and algebra)** |
|---|---|

**OBJECTIVES:**

- In part (1) of this Module, the data will be presented in a raw form, reducing them to a few graphical summaries and characteristic parameters.
- In part (2), and after the reminders of combinatorial analysis, the general principles of probability calculus are introduced, showing the possibilities of using set algebra. The different usual laws of probability are then studied and their conditions of application examined.

**MODULE CONTENT :**

**(1)** Descriptive statistics (06h lecture and 04h30 TD)

1. Introduction
2. Tables and graphs
3. Analysis of a frequency distribution

**(2)** : Probability calculation

1 Combinatorial analysis (01h30h TD)

2 Probability space (03h lecture and 03h DED)

- randomized experiment,
- random events,
- Probability (intuitive approach, definition, properties and uniform probability)

3 Conditional probability and independence (03h lecture and 03h DED)

Introduction, definition, formula of compound probabilities, formula of probabilities to bayes formula, independence.

4 Discrete random variables (D.R.V.) (06h lecture and 06h DED)

a) V.a.d
b) Laws of probability
c) Distribution function
d) Mode, moments, expectation and variance
e) Discrete random pair
   - Law of the couple
   - Marginal laws
   - Independence
   - Conditional laws
   - Laws of the sum

5 Discrete probabilistic models (03h lecture and 03h TD)

Uniform law, Bernoulli's law, binomial law, fish law, hypergeometric law, pascal law, approximations

6 Continuous random variables (C.R.V.)

(06h lecture and 06h TD)

1. V.A.C
2. Pair of continuous random variables
3. Generalization to continuous random vector

7: Continuous probabilistic models (03h lecture and 03h TD)

1. Normal law
2. Other usual continuous laws
   Uniform law, exponential law, chi-square law, Student's law, Fisher's law.

**PERSONAL WORK:**

Personal work will be scheduled in the second semester.

**METHODS OF TESTING KNOWLEDGE**

1controle+ 1 grade Average (participation, written questions in TD)

**RECOMMENDATIONS :**

- It is recommended to use the video projector for the course and to distribute a course support or handout.

**BIBLIOGRAPHY**


- Descriptive statistics, Bernard PY, Economica 1991
- Probabilités et statistique, Jacqueline FOURASTIE and Benjamin SAHLER, Série j Quinet, édition DUNOD 1981
- Probability and statistics courses, Christian LEBOEUF, Jean-louis ROQUE and Jean GUEGAND ellipses-Marketing 1983
- Probabilités, statistiques et sondages, J.GENET, G.PUPION and M.REPUSSARD Vuibert 1974

**UED 2.1 - BUSINESS ECONOMICS**

| EU Code | Module title | Credits |
|---|---|---|
| **UED 2.1** | **BUSINESS ECONOMICS** | **3** |

| Hourly volumes | | | | |
|---|---|---|---|---|
| **Course/DD/PT** | **TD / TP** | **TP** | **Other (specify)** | **TOTAL** |
| **45** | | | | **45 h.** |

| **Semester:** | **3** |
|---|---|

| **Prerequisite:** | **No** |
|---|---|

**OBJECTIVES:**

- The student must be able to understand the role of the firm in the economic activity of a nation and approach it as an open system.
- The student must also be able to analyze the missions and responsibilities of each of the major functions (operational and support) of the company.

**MODULE CONTENT :**

I - INTRODUCTION TO ECONOMICS (3 hours)

- Definition
- The economic activity and its objectives

II - INTRODUCTION TO BUSINESS (3 hours)

- Definitions
- Basic missions
- Company classification (legal, sectoral, etc.)
- The company as a system (flows)

III - THE COMPANY AND ITS ENVIRONMENT (6 hours)

- The company and its direct environment: A basic unit of economic activity
  - Two agent circuit: Supply and Demand
  - Three-agent circuit: Savings - Investment
- The company and its indirect environment (broad)
- Role of the administration
- Role of culture
- Synthesis

III - THE MAJOR FUNCTIONS OF THE COMPANY (9 hours)

- Operational functions
  - Commercial function
  - Production function
  - Purchasing and supply function
- Support functions (Administration, HR, Finance, Communication, ...)

IV - COMPANY FACED WITH THE INFORMATION SOCIETY (3 hours)

- Information Society
- Challenges of the Net-Economy
- New forms of business.

**PERSONAL WORK:**

- Group case studies on the functions of the company

| METHODS OF TESTING KNOWLEDGE |
| --- |
| 1 intermediate test + 1 mark for personal and/or group work |

**RECOMMENDATIONS** :

- It is recommended to use the video projector for the course and to distribute a course support or handout.
- The emphasis must be on the general culture aspect

**BIBLIOGRAPHY**


- BIOLLEY G., "Mutation du management", Les Editions d'Organisation, 1986.
- ROUX D. " Economic analysis and business management: Theories, methods and practices", Dunod, 1989
- LYVIAN Y.F " Introduction to the analysis of organizations", Economica, 2000

**UET 3.1 - ENGLISH 2**

| EU Code | Module title | Credits |
|---|---|---|
| UET 3.1 | ENGLISH2 | 2 |

| Hourly volumes | | | | |
|---|---|---|---|---|
| Course | TD | TP | Other (specify) | TOTAL |
| | 30h | | | 30 h. |

| Semester: | 3 |
|---|---|

| Prerequisite | Computer vocabulary/particular point of grammar. |
|---|---|

**OBJECTIVES:**

In the chapter1 the student will learn how to :

- talk and write about computer applications in everyday life.
- recognize the basic components of a computer system and understand their functions.
- use synonyms, acronyms and abbreviations when talking about computers.

In the chapter2 the learner will understand the basic features of databases and acquire specific vocabulary related to internet utilities.

In the chapter3 concerns languages work.

**MODULE CONTENT :**

- The study of clauses
  - Noun clauses
  - Adjectiveclauses
  - adverbclauses
- The study of phrases (participials)
  - The presentparticiple
  - The pastparticiple
- Study of texts for the appropriation of vocabulary specific to the field of IT

**PERSONAL WORK:**

6 hours for preparing personal works.

**METHODS OF CONTROL OF KNOWLEDGE :**

1mark for control+1mark for personal work

**RECOMMENDATIONS** :

- Tasks in laboratory
- The courses will be carried out in the form of TDs

**BIBLIOGRAPHY**


- "Natural English, upper intermediate student book", Oxford university press, 2003
- "Oxford advanced learner's dictionary, Oxford university press, 2000

**UEF7.1 - OBJECT-ORIENTED PROGRAMMING**

| EU Code | Module title | Credits |
|---|---|---|
| UEF7.1 | P R O G R A M M A T I O N O R I E N T A N D O B J E C T | 4 |

| Hourly volumes | | | | |
|---|---|---|---|---|
| Course | TD / TP | TP | Other (specify) | TOTAL |
| 30 h. | 30 h. | | | 60 h. |

| Semester: | 4 |
|---|---|

| Prerequisite | UEF1.1 |
|---|---|

**OBJECTIVES:**

- Introduce the basic concepts of object programming. The notions of classes, objects/instances, message sending must be assimilated, as well as the decomposition of a problem in these terms. At the end of this module the student should be aware of the importance and the application of the notions of polymorphism, inheritance and abstraction of the problem representation.
- Learn to program in Java .

**MODULE CONTENT :**

I Introduction to Object Oriented Programming (~2 hours)
II Classes and objects (~4 hours)
III Primitive types, arrays and strings (in Java) (~3 hours)
IV Inheritance and polymorphism (~4 hours)
V Internal and anonymous classes (~2 hours)
VI Collections (~3 hours)
VII Graphic programming (~4 hours)
VIII Applets (~2 hours)
IX Exception handling (~2 hours)
X Streams and files (~4 hours)

**PERSONAL WORK:**

- Periodic activities
- A TP to be handed in at the end of the semester

**METHODS OF TESTING KNOWLEDGE**

Intermediate tests, practical work and notes on participation and attendance

**RECOMMENDATION**:

- The practical application of OOP notions is essential for a good understanding of the course. It is therefore suggested that all the tutorials take place in the machine room.
- The use of the BlueJ environment during the first TP sessions for a better assimilation of the notions of the Object Oriented approach before moving to the Eclipse IDE.

**BIBLIOGRAPHY**
**(title, author(s), publisher)**

1. Head First Java, Second Edition,By Kathy Sierra, Bert Bates, O'Reilly Media.
2. Programming in JAVA4$^{ième}$ edition, Deitel and Deitel, Les éditions reynald Goulet
3. Http://java.sun.com
4. Le Programmeur JAVA 2, Lemay L, Campus Press.
5. In the Heart of Java 2 Volume I - Fundamentals, Horstmann and Cornell, The Sun Microsystems Press Java Series
6. Programming in Java, Claude Delannoy, Eyrolles

**UEF 7.2 - INTRODUCTION TO INFORMATION SYSTEMS**

| EU Code | Module title | Credits |
|---|---|---|
| UEF 7.2 | INTRODUCTION TO INFORMATION SYSTEMS | 3 |

| Hourly volumes | | | | |
|---|---|---|---|---|
| Course | TD / TP | TP | Other (specify) | TOTAL |
| 15 h. | 30 h. | | | 45 h. |

| Semester: | 4 |
|---|---|

| Prerequisite: | UEF5.1 |
|---|---|

**OBJECTIVES:**

- The student must be able to understand the concept of system in order to better use it in modeling complex situations
- The student must be able to perceive the fundamental role of information as well as the main analysis tools for a better quality of information.
- He must perceive the importance of the company's information systems? An economy of service, an economy of information or even creation of value.

**MODULE CONTENT :**

I - NOTION OF SYSTEMS (6 hours)

- System definitions
- Composition of a system
- Objectives of a system
- Function of a system
- A classification of systems
  - Natural systems and technical systems
  - Physical systems and conceptual systems
  - Static and dynamic systems
  - Open and closed systems
  - Life cycle of a system
- Systems and sub-systems
- Control of a system

II- NOTION OF INFORMATION (3 hours)

- Definitions:
  - What is a data, an information, a knowledge?
- Information theory
  - measurement of the amount of information
  - analysis of the communication chain
- Quality of information

III- INFORMATION ANALYSIS TOOLS (12 hours)

- Coding of information
  - Definitions
  - Lexicographic power
  - Objective of the coding
  - Types of coding

- Characteristics of a code
- Coding systems
- How to choose a coding system?

- Information control
  - need for controls
  - Different types of control
  - Order of execution of the controls
  - Manual and automatic controls
- Protection of information

IV- NOTION OF INFORMATION SYSTEMS (9 hours)

- Definitions
  - What is an information system?
  - What are the different subsystems (strategic, tactical, operational)
  - What is an information technology?
- Objectives
- Role of the I.S. in the organization
  - OID model (Lemoigne)
- Classification of I.S.
  - Operational I.S.
  - Decision support system
  - Communication I.S.
- I.S. development life cycles

**PERSONAL WORK:**

- Case studies on systemic issues
- Case studies on: coding, controls

| METHODS OF TESTING KNOWLEDGE |
|---|
| 2 intermediate controls + 1 TPs |

**RECOMMENDATIONS** :

- It is recommended to use the video projector for the course and to distribute a course support or handout.
- We must insist on the fact that the IS is the language of the company, a language that is linked to its actions. It is organic, linked to its positioning and its priorities; it expresses its

**BIBLIOGRAPHY**


- Blanchard, B-S., Fabrycky, W-J., "Systems engineering and analysis", Prentice Hall Upper Saddle River, New Jersey 07458, 1998
- Davis G.B, Olson M.H, Ajensat J., Peaucelle J.L, "Systèmes d'informations pour le management", Edition G. Vermette Inc, 1986
- K.C. Laudon, J.P. Laudon, "Management Information Systems: Managing The Digital Firm", 9th Edition, Prentice Hall, 2005.
- Lemoigne J.L, "La théorie du système général", Presses Universitaires Françaises, 19 ?
- Lemoigne J.L., "Les Systèmes d'Information", Editions d'organisations, 1971
- Meinadier J.P, " Le métier d'intégration de système ", Hermès 2002
  Reix R., " Dictionnaire des systèmes d'information ", 1999,
- Senn J.A., "Analysis and design of I.S.", Mc Graw Hill, 1989.
- Akoka J. & al, " Encyclopedia of computer science and information systems ", Vuibert, 2006

- Von Bertalanffy L. "Théorie générale des systèmes", Dunod, 1993.

**UEF 8.1 - MATHEMATICAL ANALYSIS 4**

| EU Code | Module title | Credits |
|---|---|---|
| UEF 8.1 | MATHEMATICAL ANALYSIS 4 | 6 |

| Hourly volumes | | | | |
|---|---|---|---|---|
| Course | TD | TP | Other (specify) | TOTAL |
| 45h | 45h | | | 90h |

| Semester: | 4 |
|---|---|

| Prerequisite: | UEF6.1 |
|---|---|

**OBJECTIVES:**

The objective of this EU is threefold:

- Extend the notion of Riemann integral to the case of an unbounded interval or an unbounded function.
- Define the Riemann integral in dimensions 2 and 3.
- Introduce some notions about PDEs.

**MODULE CONTENT :**

I- Geometry of curves and surfaces (27 h)

- Curves and surfaces in Euclidean space I
- Parametrization of curves and surfaces.
- Regularity of curves and surfaces.
- Line tangent to a curve, and plane tangent to a surface.
- Notion of a vector field normal to a curve or a surface.
- Orientable curves and surfaces, and orientation.
- Notion of edge, and oriented edge.
- Notion of sub-variety of $IR^3$ .

II- Improper integrals (18 h)

- Definition and basic properties.
- Convergence of integrals of positive functions.
- Convergence of integrals of functions of any sign.
- Integration techniques.
- Parametric integrals.

III- Integration of differential forms on subvarieties of $IR^3$ (27 h)

- Curvilinear integrals
- Surface integrals.
- Volume integrals.
- Stocks formula in dimensions 2 and 3**.**

IV- Notion of partial differential equations (18 h)

- General definitions and resolution of some PDEs of order 1.
- Examples of PDEs of order 2 (Poisson, heat and wave equations)

**PERSONAL WORK:**

Regular homework assignments are provided to work on the assimilation of lessons and the deepening of concepts.

| METHODS OF TESTING KNOWLEDGE |
| --- |
| 4 written exams + homework grade + final exam. |

**RECOMMENDATIONS** :

**BIBLIOGRAPHY**


- E. Azoulay, J.Avignant, G.Auliac, " Les mathématiques en licence (Tomes 1 à 4) ", Edi Science.
- J.Dixmier, " Cours de mathématiques. Cycle préparatoire", Two volumes, Dunod.
- J.Monier, " Cours de mathématiques ", (Analyse 1, 2,3 et4) , Dunod.
- J.lelong-ferand, J.M.Arnaudies, " Cours de mathématiques. Cycle préparatoire (tome 2 Analyse, tome3 Géométrie et cinématique)", Dunod.
- B.Calvo, A.Calvo, J.Doyen,F. Boschet, " Cours d'analyse de I à V. 1er Cycle et Classes préparatoires aux grandes Ecoles. Armand Colin", Collection U.
- R.Couty, J.Ezra, "Analysis", Armand.

**UEF 8.2 - MATHEMATICAL LOGIC**

| EU Code | Module title | Credits |
|---|---|---|
| UEF 8.2 | M A T H E M A T I C L O G I C A L | 4 |

| Hourly volumes | | | | |
|---|---|---|---|---|
| Course | TD | TP | Other (specify) | TOTAL |
| 30h | 30h | | | 60h |

| Semester: | 4 |
|---|---|

| Prerequisite | |
|---|---|

**OBJECTIVES:**

At the end of the course, the student should know how to distinguish between syntax and semantics, how to formalize a problem statement and how to use model theory or proof theory to show the satisfiability (non-satisfiability) of this statement. The student must also master the properties of consistency and completeness of a logical system.

**MODULE CONTENT :**

I. Set theory (reminders) (4h30h)

- Functions
- Relationships
- Set and parts of a set,
- Countable sets

II. Propositional calculus (15h30)

- Introduction
- Proposal and paradox
- Syntax of the propositional language
    - The alphabet
    - The rules of writing
- Semantic study of propositional language
    - Truth table of a formula
    - Satisfiability
    - Logical consequence
    - Complete connector system, Sheffer connectors
- Properties of logical connectors
- Normal forms
    - Semantic tree
- Theory of demonstration in propositional calculus
    - Introduction
    - The resolution in calculation of the proposals
    - Consistency and completeness of the resolution
    - Resolution strategies
-
- III. First order predicate calculus (40h)
    - Introduction to first order languages
    - The alphabet

- Language expressions (terms and formulas)
- Complete connector system
- Field of a quantizer
- Free variables, linked variables, free terms for a variable

- Semantic study of the first order predicate language
  - Interpretation of a term
  - Interpretation of a formula
  - Satisfiability of a formula
  - Model of a formula
  - Valid formula
  - Satisfiability of a set of formulas
  - Model of a set of formulas
  - Logical consequence
  - Conjunctive normal form and disjunctive normal form
  - Normal form prefix
  - Skolem shape
  - Clausal form
    - The world of Herbrand
    - Herbrand interpretation (H-interpretation)
    - Semantic tree

- Theory of demonstration
  - Introduction to the theory of demonstration in predicate calculus
  - The resolution in predicate calculus
  - Substitution
  - Composition of substitutions
  - Unification
  - Principle of the resolution
  - Consistency and completeness of resolution in predicate calculus
  - Resolution strategies

**PERSONAL WORK:**

**METHODS OF TESTING KNOWLEDGE**

- Three short tests (30mn)
- A final test of average length: 2 hours
- A note of participation

**BIBLIOGRAPHY**


- Chang, Char-Tung Lee, "Symbolic Logic and Mechanical Theorem Proving," Academic Press, Inc. 1973.
- Kleene, "Logique mathématique", Collection U, 1973.
- Mendelson. D., "Introduction to Mathematical Logic", Van Nostrand Company. 1979.

**UEF 8.3 - OPTICS AND ELECTROMAGNETIC WAVES**

| EU Code | Module title | Credits |
|---|---|---|
| UEF 8.3 | OPTICS AND ELECTROMAGNETIC WAVES | 3 |

| Hourly volumes | | | | |
|---|---|---|---|---|
| Course | TD | TP | Other (specify) | TOTAL |
| 15 | 30 | | | 45h |

| Semester: | 4 |
|---|---|

| Prerequisite | |
|---|---|

**OBJECTIVES:**

**MODULE CONTENT :**

I. GEOMETRIC OPTICS (20h)
- General
  - Light beam and ray
  - Objects, real and virtual images
- Principle of rectilinear propagation of light
- Principle of reverse light return
- Snell-Descartes laws
- Fermat's principle
- Flat mirrors
- Diopters: plane, spherical, parallel face blades, prisms
- Thin lenses: convergent and divergent
- Eye

II. ELECTROMAGNETIC WAVES (25h)
- Mathematical reminders : grad, div, rot, laplacian, ...
- Maxwell's equations
  - Static electromagnetic field
    - Electric field
    - Gauss's theorem: differential form and integral
    - Magnetic field
    - Ampere's theorem
  - Variable electromagnetic field
    - Faraday law: integral and differential forms
    - Lenz's law
    - Generalized Ampere's
  - law Maxwell's equations in vacuum
  - Electromagnetic waves
    - Plane waves, sinusoidal plane waves
    - Propagation of energy: Pointig vector
  - Reflection and refraction of electromagnetic waves

- Dielectric - dielectric interface, dielectric - conductor
- Interference and diffraction

**PERSONAL WORK:**

**METHODS OF TESTING KNOWLEDGE**

- Two short controls (30mn)
- A final test of average length: 2 hours
- A note of participation
- A TP

**EMU 3.1 - MULTIDISCIPLINARY PROJECT**

| EU Code | Module title | Credits |
|---|---|---|
| EMU 3.1 | MULTIDISCIPLINARY PROJECT (PRJP) | 4 |

| Hourly volumes | | | | |
|---|---|---|---|---|
| Course | TD / TP | TP | Other (specify) | TOTAL |
| | 60 h. | | | 60 h. |

| Semester: | 2 (The duration of the project is three (3) months and runs from mid-February to mid-May) |
|---|---|

| Prerequisite: | ALDS, ALDD, SYST1, SYST2, SFSD, |
|---|---|

**OBJECTIVES:**

The project takes place during the second semester of the second year. It consists of the conception and realization of a computer project that takes place under the same conditions as those of a company. The project is described in precise specifications and can deal with a wide variety of themes. It is proposed by one or more teachers who play the role of "client" and it must cover at least two disciplines. It is supervised by a teacher who may also be the "client".

The project group, composed of a minimum of 4 and a maximum of 6 students, depending on the size of the project and under the responsibility of a project leader appointed from among the members of the group, must behave as a real team. In addition to the technical content, which will consist of the application of the knowledge acquired for the implementation of the development cycle of a small software, the accent will be put on the acquisition and the application of the organizational and relational aspects between the members of the group, the supervisor and the "customer":

- analysis and division of labour,
- distribution of workloads among the group members by the project leader,
- flow of information between group members,
- setting up a work schedule,
- weekly presentation of the project's progress,
- delivery of the deliverables set out in the project sheet,
- writing a final report
- and presentation of the work done.

**MODULE CONTENT :**

The project must conform to the standard outline of specifications for CPI projects.

**PROJECT EVALUATION METHODS**

The evaluation of the project will take the form of a score out of twenty and will be based on the following criteria

- A continuous work grade that will be given, by the supervisor, at each session. It can be an overall mark given to the team or an individual mark if the coach notices that the volume of work provided by the members is unequal. This mark will validate the objectives set for each week,
- A note of the final product: software and manual(s) of maintenance and use given by the "customer" and the framer
- A note of the project report given by the supervisor
- A presentation note given by a jury composed of at least the "client" and the framer

| **Formula for calculating the project note** | |
|---|---|
| **Evaluation element** | **Coeff.** |
| continuous work | 4 |
| final product: software and source code | 4 |
| Installation instructions | 1 |
| Instructions for use | 1 |
| report | 3 |
| defense | 2 |
| Average = (∑ (evaluation item * coeff) /∑ coeff) rounded up to the next half point | |

**RECOMMENDATIONS:**

The project must be seen differently from a practical training, by the students, the supervisor and the "client". It does not only serve to implement the theoretical and practical knowledge acquired but also to create the conditions for a real project in a professional environment that will highlight and/or develop the qualities necessary for any engineer:

- Responsibility. Each member must feel responsible for the work he or she has to accomplish and be aware that any failure, negligence or failure will have repercussions on him or herself and on the whole group,
- Respecting work schedules. Once the work schedule is set, its respect becomes a requirement, because any delay has a financial cost but also undermines the credibility and the seriousness of the entity in charge of the project. In a competitive world, the market will always be entrusted to the competitor, less expensive and more credible. Of course, the schedule will often be readjusted, but you have to keep an eye on the critical path. If it is affected, its impact must be measured and the necessary corrections made immediately,
- Versatility. One must avoid specialization, participate in the tasks of analysis and conception, realization, writing, planning, preparation of the presentation, of the presentation itself... if a task seems difficult or uninteresting, on the contrary, take advantage of this opportunity and face it! engineers who have this faculty of adaptation are the most sought after in the working world,
- Collaborative work. The members of the group must exchange their ideas, knowledge, know-how, documentation, tools between them. One should not be locked into the tasks that have been assigned. The success of the project must be a collective objective. It is necessary to use collaborative work tools whenever possible,
- Communication. Relationships among group members, with the coach and the "client" are essential. They must be cordial whatever the situation. Conflicts must be dealt with very quickly. In addition to the weekly scheduled sessions, you should organize very short working sessions to exchange ideas, identify possible problems, find solutions to them and make personal and global verbal assessments of the project. Give constructive criticism, practice self-criticism and tolerance, which is the fundamental basis of human relations.

It is strongly recommended that the defenses take place during the second half of May and before the end-of-year exams.

Special attention must be paid to plagiarism!

Any plagiarism, which consists in t h e appropriation of the work of others (idea, text, drawing, data, images, ....) will be sanctioned by a zero grade for the project.

To avoid plagiarism, the following simple rules are recommended:

1. if you copy a text in its entirety, do not forget to put the text in quotation marks and to add a bibliographic reference at the end of the text,
2. if you are rewriting the original text, add only a bibliographic reference at the end of your text,
3. Include a page at the end of your document in which you will note all your bibliographic references and complete them (nature of the source, author, title, page, publisher, year of publication)
4. Sometimes copying is prohibited, but simply ask permission from an author, company or other organization. Do it and if you are refused, respect this decision.

Your project could be put on the Net and broadcasted in its turn. If it contains plagiarism, the discredit and damage to you and your institute is immense. To avoid this, you must respect the universal rules of ethics and deontology mentioned above.

**BIBLIOGRAPHY**

**EMU 4.1 - PROBABILITY AND STATISTICS 2**

| EU Code | Module title | Credits |
|---|---|---|
| **EMU 4.1** | **PROBABILITIES AND STATISTICS 2** | **4** |

| Hourly volumes | | | | |
|---|---|---|---|---|
| **Course** | **TD** | **TD/ TP** | **Other (specify)** | **TOTAL** |
| **30h** | **3O hrs.** | | | **60 h .** |

| **Semester:** | **4** |
|---|---|

| **Prerequisite:** | **S1, S2 and S3 (analysis, algebra and EMU2.2)** |
|---|---|

**OBJECTIVES:**

- Part A will provide the student with a good foundation for further concepts and topics in probability and statistics.
- Part (B) introduces inductive statistics which, thanks to the assimilation of experimental observations to theoretical laws and the application of tests, provides elements for decision making.

**MODULE CONTENT :**

Part (A):

- 1: Properties of expectation (07h30 lecture and 06h TD)
  - Introduction
  - Expectation of a sum of random variables
  - Covariance, sum variance, correlation
  - Conditional expectation
  - Conditional expectation and prediction
  - Moment generating functions
  - Other properties of normal random variables
- 2: Convergence (0430h lecture and 06h TD)
  - Inequalities, convergence in probability, weak law of large numbers, convergence in law, central limit theorem, approximations

Part (B): Inferential Statistics

1 Sampling theory (04h30 lecture and 04h30 tutorial)
2 Estimation (04h30 lecture and 04h30 tutorial)
3 Tests (04h30course and 04h30TD)

Some selected topics of probability (9h)

- The statistical survey
- Survey techniques
- Fish process
- Markov chains
- Surprise, uncertainty, entropy
- Coding theory and entropy
- Simulation.....

.

**PERSONAL WORK:**

The selected topics of probability will be treated in the second semester in the form of practical work,

**METHODS OF TESTING KNOWLEDGE**

1controle+ 1 mark for participation or questioning in TD+ 1 mark for personal work.

**RECOMMENDATIONS** :

- During the second semester, selected probability themes will be proposed to the students in the form of personal work (TP, presentations...)
- It is recommended to use the video projector for the course and to distribute a course support or handout.

**BIBLIOGRAPHY**


- Descriptive statistics, Bernard PY, Economica 1991
- Probabilités et statistique, Jacqueline FOURASTIE and Benjamin SAHLER, Série j Quinet, édition DUNOD 1981
- Probability and statistics courses, Christian LEBOEUF, Jean-louis ROQUE and Jean GUEGAND ellipses-Marketing 1983
- Probabilités, statistiques et sondages, J.GENET, G.PUPION and M.REPUSSARD Vuibert 1974

**UET 4.1 - ENGLISH 3**

| EU Code | Module title | Credits |
|---|---|---|
| UET 4.1 | ENGLISH 3 | 2 |

| Hourly volumes | | | | |
|---|---|---|---|---|
| Course | TD / TP | TP | Other (specify) | TOTAL |
| 30 h. | | | | |

| Semester: | 4 |
|---|---|

| Prerequisite | English2 |
|---|---|

**OBJECTIVES:**

The chapter 1, 2 focus on structure of a sentence and extra practice in translating technical texts.

**MODULE CONTENT :**

- The study of tenses(Conjugation review)
  - Present simple, continuous, perfect ;
  - Pastsimple, continuous, perfect ;
  - Future simple, continuous, perfect;
  - The concept of Futurity.
- The Voice
  - Active Vs Passive Voice
- Study of texts for the appropriation of vocabulary specific to the computer field.

**PERSONAL WORK:**

**METHODS OF TESTING KNOWLEDGE**

Knowledge control: written test + oral test + quiz

**RECOMMENDATIONS** :

- If possible laboratory.
- The courses will be carried out in the form of TDs

**BIBLIOGRAPHY**


- "Natural English, upper intermediate student book", Oxford university press, 2003
- "Oxford advanced learner's dictionary, Oxford university press, 2000
- Santiago esters, "English for computer uses",

- Raymond-Murphy, "English grammar in use