

République Algérienne Démocratique et Populaire
الجمهورية الجزائرية الديمقراطية الشعبية
Ministère de l'Enseignement Supérieur et de la Recherche Scientifique
وزارة التعليم العالي و البحث العلمي



المدرسة الوطنية العليا للإعلام الآلي
(المعهد الوطني للتكوين في الإعلام الآلي سابقا)
Ecole nationale Supérieure d'Informatique
ex. INI (Institut National de formation en Informatique)

Second cycle

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**Program 2nd year
SIL option**

Contents

UEF 2.1.1 - Agile Methods (MAGL).....	
UEF 2.1.1 - Design Patterns (PDC)	
UEF 2.1.3 - Compilation (COMPL)	
MEU2.1.1 - Web Oriented Technologies and Development (WOTD)	
UEF 2.1.2 - Software Engineering Tools(OGL)	
UEF2.1.4 - Data Analysis (ANAD).....	
UEF 2.2.1 - Mobile Technology and Development 1 (TDM1).....	
UEF 2.2.1 - Mobile Technology and Development 2 (TDM2).....	
UEF2.2.2 - Software Architectures (LA)	
UEF 2.2.3 - Software Quality (QL).....	
UEF2.2.4 - DBMS and Advanced DB (ADB)	
EMU2.2.1- Human-Computer Interaction (HCI)	
EMU2.2.2 - Specialty Project (SJR).....	
UET- Combinatorial Optimization (OPT).....	
ETU-Advanced Networks (AR)	
UET- Programming Theory (TPGO)	
UET- Distributed Systems (SysR).....	
UET- Systems and Network Security (SSR)	
TEU - Quality Assurance (QA)	
UET - Information Systems Security Engineering and Management (IMSSI) .	
UET -Accounting and Finance (COFI)	
UET - Web Oriented Technologies and Development2 (TDW).....	
UET - Embedded Systems Architectures (ES)	
UET- Secure Protocol and Software Engineering (IPLS).....	
UET -Geographic Information Systems (GIS).....	
UET-Watch.....	
ETU - Ethics and Professional Conduct (ECP)	

SECOND CYCLE (2nd year) SIL option

Table of course distribution: 2nd year (Semester 3)

Teaching Unit EU	Hourly volume half-yearly (15 weeks)					Coefficients
	Lectures	Tutorial	Practical work	Other	Total	
EU Fundamental						
UEF2.1.1	30h00	30h00			60h00	4
Agile methods	15h00				15h00	1
Design patterns	15h00	30h00			45h00	3
UEF2.1.2	15h00	45h00			60h00	4
Software engineering tools	15h00	45h00			60h00	4
UEF2.1.3	30h00	15h00	15h00		60h00	4
Compilation	30h00	15h00	15h00		60h00	4
UEF2.1.4	30h00	30h00			60h00	4
Data analysis and mining	30h00	30h00			60h00	4
EU Methodology						
EMU2.1.1	15h00		45h00		60h00	4
Web technologies and development	15h00		45h00		60h00	4
EMU2.1.2				30h00	30h00	2
Practical training in a company				30h00	30h00	2
Cross-cutting EU						
UET2.1	60h00	30h00	30h00		120h00	8
Optional teaching units* (optional)	60h00	30h00	30h00		120h00	8
Total Semester S3						
	180h00	150h00	90h00	30h00	450h00	30

* UE to be chosen among the UE proposed by the institution every semester

Table of course distribution: 2nd year (Semester 4)

Teaching Unit EU	Hourly volume half-yearly (15 weeks)					Coefficients
	Lectures	Tutorial	Practical work	Other	Total	
EU Fundamental						
UEF2.2.1	30h00	30h00			60h00	4
Technology and development mobile 1	15h00	15h00			30h00	2
Technology and development mobile 2	15h00	15h00			30h00	2
UEF2.2.2	30h00	15h00	15h00		60h00	4
Software architectures	30h00	15h00	15h00		60h00	4
UEF2.2.3	30h00	15h00	15h00		60h00	4
Software quality	30h00	15h00	15h00		60h00	4
UEF2.2.4	30h00	15h00	15h00		60h00	4
DBMS and advanced databases	30h00	15h00	15h00		60h00	4
EU Methodology						
EMU2.2.1	15h00	15h00			30h00	2
Human - Machine Interaction	15h00	15h00			30h00	2
EMU2.2.2				60h00	60h00	4
Specialty project				60h00	60h00	4
Cross-cutting EU						
UET2.2	60h00	30h00	30h00		120h00	8
Optional teaching units* (optional)	60h00	30h00	30h00		120h00	8
Total Semester S4	195h00	120h00	75h00	60h00	450h00	30

* UE to be chosen among the UE proposed by the institution every semester

UEF 2.1.1 - Agile Methods (MAGL)
Knowledge Area: Software Engineering

EU Code	Title of the module	Coefficient
UEF 2.1.1	Agile Methods (MAGL)	1

Hourly volumes		
Lectures		TOTAL
15		15

Semester :	3
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Prerequisites	<ul style="list-style-type: none">• Introduction to Software Engineering• Project management
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OBJECTIVES :

- A development methodology is a conceptual model for defining the phases and stages of a software development project from its initiation and feasibility study phase to final deployment.
- This module complements the IGL module of the 3rd year where the methodologies were introduced. UP was used as a template to define the different development activities from requirements expression to testing.
- The module will introduce software development using methods that are increasingly adopted in the professional world, namely agile methods.
- The application of the principles acquired during this module will be carried out during the course of the two projects of the speciality.

CONTENTS :

I. Agile Manifesto

1. Introduction
2. Presentation of the Agile manifesto
3. Agile Principles Journey

II. eXtremeProgramming (XP)

1. Introducing XP
2. XP and best development practices

III. Implementation of SCRUM

1. Application of Scrum in a development project
2. Support tools
3. Agile practices
4. Continuous delivery
5. Refactoring
6. Test-DrivenDevelopment (TDD)

KNOWLEDGE TEST

- Written examination on the course
- Continuous monitoring

BIBLIOGRAPHY

- Augustine, Sanjiv. 2005. Managing Agile Projects: Prentice Hall; illustrated edition.
- Schiel, James. 2009. Enterprise-Scale Agile Software Development: Taylor and Francis.
- Schwaber, Ken, and Mike Beedle. 2002. Agile software development with scrum: Prentice Hall.

UEF 2.1.1 - Design Patterns (PDC)

Knowledge Area: Software Engineering

EU Code	Title of the module	Coefficient
UEF 2.1.1	Design patterns (DCP)	3
Hourly volumes		
Lectures	TD / TP	TOTAL
15	30	45
Semester :	3	
Prerequisites	<ul style="list-style-type: none">• Object-oriented programming• Introduction to Software Engineering	

OBJECTIVES :

The aim of this module is to introduce design patterns and to list the most well-known patterns in the literature. It also aims to apply these patterns in real contexts in order to solve particular problems.

The aim is to :

- To enable the student to make robust object designs that meet standard criteria for good design.
- Have the ability to audit the code of an application written in object-oriented programming and apply SOLID principles to comply with object-oriented programming best practices
- See the practical aspects using an object-oriented programming language such as

CONTENTS :

- I. **Reminder on some notions about OOP**
- II. **Introduction to design patterns**
- III. **Gang Of Four bosses**
 1. Design patterns
 2. Structure patterns
 3. Behavioural patterns
- IV. **GRASP patterns**
- V. **MVC architecture**
- VI. **Other design patterns**

KNOWLEDGE TEST

- Written examination on the course
- Continuous monitoring of the TDs

BIBLIOGRAPHY

- Debrauwer, L. 2007. Design Patterns: The 23 design patterns: descriptions and illustrated solutions in UML 2 and Java: Éd. ENI.
- Lasater, C.G. 2006. Design Patterns: Wordware Publishing.
- Gamma, E. 1995. Design patterns: elements of reusable object-oriented software: Addison-Wesley.

UEF 2.1.3 - Compilation (COMPL)

Knowledge Area: Software Engineering

UEF code	Title of the module	Coefficient
UEF2.1.3	Compilation	4

Hourly volumes		
Lectures	TD / TP	TOTAL
30	30	60

Semester :	3
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Prerequisites	<ul style="list-style-type: none">• Theory of programming languages and applications• Programming in one of the two paradigms (Imperative programming, OOP)• Operating system (assembler, processor registers, etc.)
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OBJECTIVES :

- Write a grammar of a programming language and build a parser for it using standard tools.
- Understand the formalised description of the operational semantics and static semantics of a language
- program a compiler from a language to a target machine

CONTENT OF THE MODULE :

I. Reminders Lexical and syntactic analysis (10%)

1. Lexical analyzer and regular expressions (Lex)
2. Parser and free context grammars (type 3)
3. YACC parser generator

II. Syntactic analysis methods (30%)

1. Top-down methods of type LL(K) :
 - Ambiguity and grammar transformation
 - LL parser construction and operation
2. LR(k) bottom-up methods
 - Contextual analysis
 - Construction of LR analyzer by the method of items
 - Error management

III. Semantic analysis and syntax-driven translation (20%)

1. Intermediate languages
2. Notion of grammar symbol attributes (synthesised and inherited attributes)
3. Translation schemes (in the case of bottom-up and top-down analyses)
4. Semantic analysis (more verification at compile time less risk at runtime)

IV. Execution environment (20%)

1. Procedures and activations
2. Organisation of the memory space
3. Access to non-local names

4. Passing parameters

V. Generation of executable code (20%)

1. Stacking machine
2. Register machine
3. Flow control (flow graph and DAG)
4. Virtual machine

PERSONAL WORK (Practical work)

1. Face-to-face work

- a. Presentation of parser generation tools (YACC, JCC, the .NET class, bison...etc)
- b. Top-down syntactic analysis using the tools
- c. Ascending parsing using the tools
- d. Semantic analysis using the tools
- e. Code generation for various machines (Native code and byte code for VM)

2. Project :

- a. Individual development of a compiler: the project will be carried out and evaluated in stages during the semester
- b. Deepening of course concepts through assignments and presentations.

KNOWLEDGE TEST

- Continuous monitoring by small tests after the 5 chapters
- Evaluation of the project and the 5 TPs
- Final exam of 3 hours

BIBLIOGRAPHY

- Aho, Ullman& Sethi. "Compilers: Principles, techniques and tools" Ed. DUNOD 2000.
- Aho& Ullman "Principles of compiler design", Edition: Addison Wesley, 1977.
- Stephen C. Johnson "Yacc: Yet Another Compiler-Compiler" Computing Science Technical Report No. 32, Bell Laboratories, Murray Hill, NJ 07974.
- D. Grune "Modern Compiler Design." Ed. John Wiley & Sons, 2000. ISBN: 0 471 97697 0.
- J.E. Hopcroft& J.D. Ullman "Introduction to Automata Theory, Languages and Computation" Ed. Addison Wesley, 1979.
- K.C. Louden "Compiler Construction: Principles and Practice" Ed. Course Technology, 1997.
- ISBN: 0 534 93972 4.
- N. Silverio. "Réaliser un compilateur, les outils Lex et YACC" Ed. Eyrolles, 1994.
- J. Levine, T. Mason, D. Brown "Lex & Yacc" Ed. O'Reilly, 1992. ISBN: 1 56592 000 7.
- Tom Copeland "Generating Parsers with JavaCC" Ed. Centennial Books, Alexandria, VA, 2007. ISBN: 0-9762214-3-8

EMU2.1.1 - Web Oriented Technologies and Development1(WOD)

Knowledge Area: Software Engineering

EU Code	Title of the module	Coefficient
EMU2.1.1	Web Oriented Technologies and Development1 (WOD)	4

Hourly volumes		
Lectures	TD / TP	TOTAL
15	45	60

Semester :	3
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Prerequisites	<ul style="list-style-type: none">• Object-oriented programming• Introduction to Software Engineering
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OBJECTIVES :

- Learn the basic web development languages HTML, CSS and JavaScript.
- Prepare the student to develop front-end applications in web/cloud mode
- Adding dynamics to pages with JQuery and HTML 5

CONTENTS :

I. Introduction to web development

1. History
2. Introduction to http
3. Web languages (HTML, CSS, JavaScript)
4. Web development tools (Aptana Studio)

II. The HTML language

1. Standard tags
2. Lists, Forms and Tables
3. New HTML 4 tags

III. The CSS language

1. Introduction to style sheets
2. General rules
3. What's new in CSS3

IV. The JavaScript language

1. Introduction to JavaScript
2. The JQuery library
3. The foundations of AJAX

KNOWLEDGE TEST

- Practical examination
- Project applying knowledge

BIBLIOGRAPHY

- Ian Lloyd, The Ultimate HTML Reference, 2008, SitePoint, ISBN 978-0-9802858-8-8.
- Jon Duckett, HTML & CSS, Design and Build Websites, 2011, Wiley, ISBN: 978-1-118-00818-8
- Julie C. Meloni, SamsTeachYourselfHTML, CSSand JavaScript, 2012, SAMS, ISBN-10: 0-672-33332-5
- BEAR BIBEAULT, YEHUDA KATZ, jQuery in Action, 2008, Manning, ISBN 1-933988-35-5

UEF 2.1.2 - Software Engineering Tools(UGL)

Knowledge Area: Software Engineering

EU Code	Title of the module	Coefficient
UEF 2.1.2	Configuration management	4

Hourly volumes		
Lectures	TD / TP	TOTAL
15	45	60

Semester : 3

Prerequisites	<ul style="list-style-type: none">Introduction to Software Engineering
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OBJECTIVES :

- Configuration management planning
- Implementation of configuration management
- Configuration management audit.

CONTENTS :

- I. Introduction to configuration management
- II. Configuration management and software processes
- III. Versioning tools
- IV. Release planning
- V. Evaluation of configuration management
- VI. Life cycle tools
- VII. Automation tools

KNOWLEDGE TEST

- Written examination on the course
- Continuous monitoring of the TDs

BIBLIOGRAPHY

- Keyes, J. 2004. Software configuration management: Auerbach Publications.
- Moreira, M.E. 2004. Software configuration management implementation roadmap: Wiley.

UEF2.1.4 - Data Analysis (ANAD)

Knowledge Area: Mathematical Tools

EU Code	Title of the module	Coefficient
UEF2.1.4	Data analysis (ANAD)	4

Hourly volumes		
Lectures	TD / TP	TOTAL
30	30	60

Semester :	3
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Prerequisites	<ul style="list-style-type: none">• Statistics and probability• Linear algebra• Numerical analysis
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OBJECTIVES :

- Address the main techniques of data analysis
- Provide the student with tools to analyse and process large multidimensional data sets
- To enable the student to discern the complementarity of these methods and their relationship with more traditional statistical methods
- Putting into practice the knowledge acquired through the use of Matlab, R or other data sets.

CONTENTS :

I. Reminder

1. Reminder of linear algebra, descriptive statistics, matrix derivation and function optimisation.
1. **Factor methods (Description, Reduction, Visualisation and Interpretation)**
Principal component analysis
2. Factor analysis of correspondences
3. Multiple correspondence factor analysis
1. **Statistical modelling and supervised and unsupervised classification**
Discriminant factor analysis
2. Automatic classification
3. Introduction to the principle of statistical learning. Presentation of some methods (SVM, K nearest neighbours, Neural networks, Bayesian method...). Practical exercises on real data
4. Simple and multiple regression
5. Notions on Time Series and Exponential Smoothing

KNOWLEDGE TEST

- Written examination on the course
- Continuous monitoring of the TDs

BIBLIOGRAPHY

- Lebart, Morineau and Piron , "Multivariate exploratory statistics" 2006.
- Online resources: <http://www.math.univ-toulouse.fr/~besse/teaching.html>.
- Duda, Hart and Stork, "Pattern classification", 2nd edition, Wiley and sons, 2001.
- Hastie, Tibshirani&Friedman" The elements of statistical learning. Data mining, inference and prediction. Springer, 2001.

UEF 2.2.1 - Mobile Technology and Development 1 (TDM1)

Knowledge Area: Software Engineering

EU Code	Title of the module	Coefficient
UEF 2.2.1	Mobile Technology and Development (MTD)	2

Hourly volumes		
Lectures	TD / TP	TOTAL
15	15	30

Semester :	4
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Prerequisites	<ul style="list-style-type: none">• Object-oriented programming• Introduction to Software Engineering
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OBJECTIVES :

- Enable the engineer to assimilate the special constraints concerning the development of mobile applications
- Presentation of the essential techniques used for the complete design of a mobile system
- Discovering the different software and hardware components needed to build mobile systems
- Analysis and evaluation of the technical choices proposed by the major market players on the different software platforms they offer
- Development of test applications on different targets as a practical exercise.
- Using Android as the default target for mobile development

CONTENTS :

I. Introduction to mobile computing

- History
- Main mobile systems

II. Introduction to Android development

- Setting up the development environment
- Anatomy of an android application
- Creating applications on virtual devices
- Creation of applications on real devices

III. Android mobile application development

- Creation of user interfaces
- Activities and fragments
- Resources
- Views

- Menus and Dialogues

- Intentions

IV. Seminar on Mobile Application Development on Windows Phone

KNOWLEDGE TEST

- Practical examination on the course
- Continuous monitoring of the TDs

BIBLIOGRAPHY

- Djidel, D., and R. Meier. 2010. Developing business applications with Android 2: Pearson.
- SatyaKomatineni (Author), Dave MacLean (Author), Pro Android 4, 2012, APress, 2012, ISBN-10: 1430239301
- Reto Meier, Professional Android 4 Application Development, 2012, Jon Wiley & Sons

UEF 2.2.1 - Mobile Technology and Development 2 (TDM2)

Knowledge Area: Software Engineering

EU Code	Title of the module	Coefficient
UEF 2.2.1	Mobile Technology and Development (MTD)	2

Hourly volumes		
Lectures	TD / TP	TOTAL
15	15	30

Semester :	4
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Prerequisites	<ul style="list-style-type: none">• Object-oriented programming• Introduction to Software Engineering• Mobile Technology and Development1
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OBJECTIVES :

- Acquire more advanced knowledge of mobile application development in Android
- See through a seminar on alternative systems such as Windows Phone

CONTENTS :

I. Mobile data management

- Status and preferences
- Content providers
- SQLite databases

II. Background applications

- Services
- Threads
- Alarms

III. Sensors & Networks

- Physical and virtual sensors
- Movement & Orientation
- Maps & Geolocation
- Barometer
- Bluetooth & Wifi & NFC

IV. Advanced aspects

- Telephony & SMS
- Creating widgets
- Audio, video & camera

V. Deployment

VI. Seminar on Mobile Application Development on Windows Phone

KNOWLEDGE TEST

- Practical examination
- Continuous monitoring of the TDs

BIBLIOGRAPHY

- Djidel, D., and R. Meier. 2010. Developing business applications with Android 2: Pearson.
- SatyaKomatineni (Author), Dave MacLean (Author), Pro Android 4, 2012, APress, 2012, ISBN-10: 1430239301
- Reto Meier, Professional Android 4 Application Development, 2012, Jon Wiley & Sons

UEF 2.2.2 - Software Architectures (LA)

Knowledge Area: Software Engineering

EU Code	Title of the module	Coefficient
UEF 2.2.2	Software Architectures (LA)	4

Hourly volumes		
Lectures	TD / TP	TOTAL
30	30	60

Semester :	4
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Prerequisites	<ul style="list-style-type: none">• Introduction to Software Engineering• System• Network
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OBJECTIVES :

The architecture of a software system defines the structure of the system, its components and the connections within the system. The architecture is a very important element resulting from the high-level design and necessary for the development of the modules of the system structure. The module is a continuation of the chapter "software architectures" of the IGL module. It addresses the notion of architecture and the main architectural styles of the moment such as N-Tier architecture or Cloud-Computing. The practical aspect is important to reinforce the theoretical knowledge acquired during the module.

The objectives of this module are:

- Highlight the importance of the architectures and their impact on the final product.
- Discover the various architectures: component-oriented, service-based, client-server, etc.
- Enable the engineer to discover architectural styles such as layered architectures or multi-agent architecture
- Raising the engineer's awareness of architectures through practical workshops.

CONTENTS :

- I. Introduction to software architectures
- II. Definition of architectural styles
- III. Pipes and filters
- IV. Component-based architectures
- V. Client-Server and N-Tier
- VI. Subscription-based architectures
- VII. Cloud computing

KNOWLEDGE TEST

-Written examination on the course

-Continuous monitoring of the TDs

BIBLIOGRAPHY

- Bass, L., P. Clements, and R. Kazman. 2003. Software architecture in practice: Addison-Wesley.
- Hofmeister, C., R. Nord, and D. Soni. 2000. Applied software architecture: Addison-Wesley.
- Garland, J., and R. Anthony. 2003. Large-scale software architecture: a practical guide using UML: J. Wiley.

UEF 2.2.3 - Software Quality (QL)

Knowledge Area: Software Engineering

EU Code	Title of the module	Coefficient
UEF 2.2.3	Software quality (QL)	4

Hourly volumes		
Lectures	TD / TP	TOTAL
30	30	60

Semester :	4
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Prerequisites	<ul style="list-style-type: none">• Introduction to Software Engineering
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OBJECTIVES :

- Definition of software quality, verification and validation.
- Distinguish between the different types of tests (unit, integration, acceptance), ...etc.)
- To enable the student to understand and apply the different types of tests
- To enable the student to audit processes and products related to software engineering activities
- Introduce the different metrics and methodologies for measuring reliability.

CONTENTS :

- I. Introduction to software quality and reliability
- II. Software prediction and sizing
- III. Size and effort prediction and measurement
- IV. Calculation model (COCOMO, COCOMO II)
- V. Measurement of external product attributes
- VI. Reliability models
- VII. Tests: types, tools and methods
- VIII. Validation of the development process

KNOWLEDGE TEST

-Written examination on the course, Continuous monitoring of the tutorials

BIBLIOGRAPHY

- Stephen H.Kan, Metrics and Models in Software Quality Engineering (2nd Edition), 2010, Addison-Wesley Professional, ISBN-10: 0201729156
- Linda Westfall, The Certified Software Quality Engineer Handbook;, 2009, Quality Press, ISBN-10: 0873897307
- MuraliChemuturi, Mastering Software Quality Assurance: Best Practices, Tools and Techniques for Software Developers, 2010, J. Ross Publishing, ISBN-10: 1604270322

UEF2.2.4 - DBMS and Advanced DB (ADB)

Knowledge Area: Information Systems

EU Code	Title of the module	Coefficient
UEF2.2.4	DBMS and Advanced DB (ADB)	4

Hourly volumes		
Lectures	TD / TP	TOTAL
30	30	60

Semester :	4
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Prerequisites	<ul style="list-style-type: none">Databases
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OBJECTIVES :

The Advanced Databases course introduces advanced concepts in the field of databases. This course allows students to deepen their knowledge of relational databases and to acquire new knowledge of other types of data and data processing, particularly decision support and semi-structured data.

At the end of the course, the student will be able to :

- Master the advanced concepts of SQL programming
- Understand the architecture of a relational DBMS
- Designing and implementing multidimensional DBs.
- Designing and manipulating semi-structured XML data
- Have knowledge of the different types of existing databases.

CONTENTS :

I. Architecture of Relational DBMS (1h30)

1. Overview of DBMS architecture
2. Translation and optimisation of queries
3. Competitive access and transaction management
4. Data storage and indexing structures

II. Advanced SQL Programming (4h30)

1. Fundamentals of SQL programming
2. The Triggers
3. Stored functions and procedures
4. Error handling and management

III. The Object-Relational model (3h)

1. Presentation of the Object model
2. Presentation of the Object-Relational model
3. RO model concepts (complex types, inheritance...)
4. Querying Object-Relational DBs (SQL3)

IV. Data warehouses (9 hours)

1. Introduction to Business Intelligence (BI): Concepts, Architecture and Platforms ;
2. Multidimensional data modelling ;
3. Approaches to building data warehouses ;

4. Creating and manipulating data warehouses with SQL and MDX ;

V. Semi-structured databases (9h)

1. Introduction to XML
2. Structure of XML documents (XML Schema& DTD)
3. Construction and manipulation of XML documents (Parsing, Xlink, XPointer, DOM and SAX)
4. Querying XML documents (XPath and XQuery language)
5. Native XML database management systems

VI. Advanced databases (3h)

1. Distributed DBs
2. Geographic and multimedia databases
3. New Data Trend (The Anti-Relational)

KNOWLEDGE TEST

- Written examination on the course
- Continuous monitoring of the TDs

BIBLIOGRAPHY

- A. Meier. Practical Introduction to Relational Databases (Second Edition)
- C.Imhoff, J.G. Geiger, N.Galemmo. Mastering DataWarehouse Design Relational and Dimensional Techniques
- S.KorthSudarshan. Database System Concepts, Fourth Edition
- Gunderloy, Mike and Sneath, Tim. SQL Server Developer's Guide to OLAP With Analysis Services. Sybex, 2001. This book is a reference on OLAP programming with SQL Server 2000.

EMU2.2.1- Human-Computer Interaction (HCI)

Knowledge Area: Software Engineering

EU Code	Title of the module	Coefficient
EMU 2.2.1	Human-Computer Interaction (HCI)	2

Hourly volumes		
Lectures	TD / TP	TOTAL
15	15	30

Semester :	4
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Prerequisites	<ul style="list-style-type: none">Object-oriented programming
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OBJECTIVES :

- Introduce the basic concepts of Human-Computer Interaction and give a complete overview of all aspects related to Human-Computer Interaction
- Mastering the design of HMIs, from task modelling to the design, development and evaluation of human-machine interfaces.
- Acquire the necessary skills for the development of Human Interface Machine.

CONTENTS :

I. Basic HMI concepts (9 h)

1. Problems, objectives of the HMI
2. Notion of task
3. Task analysis models
4. Software architectures
5. Ergonomics of human-machine interfaces

II. HMI modelling (12 h)

1. Interaction models
2. Human Machine Interface Models
 - 1st generation interfaces
 - WYSIWYG interfaces
 - WYMP interfaces

III. Tools for the development and evaluation of HMIs (9h)

1. Toolboxes
2. Application skeleton
3. Interface generator
4. Web/mobile interfaces (adaptability, plasticity, multi-modality)
5. Evaluation of HMIs

KNOWLEDGE TEST

- Written examination on the course
- Continuous monitoring of the TDs

BIBLIOGRAPHY

- Ludovic Cinquin, Erika Duriot, Eric Groise, Olivier Mallassi, André Nedelcoux, David Roussellie, Vanessa Vimond "Les dossiers de l'écran : Utilisabilité et technologies IHM Editions OCTO, technologist 2010
- G. Calvary, "Ingénierie de l'interaction homme-machine: rétrospective et perspectives, Interaction homme-machine et recherche d'information" Traité des Sciences et Techniques de l'Information, Lavoisier, Hermès, 2002, pp 19-63
- J. Coutaz, "Interface Homme-Ordinateur" Dunod, 1990.
- C. Kolski, "Analyse et conception de l'IHM, Interaction homme-machine pour les Systèmes d'Information" Editions Hermès, May 2001
- C.Kolski " Environnements évolués et évaluation de l'IHM, Interaction pour les Systèmes d'Information " Editions Hermès, May 2001
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- D. Norman "The Psychology of Everyday Things", Basic Books, 1988.
- J. Preece, "Computer Human Interaction", Addison Wesley.
- Dan Olsen, "Developing User Interfaces
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- Card, Moran, Newell, "Psychology Of Human Computer Interaction".

EMU2.2.2 - Specialty Project (SJP)

Knowledge Area: Specialty Project

EU Code	Title of the module	Coefficient
EMU 2.2.2	Specialty Project (SJP)	4

Hourly volumes		
Lectures	TD / TP	TOTAL
	60	60

Semester :	4
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Prerequisites	• IGL, IHM, PDC,QL,MAGL,SCM, TDM,TDW
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OBJECTIVES :

- The Specialty Project is a complementary project to the first one, which aims to integrate the accumulated knowledge.
- Managing a real development project with an agile method
- Create a mobile / web application
- Integrate configuration management tools.

CONTENTS :

I. A development project involving the knowledge of the pre-requisite modules

KNOWLEDGE TEST

- Formative evaluation
 - a. Deliverables
 - b. Presentation
 - c. Involvement

UET - Secure Protocol and Software Engineering (IPLS)

ETU code	Title of the module	Coefficient
ETU	Engineering of secure protocols and software	4

Hourly volumes		
Lectures	TD / TP	TOTAL
30	30	60

Semester :	3 or 4
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Prerequisites	SYS1, SYS2, RES1, RES2, Introduction to Computer Security, Software Engineering
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OBJECTIVES :

- Analyse security flaws in software architecture, communication protocols, programs, and Information Systems in general.
- Introducing safety into the software engineering life cycle
- Know how to use tools to check the security of software and communication protocols
- Design and implement secure IT applications in various domains (Web, E-commerce)

CONTENT OF THE MODULE :

Vulnerability and Security of Information Infrastructures

- Application and network vulnerability analysis
- Tools to defend against cyber-attacks
- Design of secure information system architectures

Specification and Validation of Secure Internet Protocols and Applications

- Analysis of security protocols: key agreement, authentication, identification,
- Analysis of attacks on communication protocols: replay, identity theft, session interleaving, integrity violations, etc.
- Specification and automatic verification of the security of Internet protocols and applications

Modelling and Design of Secure Software

- Security software vulnerability analysis
- Introducing safety into the software development life cycle
- Safety by design: Safe software design patterns
- Checking the security of the software :

- static analysis of software safety
- dynamic analysis of programme execution

Applications

- Security of e-commerce applications
- Web Application Security (OWASP)

Practical work

- Specification, Verification and Development of Internet Protocols and Applications
- Analysis of security flaws in programs (C, Java, etc.)
- Static program verification (secure software development)
- Implementing OWASP for secure web application development

PERSONAL WORK

Mini-project of your choice :

- Risk analysis and development of a security plan for an information system
- Development of Secure Web Services
- Design and specification of secure Internet protocols and applications with AVISPA

KNOWLEDGE TEST

Personal work 30%,
TP 40%,
Examination 30%.

BIBLIOGRAPHY

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- Eduardo Fernandez-Buglioni, "Security Patterns in Practice: Designing Secure Architectures Using Software Patterns", Wiley, ISBN: 978-1-119-99894-5, April 2013.
- Brian Chess, Jacob West, "Secure Programming with Static Analysis", Addison Wesley, ISBN: 0-321-42477-8, 2007.
- AVISPA Project, "Automated Validation of Internet Security Protocols and Applications", User Manual, June 2006.
- AVISPA Project, "A Beginner's Guide to Modelling and Analysing Internet Security Protocols", June 2006

UET- Embedded Systems Architectures (SE)

Knowledge Area: Systems and Networks

ETU code	Title of the module	Coefficient
ETU	Architecture of Embedded Systems	4

Hourly volumes		
Lectures	TD / TP	TOTAL
30	30	60

Semester :	4
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Prerequisites	<ul style="list-style-type: none">• Computer architecture 1• Computer architecture 2• Computer architecture 3
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OBJECTIVES :

The objectives of this course are to familiarize the student with real-time and embedded systems:

- He/she should be familiar with the three layers of such systems: the architecture, the operating system and the application.
- he must be confronted with the constraints of real-time and embedded systems which are very different from those of the systems usually used by computer engineers.
- He/she must be able to design, develop and use: embedded software, real-time applications and embedded systems using a unified methodology.

CONTENT OF THE MODULE :

I. Integrated circuit design: (3h)

1. Evolution of integrated circuits
2. Design process
3. Design steps,
4. Manufacturing, testing and packaging

II. Real-time and embedded systems: (3h)

1. History and growth of the microprocessor market
2. General information on embedded systems
3. Examples of embedded systems
4. Characteristics of embedded systems
5. Block diagram of embedded systems
6. Architecture of embedded systems

III. Processors and circuits for embedded systems: (3h)

1. Instruction set processors
2. DSP
3. FPGA

4. ASIC

5. Socs

IV. Design methods for embedded systems: (1h)

1. Classical approach
2. Introduction of codesign

V. Different stages in the design of an embedded system: (7h)

1. Co-specification of embedded systems
2. Modelling of embedded systems
3. Partitioning and scheduling of embedded systems
4. Embedded systems synthesis
5. Verification of embedded systems
6. Testability of embedded systems

VI. Multiprocessor chips (MPSoCs): (3h)

1. Multiprocessors and the evolution of MPSoCs
2. MPSoCs applications and architectures
3. Architectures for low power real-time systems
4. Interconnection network in MPSoCs: NOCS (Network On Chip)
5. Computer-aided design and MPSoCs

VII. Platforms and operating systems for embedded systems: (4h)

1. Embedded application development platforms
2. Functionality of operating systems and their implementation on existing systems.

VIII. Fault tolerance and safety in embedded systems (2h)

IX. Examples of interlocking systems: (2h)

1. Sensor networks
2. RFID systems

PERSONAL WORK

I. Integrated circuit design :

Objective: to familiarise the student with tools to assist in the design of circuits.

I.1. Design and development of a system for hardware implementation on FPGA.

Tools :

- 1- Software: ISE from Xilinx, Modelsim simulator.
- 2- Hardware: FPGA board.
 - **Specification**, with hardware description languages (VHDL or verilog).
 - 1- Initiation, presentation of the language.
 - 2- Example of a circuit description.
 - 3- Presentation of the Xilinx ISE tool.
 - **Synthesis**, RTL level, logic gate level.
 - **Simulation and validation**, ISE simulator or Modelsim.
 - **Mapping, floorplanning, placement and routing.**
 - **Design implementation**, FPGA programming and testing.

I.2. Drawing of

Tool: MicroWind Simulator (MW) :

1. Presentation of circuits based on transistors, resistors and parasitic capacities.
2. The transition to different layout layers with different materials.
3. Presentation of the MW simulator, drawing rules.
4. Creation of the layout.
5. Simulation and testing.

II. Methods for designing embedded systems:

Objective: to familiarise the student with tools to assist in the design of embedded systems.

Tools: specification in SsystemC, and KDE from Xilinx.

KNOWLEDGE TEST

- 2 scheduled written tests
- Practical note
- Individual and team projects.

BIBLIOGRAPHY

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- Alan C. Shaw, "Real-Time Systems and Software", Wiley Publishers, ISBN: 0-471-35490-2, 2001.
- F. Vahid, T.D. Givargis, Embedded System Design: A Unified Hardware/Software Introduction, ISBN: 0-471-38678-2, Wiley Publishers, October 2001.
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- A.M.K. Cheng, Real-Time Systems: Scheduling, Analysis, and Verification, ISBN: 0-471-18406-3, Wiley Publishers, July 2002.
- S. Sriram, S.S. Bhattacharyya, Embedded Multiprocessors, Scheduling and synchronization, Signal Processing and Communications Series, 2000.
- J. BHASKER, A systemC primer, Star Galaxy Publishing, ISBN: 0-9650391-8-8, 2002.
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- H. Bhatnagar, Advanced Asic Chip Synthesis: Using Synopsys Design Compiler, Physical Compiler, and Primetime, Kluwer Academic Publishers, Kluwer Academic Publishers, ISBN: 0792376447, January 2002.
- M. Tien-Chien Lee, High-Level Test Synthesis of Digital VLSI Circuits, Artech House Publishers, ISBN: 0890069077, February 1997.

ETU - Quality Assurance (QA)

Knowledge Area: Information Systems

EU Code	Module title	Coef/Credits
EU	Quality Assurance (QA)	2

Hourly volumes		
Lectures	TD / TP	TOTAL
15		15

Semester :	3 or 4
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Prerequisites	<ul style="list-style-type: none">• Analysis and design of information systems• Project management.
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To understand the interest of the "quality" approach in the field of science and technology, in order to have confidence and inspire confidence in the actions undertaken and the decisions taken for analysis, production, etc. in the context of IT projects.

OBJECTIVES :

- Knowledge of the spirit of the "quality" systems in their organisational aspects and in their technical requirements.
- The ability to insert one's action into such a system, to contribute to its establishment, life and evolution.
- Ability to accept and take into account the external regulatory elements that are required in the different fields of activity.
- Ability to participate, in a dynamic way, in the continuous improvement of quality in the sense of induced or similar standards.

CONTENTS :

I. Introduction

1. Quality assurance as a performance objective for the organisation
2. Introduction to normative standards, for "process" quality [ISO 9000], good practice standards
3. Introduction to audit and reviews.

II. Basic tools for quality assurance .

III. The architecture of organisational and technical quality documentation

IV. Principles of certification, accreditation, approval

V. Taking into account the elements of professional, national and supranational regulation

KNOWLEDGE TEST

- | |
|--|
| <ul style="list-style-type: none">- Written examination on the course- Continuous monitoring of the TDs |
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UET - Information Systems Security Engineering and Management (IMSSI)
Knowledge Area: Information Systems

EU Code	Title of the module	Coefficient
ETU	Engineering and Management of Information System Security	2

Hourly volumes		
Lectures	TD / TP	TOTAL
15	15	30

Semester :	3 or 4
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Prerequisites	Information systems
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OBJECTIVES :

- To enable students to master the concepts related to the engineering and management of information systems security and to participate in the relevant implementation of a security policy within the company.

CONTENTS:

I. Introduction (2h)

1. The challenges of today's IS
2. Safety culture in the company

II. Overview of vulnerabilities, threats and risks (4 h)

III. Security actors (2h)

IV. Security architecture (1h)

V. Managing security. What does it mean (3h)

1. Maturity of companies with regard to security
2. Security policy
3. The organisation of security and the human resources allocated to it

VI. TD: Existing security methods and repositories (15h)

1.French methods

- The EBIOS method (Expression of needs and Identification of objectives)
- The MEHARI method (Harmonised Risk Analysis Method)
- The Marion method
- The Melissa Method

2. Other methods

German (www.bsi.de), Canadian (www.cse-cst.gc.ca), American (www.ansi.org)

3. International standards

- ISO 2700X series

VII. CISO: Roles and means of action (security process, security roadmap, outsourcing...) (3h)

PERSONAL WORK

-TP / TD on the application of IS security methods

KNOWLEDGE TEST

- Written examination on the course
- Continuous monitoring of the TDs

BIBLIOGRAPHY

- M. Bennasar, A. Champenois, P. Arnould and T. Rivat, "Manager la sécurité du SI, Planifier, déployer, contrôler, améliorer", DUNOD, 2007.
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- www.clusif.asso.fr

ETU - Accounting and Finance (COFI)

Knowledge Area: Information Systems

EU Code	Title of the module	Coefficient
ETU	Accounting and Finance (COFI)	4

Hourly volumes		
Lectures	TD / TP	TOTAL
30	30	60

Semester :	3 or 4
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Prerequisites	<ul style="list-style-type: none">• Business Economics
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The evolution of companies in recent years (after the restructuring of public companies) has profoundly modified the management of financial flows within companies. The complexity of financial information has increased significantly, reflecting both the increasing complexity of the real economy and the information needs of users:

- To introduce the accounting documents, their purpose and the accounting logic which is structured by a codification.
- Mastering the transition from one accounting system to another.
- Understand and identify financial statements. Be able to analyse the activity and results of your company.
-

CONTENTS :

I. General Accounting (9 h)

1. Role and functioning of the accounting system
 - Legal and fiscal obligations, accounting IS.
 - Journal, ledger, trial balance, profit and loss account and balance sheet.
 - The four masses of the balance sheet: assets and receivables, equity and liabilities.
 - The three levels of results: operating, financial and exceptional.
 - Link between balance sheet and income statement: double determination of the result.
2. Accounting for current transactions
 - Accounting movements and translation of economic facts.
 - Structure of the chart of accounts, search for the account assignment.
 - Double-entry mechanism, debit and credit
 - Account for invoices for purchases, overheads and sales.
 - Distinction between expense and fixed asset.
 - Salary, VAT mechanism,...
 - Accounting for closing transactions: Economic significance and accounting :

- depreciation of fixed assets ;
- provisions for asset depreciation, risks and charges ;
- of inventory changes.

II. Cost accounting (6h)

1. Full costing

- General principles and definitions
- Basic elements of costing
- The calculation period
- Direct and indirect costs

2. Determining costs

- Purchasing costs
- Production costs
- Distribution cost
- Costing and costing results

3. Cost analysis

- Variability of charges
- Analysis of load behaviour
- The break-even point
- Rational allocation of structural costs
- Simple and advanced direct costing.
- Standard costs or pre-set costs

4. Budgetary control: Analysis of variances between actual and planned

- Variance analysis of variable direct costs
- Gap analysis on indirect costs
- The difficulties of implementing budgetary control

III. Financial analysis (15 h)

1. Understanding the basics of financial analysis

2. Understanding financial statements

- Why do a financial analysis?
- What happened during the year (the profit and loss account)
- What are my assets (the balance sheet)
- What is the breakdown of my balance sheet and income statement?

3. Financial statement analysis

- How do I analyse my income statement?
- What is my margin and added value (GIS)
- How do I analyse my balance sheet?
- Using indicators to monitor your activity: ratios

4. Financial analysis and my business in everyday life

- My company, its working capital and working capital requirements
- How do I monitor my cash flow?

Case studies at the end of each chapter are required.

KNOWLEDGE TEST

- Written examination on the course
- Continuous monitoring of the TDs

BIBLIOGRAPHY

- H. BOISVERT. Le contrôle de gestion - Vers une pratique renouvelée. Editions du renouveau pédagogique (4th quarter 2001)
- T. CUYAUBERE and J. MULLER. Contrôle de gestion et comptabilité analytique. Editions Bertrand Lacoste, 1994.
- R. DEMEESTERE, P. LORINO, O. MOTTIS. Contrôle de gestion et pilotage. Nathan, 1997.
- Financial Analysis - 4th Edition - Financial Information and Diagnosis [Paperback] Hubert de La Bruslerie, Publisher: Dunod, Edition: 4th edition (21 July 2010), Collection: Management Sup, Language: French, ISBN-10: 978-2100549405, ISBN-13: 978-2100549405.
- Financial Analysis: Concepts and Methods, Alain Marion, Publisher: Dunod, Edition: 4th edition (29 August 2007), Collection: Gestion sup, Language: French, ISBN-10: 2100513427, ISBN-13: 978-2100513420.
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UET- Combinatorial Optimisation (OPT)

Knowledge Area: Mathematical tools

EMU Code	Title of the module	Coefficient
ETU	Combinatorial Optimisation	3

Hourly volumes		
Lectures	TD / TP	TOTAL
30	15	45

Semester :	4
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Prerequisites	<ul style="list-style-type: none"> Data structure, THP, ROP1
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OBJECTIVES :

- Solving combinatorial optimisation problems (exact and approximate methods)
- To show the effective applicability of the methods presented to practical problems.
- rigorous reasoning before intuition

CONTENT OF THE MODULE :

I. Introduction to combinatorial optimisation

1. The problem of combinatorial optimisation
2. Fundamental tools of combinatorial optimisation
3. Some models of combinatorial optimisation
 - Touring problem
 - Graph colouring problem
 - Scheduling problem
 - Inventory Management problem

II. Separation and evaluation methods

1. Principle of the Branch and Bound approach
2. Application to integer linear programming problems
3. Application to the backpack problem
4. Application to the travelling salesman

III. Dynamic programming

1. Introductory example: Stock management problem
2. Solving the inventory management problem using networks (Bellman algorithm)
3. Principles of the programming programming: Problems that can be justified by dynamic programming.

IV. Approximate Methods

1. Gluttonous Heuristics
2. Specific construction methods
3. Neighbourhood methods
 - Simulated annealing method
 - Taboo Research
4. Evolutionary metaheuristics :
 - Genetic Algorithms,
 - Ant colonies,

PERSONAL WORK

-1TP and 1 project

KNOWLEDGE TEST

- 2 written tests on the course and TD
- Continuous assessment during the course and TD

BIBLIOGRAPHY

- M. Bazara, C.M., Shetty, "Non Linear Programming, (Theory and Algorithms)", Wiley, 1979.
- G. B. Dantzig, "Linear Programming and Extensions", Princeton University Press, 1963.
- R. Diestel, "Graph Theory", Springer, Second Edition, 1999
- M. Gondron, M. Minoux, "Graphs and Algorithms", Wiley, 1984.
- B. Korte, J. Vygen, "Combinatorial Optimisation", Springer, 2001.
- P. Lacomme, C. Prins, M. Sevaux, "Algorithmes De Graphes", Eyrolles, 2003.
- M. Minoux, " Programmation Mathématique : Théorie Et Algorithmes ", Tomes 1 Et 2, Dunod, 1983
- G. Nemhauser, "Introduction to Dynamic Programming", Wiley, 1966.
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UET - Web Oriented Technologies and Development2 (TDW)

Knowledge Area: Software Engineering

EU Code	Title of the module	Coefficient
ETU	Web Oriented Technologies and Development (WOTD)	3

Hourly volumes		
Lectures	TD / TP	TOTAL
15	30	45

Semester :	4
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Prerequisites	<ul style="list-style-type: none">• OOP• IGL• TDW 1
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OBJECTIVES :

- Design and develop web applications.
- Assimilate the concepts related to the management of a Web-oriented project.
- Know and learn to select with justification the technologies and Web architectures to be used in a Web-oriented project (J2EE, XML, scripting languages, AJAX, Web services, etc.)
- Uses an open language (PHP) for the development of dynamic websites
- Learn to use the tools that support web-oriented development.

CONTENTS :

I. Dynamic web

4. Introduction to the dynamic web

5. Impact of databases

II. Creating dynamic websites with PHP

4. Introduction to PHP

5. Main concepts of PHP

6. Creating dynamic websites with PHP

7. Creation of web-based database applications

8. Deploying applications on a web server

III. Creation of dynamic websites based on CMS

4. Introduction to CMS and the main CMS on the market

5. Introducing Drupal

6. Drupal extension

KNOWLEDGE TEST

- Practical examination on the course
- Continuous monitoring of practical work
- TP Examination

BIBLIOGRAPHY

- Melancon, B., A. Micka, A. Scavarda, B. Doherty, B. Somers, K. Negyesi, J. Rodriguez, M. Weitzman, R. Scholten, and R. Szrama. 2011. *The Definitive Guide to Drupal 7*: Apress.
- David, M. 2010. *HTML5: Designing Rich Internet Applications*: Elsevier Science & Technology.
- Lancker, L.V. 2009. *jQuery: The JavaScript framework for Web 2.0*: Editions ENI.
- Guérin, B.A. 2007. *PHP 5, MySQL 5, AJAX: train yourself to create professional applications*: Editions ENI.
- Ullman, L.E. 2003. *PHP and MySQL for dynamic Web sites*: Peachpit Press.

ETU - Geographic Information System (GIS)

Knowledge Area: Information Systems

ETU code	Title of the module	Coefficient
ETU	Geographic Information System	2

Hourly volumes		
Lectures	TD / TP	TOTAL
15	15	30

Semester :	3 or 4
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Prerequisites	Basics of Databases, Probability and Statistics, Graph Theory
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OBJECTIVES :

- To clarify the concept of GIS, and then to provide a method for spatial analysis of map data.
- Study the acquisition, organisation and storage of data in databases satellite images or collected in the field.
- Modelling geo-spatial or simply geographical data in 2D and 3D for decision support

CONTENTS:

I. Introduction to GIS (2h)

1. History and development of GIS
2. Territory, geography and cartography
3. Geomatics and geodetic reference systems
4. Use and challenges of GIS (customers, finance, decision-making, human resources, etc.)
5. Comparison of GIS, CAD

II. Acquisition and analysis (4h)

1. Acquisition methodology
2. Studies of the main types of scanned or satellite images available (resolution, spectral band, swath, repetitive ...) and their distribution
3. Spatial vector analysis (multi-spectral image)
4. Spatial analysis using the raster model
5. Metadata and applicable standards
6. Study of common storage modes

III. Information processing and retrieval (7h)

1. Digital models and terrain topology
2. Architecture of geographic information systems
3. Coordinate systems and map projection
4. Transformation operations and image geo-referencing techniques
5. Digital terrain models (maps, 3D views)
6. Spatial data analysis and modelling
7. Relationship between graphic data and added alphanumeric data
8. Introduction to virtual reality and 3D scene animation

IV. GPS system (2h)

1. Presentation
2. Types of measures
3. Examples of applications

PERSONAL WORK

- Report following a guided tour of the INCT (National Institute of Cartography and Remote Sensing) in Hussein Dey
- Discovery of ARCGIS software (visualisation and manipulation of geographical information)
- Creation of a geographic database in ARCCatalog and Geodatabase in ARCGIS
- Spatial analysis operations in vector and raster mode
- Data representation in ARCMAP and ARCVIEW
- Spatial analysis micro project with ARCGIS (or Autodesk MAP 3D)

KNOWLEDGE TEST

- Continuous assessment 15%, lectures and practical work 20% and final exam 65%.

BIBLIOGRAPHY

- Poidevin, Didier, "La carte, moyen d'action. A practical guide to the design and production of maps" 1999
- Rodier, Xavier, "Le système d'information géographique TOTOPI", Les petits cahiers d'Anatole, 4, 2000
- "Geographic Information System, Archaeology and History, History & Measurement", 2004, vol. XIX, n°3/4.
- Denègre, Jean; Salgé, François, "Les systèmes d'information géographiques" coll. Que-sais-je? 3122, Paris, PUF, 1996 1st ed., 2001 2nd ed.
- Longley, P. A., M. F. Goodchild, D. J. Maguire and D. W. Rhind. "Geographical informatics systems. Vol. 1 and 2. 2nd ed. New York, John Wiley, 1997.
- Burroughs, P. A. "Geographical information systems for land resources assessment". Oxford, Clarendon Press 1986
- Laurini, R., and D. Thompson. "Fundamentals of spatial information systems. London, Academic Press, 1992

ETU-Advanced Networks (AR)

Knowledge Area: Systems and Networks

UEF code	Title of the module	Coefficient
ETU	Advanced networks	4

Hourly volumes		
Lectures	TD / TP	TOTAL
30	30	60

Semester :	3
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Prerequisites	<ul style="list-style-type: none">• Networks I• Networks II
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OBJECTIVES :

- Understand the principle and implementation of dynamic routing and Internet routing
- Discover the advanced aspects of IPV6 addressing including the mobility aspect
- To make students aware of the importance of Quality of Service (QoS) in computer networks.
- To provide the student with notions relating to the management and supervision of networks
- Understand new network applications: multimedia, real-time applications based on Voice over IP.
- Understand the technologies used to build the packet transport infrastructure within the Internet and current approaches to providing high performance communications in wide area networks.
- Introduce the student to mobile networks.

Some recommendations:

- The practical exercises must be started at the same time as the course, with a reminder of the notions seen in the third year.

CONTENT OF THE MODULE :

I. Addressing and dynamic routing (6 h)

1. Reminders on IPV4 addressing ;
2. Multicast communication in IP networks ;
3. Dynamic routing and routing over the Internet (RIP , OSPF , BGP ;
4. Advanced study of IPV6 addressing: auto configuration mechanisms, mobility management.

TP/TD (8 h):

1. Theoretical analysis of routing protocols dynamic (as a tutorial) ;
2. Dynamic routing configuration (RIP, OSPF and BGP) with protocol analysis.

II. Quality of Service (QoS) in IP networks (6h)

1. Definitions and issues ;

2. Mechanisms for managing Quality of Service (QoS) ;
3. QoS architectures: best effort, integrated services (IntServ), differentiated services (DiffServ); load controlled service;
4. The RSVP signalling protocol ;
5. Congestion control and flow control ;
6. IPv6 and QoS.

Practical work (8 h):

1. Implementation of a QoS mechanism on routers ;
2. Implementation and analysis of congestion control techniques.

III. Multimedia networks (6 h)

1. Multimedia and real-time data: information coding, transfer constraints (throughput, error rate, jitter, etc.);
2. Streaming audio and video data: the RTSP protocol;
3. Real-time interactive applications: RTP and RTCP protocols;
4. IP telephony: issues, standards, H.323 and SIP protocols, coding systems, equipment, QoS, call processing.

Practical work (4 h):

1. Implementation of an IP PABX (example: Asterix) and protocol analysis;
2. Implementation of a video streaming application and protocol analysis.

IV. Network monitoring and management: SNMP protocol (4h)

1. Multimedia data General presentation ;
2. The SNMP protocol ;
3. The database - MIB ;
4. Data representation ;
5. SNMP messages ;
6. A component of the development of a network management application.

Practical work (6 h):

1. Implementation of a network supervision tool (example: nagios);
2. Analysis of the SNMP protocol.

V. Wide area networks (broadband) (6h)

1. High-speed networks: architecture, techniques, switching and routing;
2. Long-distance technologies (PDH/SDH) ;
3. Optical networks (SONET/SDH): WDM, C-WDM, D-WDM multiplexing techniques;
4. Operator access: Types of interface, Level of availability, Constraints, Frame relay, ATM ;
5. MPLS and GMPLS technology: switching and signalling techniques.

Practical work (2 h):

1. Implementation of MPLS technology

VI. Introduction to mobile networks (4 h)

1. Mobile radio telecommunication networks: GSM, GPRS, UMTS.
2. Standards (3G and derivatives): architecture and protocols.
3. Deployment and administration of mobile phone technologies.

PERSONAL WORK

- Design project of a network (implementation of quality of service, dynamic routing, network supervision) ~15 hours ;
- Programming of a network application (SNMP, multicast) ~ 15 hours.

KNOWLEDGE TEST

- Intermediate review : 15%
- Final exam: 35%.
- TP test: 30%.
- Projects: 15%.
- TP reports: 5%.

BIBLIOGRAPHY

- J. Crowcroft, M. Handley, I. Wakeman, "Internetworking Multimedia", Morgan Kaufmann, 1999.
- P. Ferguson, G. Huston, "Quality of Service: Delivering QoS on the Internet and in Corporate Networks", Wiley, 1998.
- J.F. Kurose, K.W. Ross, "Computer Networking: A Top-Down Approach Featuring the Internet", Addison Wesley, 2003.
- J. Raj, "The Art of Computer Systems Performance Analysis", Wiley, 1991.
- A. Tanenbaum, "Réseaux: Architectures, protocoles, applications", InterEditions, 3rd edition, 1997.

UET- Programming Theory (TPGO)

Knowledge Area: Software Engineering

UEF code	Title of the module	Coefficient
ETU	Programming theory	4

Hourly volumes		
Lectures	TD / TP	TOTAL
30	30	60

Semester :	3
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Prerequisites	<ul style="list-style-type: none">• Algorithms• Mathematical logic• Theory of programming languages and applications• Graph theory
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OBJECTIVES :

- Know the foundations and theories behind programming
- Know how to evaluate and compare the performance of algorithmic solutions
- Learning to reason about programmes
- Have an overview of programming paradigms

CONTENT OF THE MODULE :

I. Preliminary concepts

1. Landau rating
2. Graph traversal
3. Fixed point theory

II. Complexity theory

1. Introduction
2. Decision problems and languages
3. Calculation models
4. Complexity classes
5. Polynomial reductions
6. NP-Complete

III. Complexity reduction

1. Top-down method (divide and conquer)
2. Bottom-up method (Dynamic Programming)

IV. Problem solving

1. Backtracking
2. Hill-Climbing
3. Best First Search
4. Branch and Bound
5. Algorithm A*

V. Imperative programming

1. Programme schemes
2. Programme transformations

3. Formal evidence

VI. Application programming

1. Lambda-calculation
2. Lisp and higher order functions
3. Inductive evidence
4. Interpretation of functional languages

VII. Declarative programming

1. Automatic proof of theorems
2. Prolog and symbolic manipulations
3. Interpretation of logic languages

PERSONAL WORK

-Practical work (3 to 4) + lectures (1 or 2)

KNOWLEDGE TEST

-Practical work/presentations + one or more written tests + a final exam

BIBLIOGRAPHY

- M. J. Atallah, M. Blanton, "Algorithms and Theory of Computation Handbook", Second Edition, CRC Press, 2010.
- M. R. Garey, D. S. Johnson, "Computers and Intractability: A Guide to the Theory of NP-Completeness", W. H. Freeman, 1979.
- O. Goldreich, "Computational Complexity A Conceptual Perspective", Cambridge University Press, 2008.
- R. Kowalski, "Logic for Problem Solving", North Holland, 1979.
- S. L. Peyton Jones, "The Implementation of Functional Programming Languages", Prentice-Hall, 1987.
- M. L. Scott, "Programming Language Pragmatics, Second Edition, Morgan Kaufmann, 2006.
- M. Spivey, "An introduction to logic programming through Prolog", Prentice-Hall International, 1995.

UET- Distributed Systems (SYSR)

Knowledge Area: Systems and Networks.

UEF code	Title of the module	Coefficient
ETU	Distributed Systems	4

Hourly volumes		
Lectures	TD / TP	TOTAL
30	30	60

Semester :	4
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Prerequisites	<ul style="list-style-type: none">• Operating systems (I and II)• Networks
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OBJECTIVES :

- Introduce the basic concepts of distributed systems.
- At the end of this module the student should understand the advantages that distributed systems provide over centralized systems.
- The student should be able to design distributed applications

CONTENT OF THE MODULE :

I. Introduction (3h)

2. Centralized systems
3. Multiprocessor systems
4. Network systems
5. Large-scale systems
6. Basics of Distributed Systems :
 - Purpose of distributed systems
 - Advantages and disadvantages of distributed systems
 - Basic functions of a distributed system
 - Characteristics of distributed algorithms :
 - Data Migration, Process Migration
 - Robustness (Fault tolerance)
 - Remote Services: Remote Procedure Calls (RPC)

II. Distributed programming models (2h)

7. Socket-based model (TP)
8. Client-server model (TP)
9. CPR model (TP)
10. RMI model (TP)
11. Service-based model (ST)

III. Coordination in Distributed Systems (10h)

12. Concept of time
 - Physical clock
 - Logic clock
13. Scheduling of events.
14. Broadcasting
 - Causal diffusion
 - Atomic scattering

<ul style="list-style-type: none"> - FIFO broadcasting 15. Global state of a distributed system 16. Distributed Algorithms: Mutual Exclusion and Election Algorithms <ul style="list-style-type: none"> - Centralized approach (reminder) - Fully distributed approach - Techniques based on the scheduling of events - Techniques based on token circulation. - Synchronisation and Termination Detection 17. Handling interlocking <ul style="list-style-type: none"> - Static and dynamic prevention (schemes with and without requisition) - Detection and Healing (Centralized and Fully Distributed Approaches) <p><i>IV. Distributed Data Management in Distributed Systems (12h)</i></p> <ul style="list-style-type: none"> 18. Space sharing: Distributed virtual memory (consistency, safety, liveness) 19. Object Management : Location, Fragmentation, Duplication (consistency) 20. Distributed file systems (NFS, AFS, CODA) <p><i>V. Implementation of Distributed Applications and Case Studies (3h in class and the rest to be treated in TD/TP):</i></p> <ul style="list-style-type: none"> 21. Client-Server application 22. Amoeba 23. Corba 24. JAVA (RMI)

PERSONAL WORK
<ul style="list-style-type: none"> - Do at least two PTs from the list of PTs below: <ul style="list-style-type: none"> - TP Socket-based model - TP Client-server model - TP CPR Model - TP RMI model - TP Service-based model - Practical work on distributed algorithms

KNOWLEDGE TEST
-At least one continuous assessment + final exam + practical work.

BIBLIOGRAPHY
<ul style="list-style-type: none"> • G. Coulouris, J. Dollimore, T. Kindberg, G. Blair "Distributed_Systems Concepts_and_Design", Addison Wesley, 2011 • S. Ghosh, "Distributed Systems: An Algorithmic Approach", hapman & Hall/CRC, 2007. • N. A. Lynch, "Distributed Algorithms", Morgan Kaufmann Publishers, 1996M. Raynal, J-M. Helary, "Synchronisation et contrôle des systèmes et des programmes répartis", Eyrolles, 1988. • M. Raynal, "Le problème de l'exclusion mutuelle", Eyrolles, 1987. • A. Silberschatz, P. B. Galvin , G. GAGNE, "Principles of Operating Systems", 7th edition, Addison-Wesley, 2005 • A. S.Tanenbaum, M. V. Steen, "DistributedSystems Principlesand Paradigms", (2nd Edition) Prentice_Hall , 2006 • A. S. Tanenbaum, "Operating Systems: Centralized Systems Distributed Systems", InterEditions, 1994.

ETU- Systems and Network Security (SSR)

Knowledge Area: Systems and Networks.

UEF code	Title of the module	Coefficient
ETU	Systems and Network Security	3

Hourly volumes		
Lectures	TD / TP	TOTAL
25	20	45

Semester :	4
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Prerequisites	<ul style="list-style-type: none"> • Networks Networks I and Networks II • System I and II • Introduction to cryptography
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OBJECTIVES :

- To make the student aware of computer security issues in general and network security in particular.
- Understand the risks associated with system flaws and applications.
- Understand the need for protection in systems.
- To illustrate the different types of attacks in a computer network and the countermeasures.
- Showing the importance of authentication and the use of mechanisms to ensure this.
- Understand the secure architectures of a computer network.
- To raise awareness of the importance of filtering and access control.

CONTENT OF THE MODULE :

I. General information on system and network security (3 h)

1. Security of systems and networks (issues, statistics, software, communication, networks, access control, ...)
2. Ethics in computer security (laws, legislation, charter,...)
3. Need to define a security policy
4. The rules to follow and the basic elements for defining a policy
5. Recommendation for implementation of the policy

TD/TP (2 h) :

Describe a security policy for the use of a computer system (case of a company)

II. Protection and Security of Systems (15h)

A. Protection (3h)

1. Definition
2. Protective devices
 - materials
 - software: system level, application level.
3. Problems of protection :
 - Basic concepts
 - Insulation
 - Global and selective sharing

- Notion of Area of Protection
 - Representation of protection rules: Rights matrix
 - Representation by columns or Access Lists
 - Representation by lines or Capability Lists
 - Study of typical examples of protection systems:
 - UNIX system
 - Windows system
4. Other problems :
- Dynamic modification of access rights
 - Hierarchical protection
 - Protection through mutual distrust

B. Safety (6h)

1. Purpose and Objectives of Security in a System
2. Authentication and Privacy
 - By hardware and software (biometric techniques)
 - By pure software means :
 - Static, dynamic, one-time use, custom questionnaire.
 - Secure management of passwords (size, associated security rules, backup procedures in case of loss).
3. Malware: classification by category (spyware, Trojans, viruses, worms, logic bombs, trapdoors, rootkits, bots)
4. Attacks and System Intrusion
 - Attack by exploitation of vulnerabilities.
 - The system
 - Applications Examples
 and associated countermeasures.
 - Attack by deception (social engineering, spoofing, phishing)
Examples and associated countermeasures.
5. Some useful security techniques and tools
 - Against data loss: periodic automatic back-up, logging of processing, redundancy).
 - Against malware: Malware detection software (AntiVirus, system hotspot protection, etc.)
 - Containment technique (SandBoxing)
 - Virtual machine technology (full system virtualisation software)

III. Network security (15h course)

A. Network vulnerabilities and attacks (3h)

1. Definition and description of a network attack (scans, vulnerability discovery, information exploitation and penetration, etc.)
2. Threat across the layers of the OSI model
 - Attacks on the IP protocol (ipspoofing, etc.)
 - Attacks on TCP (flooding, smurfing, etc.).
 - Attack on web applications (system, service, application)
 - SQL injection
 - Buffer Overflow
 - Fishing
 - Attacks and intrusion (sniffers, spoofing, flooding, denial of service,).
3. Audit, diagnostics and countermeasures .
Practical work (6 h) :
 - Simulate some network attacks.

- Use diagnostic tools (audit) to detect flaws in some applications.
- Implementing some countermeasures to correct the flaws in a system.

B. Authentication in networks (3 h)

1. Problems with authentication.
2. Password authentication (PAP and CHAP protocols).
3. Authentication using a network server.
4. Use of cryptographic tools for network authentication:
 - Authentication by digital certificate (PKI concept).
 - Authentication in WIFI networks.
 - Security of WAN connections: VPN (IPsec).

Practical work (6 h) :

- Implementation and analysis of authentication protocols in WIFI
- Analyse protocols: SSH and HTTPS
- VPN (IPsec)

C. Filtering and access control (3 h)

1. Introduction and importance of filtering and access control.
2. Access List Filtering: ACL
3. Principle of a firewall (operation, filtering,).
4. Secure network architectures : DMZ
5. Proxy and content filtering (http, SMTP)
6. Intrusion D e t e c t i o n Systems (IDS)
7. HoneyPot and HoneyNet

Practical work (6 h) :

- Implementation o f an access c o n t r o l system based on ACLs (example on routers)
- Setting up a firewall-based filtering system (example iptables under Linux)
- Setting up a DMZ architecture with filtering
- Setting up an IDS (example: SNORT)

PERSONAL WORK

-A problem with several possible variants (research, development, implementation of a solution,) will be proposed and the choice (study, analysis and realisation) will be left to the student's initiative.

KNOWLEDGE TEST

- Intermediate review : 15%
- Final exam: 25%.
- TP test: 40
- Projects: 15%.
- TP reports: 5%.

BIBLIOGRAPHY

- J. Chirillo, "Hack Attacks Revealed", WILEY Edition, 2001.
- M. Cross, S. Palmer "Web Application Vulnerabilities: Detect, Exploit, Prevent" EditionSyngress, 2007.
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- G. Dubertret, "Initiation A La Cryptographie", Vuibert, 1998.
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- B. Schneier, "Cryptographie Appliquée : Algorithmes, Protocoles Et Codes Source En C", Vuibert, 2002
- E. Seagren, "Secure your network for free using Nmap , WireShark , Snort , Nessus" Edition
- Syngress, 2007A. Silberschatz, P.B. Galvin, G. Gagne, "Operating System Concepts", 8th_Edition, Wiley, 2009.
- W. Stallings, "Operating Systems Internals and Design Principles", 7th Edition, Prentice Hall, 2012.
- W. Stallings, "Network Security Essentials: Applications and standards", 4th Edition, Prentice Hall, 2011.
- W. Stallings, "Cryptography and network security principles and practice", 5th Edition, Prentice Hall, 2011.
- W. Talligs, "Sécurité des réseaux: applications et standards", Vuibert, 2002
- A. Tanenbaum, "Modern Operating Systems", 3rd Edition, Prentice Hall, 2009.
- A. Tanenbaum, "Computer Networks", 4th Edition, Prentice Hall, 2003.
- Ifaci, "Les Principes De La Sécurité Informatique: Guide D'audit", Centre de Librairie et d'Editions Techniques, 1990.

ETU-Watch

Knowledge area: General training and knowledge Enterprise

EU Code	Title of the module	Coefficient
ETU	Watch	2

Hourly volumes		
Lectures	TD / TP	TOTAL
15	15	30

Semester :	3 or 4
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Prerequisites	no
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OBJECTIVE

- What are the tools and means of information monitoring?

CONTENTS

- 1 - General presentation
 - General & Definitions
 - Types of monitoring
 - Methods and tools
- 2 - Principles and methodology
 - Monitoring process
 - Collection and sourcing
 - Analysis, synthesis and processing
 - Sharing and dissemination
- 3 - Information sources
 - Research methodology
 - Internet search
 - Search by field and intuitive search
- 4 - Search engines
 - Evolution of the web
 - Search engines
 - Types of engines: linear, graphic, cluster, visual, multimedia
 - Research practices

- Custom search
- Social, real time, reverse search
- Semantic, predictive and conversational search

5 - RSS feeds

- Definitions and standards
- Types of content
- RSS Feed Aggregators
- Types of aggregators (Netvibes, ...)
- Generate an RSS feed
- Benefits of RSS feeds

6 - Monitoring agents and tools

- Intelligent agents (Cybion, Digimind, ...)
- Structure and functioning of agents
- Monitoring agents (Webwatcher, ...)
- Conversational agents

7 - Processing and use of information

- Analysis, filtering and curation of information
- Information processing tools
- Dissemination of information
- Evaluation and improvements of the monitoring process

8 - Business intelligence

- Strategy and information
- Business intelligence & monitoring
- Strategic intelligence
- Business intelligence practice (in SMEs)
- Extending the use of business intelligence
- Economic intelligence in Algeria

KNOWLEDGE TEST
<ul style="list-style-type: none"> - 1 written exam - presentation

UET - MANAGEMENT (MNG)

Knowledge area: Business knowledge and general training

EU Code	Title of the module	Coefficient
ETU	Management (MNG)	2

Hourly volumes		
Lectures	TD / TP	TOTAL
30	0	30

Semester :	3 or 4
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Prerequisites	
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OBJECTIVES :

- Introduction to the principles of management.

CONTENTS :

1. Introduction and general principles of

management The company

The business concept

- Evolution of company organisations
- The main functions of companies

2. The Manager

Introduction to the Manager concept

- The qualities of the Manager
- Forms of Management

3. Manager's tools

- TDBs
- Business plan and pricing
- Tools for managing work teams
 - Motivational tools
 - Assessment tools

4. Non-specialty tools

- Finance for non-financial people
- Marketing for non-marketers
- HR for non-HR

PERSONAL WORK

- TBD

KNOWLEDGE TEST

ETU - Ethics and Professional Conduct (ECP)

Knowledge area: Business knowledge and general training

EU Code	Module title	Coef/Credits
ETU	Ethics and Professional Conduct (ECP)	2

Hourly volumes		
Lectures	TD / TP	TOTAL
30	0	30

Semester :	3 or 4
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Prerequisites	No
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OBJECTIVES :

- Preparing the engineer with a moral code and ethical principles
- To instil principles of professional conduct within an organisation.

CONTENTS :

- I. Responsibilities towards the company and the company
- II. Models of professionalism
- III. Ethics and practice

KNOWLEDGE TEST

- Written examination on the course
- Continuous monitoring of the TDs

BIBLIOGRAPHY

- Brennan, L.L., and V.E. Johnson. 2004. Social, ethical and policy implications of information technology: Information Science Pub.
- Bott, F. 1996. Professional issues in software engineering: UCL Press.