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Ministère de l'Enseignement Supérieur et de la Recherche Scientifique
وزارة التعليم العالي و البحث العلمي

ESI ECOLE NATIONALE SUPÉRIEURE D'INFORMATIQUE

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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2nd year SIT program

Contents

SECOND CYCLE (2nd year) SIT option

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

Teaching Unit EU	Semester volume (15 weeks)					Coefficients
	Lectures	Tutorial	Practical work	Other	Total	
EU Fundamental						
UEF2.1.1	**45h00**	**45h00**			**90h00**	**6**
Information systems analysis	30h00	30h00			60h00	4
Change management in information systems projects	15h00	15h00			30h00	2
UEF2.1.2	**60h00**	**30h00**			**90h00**	**6**
Decision support information system: methods and tools	30h00	15h00			45h00	3
Advanced databases	30h00	15h00			45h00	3
UEF2.1.3	**30h00**	**30h00**			**60h00**	**4**
Data analysis and mining	30h00	30h00			60h00	4
EU Methodology						
EMU2.1.1	**45h00**	**15h00**			**60h00**	**4**
Information and communication technologies in organisations	30h00	15h00			45h00	3
Quality assurance	15h00				15h00	1
EMU2.1.2				**30h00**	**30h00**	**2**
Practical training in a company				30h00	30h00	2
Cross-cutting EU						
UET2.1	**60h00**	**30h00**	**30h00**		**120h00**	**8**
Teaching units optional*.	60h00	30h00	30h00		120h00	8
Total Semester S3	**240h00**	**150h00**	**30h00**	**30h00**	**450h00**	**30**

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

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

Teaching Unit EU	Hourly volume half-yearly (15 weeks)					Coef/Credits
	Lectures	Tutorial	Practical work	Other	Total	
EU Fundamental						
UEF2.2.1	**30h00**	**45h00**			**75h00**	**5**
Cooperative Information Systems	15h00	15h00			30h00	2
Integrated management software packages	15h00	30h00			45h00	3
UEF2.2.2	**15h00**	**15h00**			**30h00**	**2**
Engineering and management of information systems security	15h00	15h00			30h00	2
UEF2.2.3	**30h00**	**30h00**			**60h00**	**4**
Software architectures	30h00	30h00			60h00	4
UEF2.2.4	**15h00**	**30h00**			**45h00**	**3**
Queuing and simulation	15h00	30h00			45h00	3
EU Methodology						
EMU2.2.1	**30h00**	**30h00**			**60h00**	**4**
Accounting and finance	30h00	30h00			60h00	4
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	**180h00**	**180h00**	**30h00**	**60h00**	**450h00**	**30**

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

UEF2.1.1 - Information Systems Analysis (ISA)

Knowledge Area: Information Systems

EU Code	Title of the module	Coefficient
UEF2.1.1	Information Systems Analysis	4

Hourly volumes		
Lectures	TD / TP	TOTAL
30	30	60

Semester :	3

Prerequisites	• MCSI • Project management • UML • Analysis of organisations

OBJECTIVES :

- To show the importance of initiating, specifying and prioritising information systems projects as part of an information systems planning process
- In-depth study of the first stages of any information system project, which are initialization and analysis.
- Analyse and articulate the types of feasibility in order to successfully launch the information system project Communicate effectively with the various stakeholders in the organisation to gather information using a variety of techniques

CONTENTS :

- *Introduction (3h)*
  1. Reasons for initiating IS projects
  2. Key success factors
- *Information systems planning (12 h)*
  3. Issues: Alignment of IS with the organisation's strategy
  4. Approach to the development of an IT Master Plan
- *Information system analysis (15 hours)*
  1. Feasibility analysis
     a. economic,
     b. technique,
     c. operational,
     d. organizational
  2. Specification of needs and requirements
  3. Definition of objectives and scope
  4. Evaluation of alternatives
  5. Risk analysis

- *Techniques for collecting requirements (TD) (30 h)*
    1. Interviews
    2. questionnaire
    3. observation
    4. Document analysis
    5. Brainstorming

The T.D. will be an opportunity to appropriate the tools for collecting information and diagnosing the existing system on the basis of practical cases

PERSONAL WORK

- Preparation of the T.D.
- TP

KNOWLEDGE TEST

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

BIBLIOGRAPHY

- G. Balantzian, *Le schéma directeur d'informatisation de votre entreprise, démarche pratique*, Masson, 1985
- Y. Constantinidis, "Expression of needs for information systems, guide d'élaboration de cahier de charges", Eyrolles, 2010
- A. Hoffer, Joey F. George, J.S. Valacich, *Modern Systems Analysis and Design*, Prentice Hall, 2010
- R. Reix, *Systèmes d'information et management des organisations*, Vuibert, 4th edition 2002.
- J. Whitten, L. Bentley, *Systems Analysis and Design Methods*, McGrawHill, 2005.
- J.W. Satzinger, S.D. Burd and R.B. Jackson, *Information Systems Analysis and Design,* 2003

UEF2.1.1 - Change Management in Information System Projects

Knowledge Area: Information Systems

EU Code	Title of the module	Coefficient
UEF2.1.1	**Change Management in Information System Projects**	**2**

Hourly volumes		
Lectures	**TD / TP**	**TOTAL**
15	**15**	**30**

Semester :	**3**

Prerequisites	• CPRJ (1CS) Project management • Analysis of organisations

The rapid evolution of the business environment has generalised project management and the need for support. Change can no longer be managed by traditional management (hierarchy) but requires specific and temporary actions.

The notion of change management takes on its full importance and opens up management to socio-organisational concepts and to taking into account the actors and their reactions.

Managers today must think of management in terms of change management.

OBJECTIVES :

- Understand the main stages of change management, particularly in IT projects.

CONTENT OF THE MODULE :

I. Introduction to the psychosociology of change (3 h)

1. The variables of change
2. Typologies of change in companies (prescribed, crisis, constructed, adaptive)
3. Resistance to change management

II. Levers of change management (3h)

1. Internal marketing and communication
2. Training
3. Accompaniment

III. Change management in I.S. projects (9 h)

1. Carry out a change management action
2. Understanding the problems of user resistance to IT implementation
3. Facilitation and management of a change project

PERSONAL WORK
- Presentations
- Article summaries

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

BIBLIOGRAPHY
• C. Morley, "Management d'un projet système d'information: principes, techniques, mise en œuvre et outils", 4th Edition, Dunod, 2004. • D. Autissier, "Guide pratique de la conduite de changement, Comment passer du discours à l'action", Dunod, 2007. • J.M. Mouto, F. Dupuy, "L'alchimie du changement. Problématique, étapes et mise en œuvre", Dunod, 2001. • J. Gabay, B. Gébré, "La conduite des projets d'évolution des systèmes d'Information", Dunod, 1999.

UEF2.1.2 - Decision Support Systems: Methods and Tools

Knowledge Area: Information Systems

EU Code	Title of the module	Coefficients
UEF2.1.2	Decision Support Systems: Methods and Tools	3

Hourly volumes		
Lectures	TD / TP	TOTAL
30	15	45

Semester :	3

Prerequisites	• Introduction to IS • Analysis of organisations

OBJECTIVES :

- In-depth study of the concepts and models underlying decision support information systems. Particular emphasis will be placed on the development of methods for the design of DIS.
- In-depth study of the main decision support tools, including the Edges, SIAD, Data warehouses, Datamining.

CONTENT OF THE MODULE :

I. Introduction

II. Decision-making (6h)

1. Basic concepts (the decision maker, the decision)
2. Decision-making
   - The cognitive process of the decision maker
     - Typology of decision-making processes
     - The IDC model
   - The decision situation
     - Decision making and work organisation
       a. Structuring of decisions
       b. Steering modes
     - Types of decision situations
       a. Operational decisions
       b. Adaptation decisions
       c. Strategic decisions
3. Cooperative decision making

III. Decision support (9 h)

1. Definition
2. Introduction to multi-criteria decision support
3. Method and tools for individual decision support
   - Individual decision support tools
     - SIAD
     - Executive Information System (EIS)
     - Expert Systems (ES)
     - Query languages (SQL, QBE,...)

- DM
- Individual decision support methods
  - AMS method for dashboards
  - ROMC method

4. Method and tools for group decision support
   - Group decision support tools
     - GDSS
     - Workflow tools, Groupware tools (will be seen in the Cooperative IS course)
5. Method and tools for decision support at t h e organisational level
   - ODSS
   - OLAP tools, Data Warehouse (will be seen in the Advanced DB course)

PERSONAL WORK
- Creation of a dashboard - Development of SIAD

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

BIBLIOGRAPHY

- F. Adam, P. Humphreys, "Encyclopedia of Decision Making and Decision Support Technologies", Information Science Reference, 2008.
- E.D. Carlson, R.H. Sprague, "Building Effective Decision Support Systems", Prentice Hall, 1982.
- C.W. Holsapple, A.B. Whinston, "Decision Support Systems - A Knowledge Based Approach", West Publishing Company, 1996.
- P.G. Keen, M.S. Scott Morton, "Decision Support Systems", Addison Wesley, 1978.
- S. Kaplan, "Tableau de bord prospectif", Editions d'organisations, 2005.
- J.L. Le Moigne, "Les Systèmes de Décision", Éditions d'Organisation, 1973.
- J. Mélèse, "Analyse Modulaire des Systèmes", Éditions d'Organisation, 1972.
- H. Mintzberg, "Structure et Fonctionnement des Organisations", Éditions d'Organisation, 1982.
- A. Newell, H.A. Simon, "Human problem solving, Prentice Hall", 1972.

UEF2.1.2 - Advanced Databases

Knowledge Area: Information Systems

EU Code	Title of the module	Coefficient
UEF2.1.2	Advanced Databases	3

Hourly volumes		
Lectures	TD / TP	TOTAL
30	15	45

Semester :	3

Prerequisites	• Database (UE: BDD of the third year) • MCSI (UE: MCSI in the third year)

OBJECTIVES :

This course allows students to deepen their knowledge of 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

CONTENT OF THE MODULE :

- *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
- *Advanced SQL Programming (4h30)*
  1. Fundamentals of SQL programming
  2. The Triggers
  3. Stored functions and procedures
  4. Error handling and management
- *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)
- *Multidimensional databases (DATAWAREHOUSE) (9h)*
  1. Introduction to Business Intelligence (BI): Concepts, Architecture and Platforms ;
  2. Multidimensional data modelling ;
  3. Creation and manipulation of data warehouses with SQL and

MDX ;

- *Semi-structured databases (6h)*
    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
- *Other aspects of Databases (6h)*
    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

- M. Gunderloy, T. Sneath, "SQL Server Developer's Guide to OLAP with Analysis Services", Sybex, 2001. (Reference book on OLAP programming with SQL Server 2000.
- C. Imhoff, J.G. Geiger, N. Galemmo, "Mastering DataWarehouse Design Relational and Dimensional Techniques", Wiley, 2003.A. Meier, "Practical Introduction to Relational Databases", 2ème edition, Springer, 2006.
- S. Korth-Sudarshan, "Database System Concepts", 4ème edition, McGraw-Hill, 2001.

UEF2.1.3 - Data Analysis and Mining

Knowledge Area: Mathematical tools

EU Code	Title of the module	Coefficient
UEF2.1.3	Data Analysis and Mining	4

Hourly volumes		
Lectures	TD / TP	TOTAL
30	30	60

Semester :	3

Prerequisites	• Statistics and probability, linear algebra, numerical calculation.

The use of data analysis extends to a wide range of fields, including pattern recognition, data mining, prediction, marketing, biostatistics.....

OBJECTIVES :

- Present the techniques of multidimensional descriptions, statistical modelling and learning theory used in data mining in various fields of application: industry, marketing.... The aim is to bring out the relevant information contained in a large mass of data.

At the end of this course, students will be able to mobilise the tools to process data and interpret the results of the various measurements they encounter in the exercise of their profession.

CONTENT OF THE MODULE :

I. Reminder (1h)

Linear algebra, descriptive statistics, matrix derivation and function optimisation.

II. Factor methods (Description, Reduction, Visualisation and Interpretation of data) (14h)

1. Principal component analysis.
2. Factor analysis of correspondences.
3. Multiple correspondence factor analysis.

III. Data mining: Supervised and unsupervised classification (15h)

1. Classification and Ranking (Prediction) of data
   - Discriminant factor analysis.
   - Automatic classification.
   - Introduction to the principle of statistical learning: Presentation of some methods (SVM, K-nearest neighbours, Neural networks, Bayesian method...).
2. Modelling and forecasting
   - Simple and multiple regression.
   - Notions on Time Series and Exponential Smoothing

PERSONAL WORK

- TD to enable the student to manipulate the tools of data analysis.
- Practical work on real data using appropriate software including R, SAS and Matlab, WEKA.

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

BIBLIOGRAPHY
• R. Bourbonnais, M. Terraza, "Analyse des séries temporelles: Application à l'économie et à la gestion", Dunod, 2010. • R. O. Duda, P.E. Hart, D.G. Stork, "Pattern classification", 2nd edition, Wiley and sons, 2001. • T. Hastie, R. Tibshirani, J. Friedman, "The elements of statistical learning. Data mining, inference and prediction", Springer, 2001. • L. Lebart, A. Morineau, M. Piron, "Statistique exploratoire multidimensionnelle", Dunod, 2006. • G. Saporta, "Probabilites Analyse des Données et Statistique", 3rd edition, Technip, 2011. • Online resources: http://www.math.univ-toulouse.fr/~besse/teaching.html.

EMU2.1.1 - ICT in Organisation

Knowledge Area: Information Systems

EU Code	Title of the module	Coefficient
EMU2.1.1	ICT in Organisation	3

Hourly volumes		
Lectures	TD / TP	TOTAL
30	15	45

Semester :	3

Prerequisites	• Analysis of organisations

In today's economy, there are hardly any companies that do not need the help of IT. Indeed, ICTs (Information and Communication Technologies) play an essential role in the management of companies. These technologies have become a factor of innovation and transformation of organisations.
The objective of this course is twofold:

- Firstly, to clarify the contribution of ICT to the achievement of the company's strategic objectives, whether as an innovation leading to a strategic advantage or as a support to the company's strategy.
- Then show how to organise ICT management in a company.

Learning objectives for students

Students should be able to answer the following questions at the end of this course:

- What is ICT?
- What is the influence of ICT on the global economy and businesses?
- What are the impacts of ICT on organisations?
- What is the strategic role of ICT in organisations?
- How is the ICT function structured in organisations?
- What are the basic indicators of the CIO Dashboard?

CONTENT OF THE MODULE :

I. ICT in Organisation: Global Analysis (4h)

1. T.I.C: clarification
2. ICT evolution: Technology push & Market pull (figures)
3. Structure of the ICT industry
4. Analysis of the role of ICT in the organisation (Results of the MIT Survey, S. Morton)

II. Strategic role of ICT in business (6 h)

1. Describe the role of information and the information system in a company
2. Understanding the concept of IT strategy
3. Which IT to solve which problems? Contributions of M. PORTER's 5 forces model (rivalry between competitors, threat of new entrants, power of (e.g., supplier bargaining, customer bargaining power, threat of substitute products and services)

III. IT in the structure of the organisation? What solutions (8h)

1. Centralized computing
2. Disseminated computing
3. Outsourcing of IT services

IV. Internal structure of the ISD (Information Systems Department) in an Organisation (12 h)

1. Internal organisation of an IT structure in a large company
2. Role of CIOs in the organisation
3. CIO Dashboard
   - Building principles
   - The BSC or Balanced Scorecard applied to the ISD

RECOMMENDATIONS

TD/TP (15h) :

- Examples of videos followed by discussions
- Application of Porter's 5 forces model to business cases
- Presentations of ICT mini-projects
- Presentation of information collected from professionals (DSI)
- Construction of ISD Dashboards

PERSONAL WORK

- Reading of various articles to complement the course
- Work in groups of 4 students (information gathering from CIOs)

KNOWLEDGE TEST

- 1 Written examination on the course
- 1 Continuous control of the TD (group work, participation mark, attendance mark)

BIBLIOGRAPHY

- J.L Peaucelle, *La gestion de l'informatique*, Les Editions d'Organisations, 1990
- S.C Morton, *The Competitive Enterprise of the Future*, Editions d'organisation, 1995
- J.F Challande, J.L Lequeux, *Le grand livre du DSI. Mettre en œuvre la direction des Systèmes d'information 2.0*, Eyrolles, 2009
- C. Legrenzi, P. Rosé, *Le tableau de bord du DSI, Pilotage, performance et benchmarking of the information system*, DUNOD, 2007
- S. Kaplan, "*Tableau de bord prospectif*", Editions d'organisations, 2005

EMU2.1.1- Quality assurance

Knowledge Area: Information Systems

EU Code	Title of the module	Coefficient
EMU2.1.1	Quality Assurance	1

Hourly volumes		
Lectures	/	TOTAL
15		15

Semester :	3
Prerequisites	• Analysis and design of information systems • Project management

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.
- Ability to insert one's action into such a system, to contribute to its implementation, life and its evolution.
- Ability to accept and take into account the external regulatory elements that are required in the different fields of activity.
- Ability to participate dynamically in the continuous improvement of quality in the sense of induced or similar standards.

CONTENT OF THE MODULE :

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 quality auditing

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.

PERSONAL WORK

-Reading articles

KNOWLEDGE TEST

-Written examination on the course

BIBLIOGRAPHY

- J.P Huberac, Guide des méthodes de la qualité, MAXIMA, 1999
- C.Y Laporte, A. April, "Assurance qualité logicielle, Tome II", Hermès, 2011
- C. Jambart, "Assurance qualité", 3ème edition, Economica, 2011
- R. Ernoul, "Le grand livre de la qualité", AFNOR,
- C. Villalonga, L'audit qualité interne, Dunod, 2003

UEM2.1.2- Practical training in a company

EU Code	Title of the module	Coefficient
EMU2.1.2	Practical training in a company	2

Hourly volumes		
Lectures	TD / TP	TOTAL
/	30	30

Semester :	3

OBJECTIVES :

The expected objective of the trainees is to participate in the study and analysis of a real problem from the professional environment and possibly propose scenarios for improvement.

- Learning sub-objectives
  - Putting into practice what you have learned
  - Developing analytical skills
  - Developing the spirit of synthesis
- Personal development sub-goals
  - Life experience
  - Compliance with academic and professional guidelines

TARGET COMPETENCES:

- Communication
- Observation
- Teamwork

CONTENT OF THE MODULE :

I. A presence in the workplace

II. A written report on the internship

III. A presentation to a panel of teachers

IV. Self-evaluation of the experience (participation in a post-course survey)

PERSONAL WORK

- A search for a subject among companies
- Negotiation of the objectives to be achieved

UEF2.2.1 - Cooperative Information Systems

Knowledge Area: Information Systems

EU Code	Title of the module	Coefficient
UEF2.2.1	Cooperative Information Systems	3

Hourly volumes		
Lectures	TD / TP	TOTAL
15	30	45

Semester :	4
Prerequisites	• Introduction to information systems

Cooperative work is the subject of a multidisciplinary field of study called CSCW (Computer Supported Cooperative Work). This discipline studies the individual and collective mechanisms of group work and investigates how information and communication technologies can facilitate this work.

OBJECTIVES :

- To provide students with the necessary basic knowledge of cooperation more specifically cooperative work and ICT contributing to the cooperative advantage (groupware, workflow, ..).

CONTENT OF THE MODULE :

I. Concepts and theoretical approach to Collaborative Work (6h)

1. Cooperation vs. collaboration: Definitions
2. Cooperating to cope with complexity
3. Cooperative work
4. Virtuality for cooperation.
5. Keys to a successful cooperative approach

II. Process of setting up Collaborative Work (6 h)

1. Sharing and exchange of structured files, documents, services
2. User interfaces and collaborative working
3. Workflow

III. Technologies supporting collaborative work (3h)

1. Messaging
2. Groupware
3. Videoconferencing
4. Workflow
5. EDM

IV. Application: Sharepoint or open source (Alfresco, Google docs) in TD/TP (30h)

PERSONAL WORK

-T.P. will be an opportunity to learn about the tools (Sharepoint or other)

KNOWLEDGE TEST

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

BIBLIOGRAPHY

- D. Chaffey, "Groupware, Workflow Management: Reengineering the Enterprise with Collaborative Software", Digital Press, 1998.
- S. Khoshafian, "Groupware and Workflow", Intereditions, 1998.
- S.K. Levan, "Travail Collaboratif sur Internet: Concept, Méthodes et Pratiques des Plateaux Projet", Vuibert, 2004.

UEF2.2.1 - Integrated Management Software (IMP)

Knowledge Area: Information Systems

EU Code	Title of the module	Coefficient
UEF2.2.1	Integrated Management Software	3
Hourly volumes		
Lectures	TD / TP	TOTAL
15	30	45
Semester : 4		
Prerequisites	• Introduction to IS, MCSI, TICO	

OBJECTIVES :

- To assimilate the concepts related to the integration of management information systems.
- Mastering business process modelling (identification, modelling)
- Detail the integration solutions through ERP and EAI technologies and understand the expected benefits and all issues related to their implementation.

CONTENT OF THE MODULE :

I. Introduction

1. Evolution of computerisation in organisations
2. Information system and need for standardisation

II. Processes: Identification and modelling (3h)

1. Concept of process
2. Process identification (BIAIT technique)
3. Modelling a process

III. ERP: Fundamentals (4 h)

1. Definitions
2. History of ERP
3. Typical ERP architecture
4. Examples of ERP systems
5. The ERP Market
6. New trends

IV. ERP project management and associated risks (6 h)

1. ERP project management method
2. Budgeting for an ERP system
3. Risks associated with ERP projects
4. Beyond ERP project management: change management

V. Concept of EAI (Enterprise Application Integration) (2 h)

RECOMMENDATIONS

TD/TP (30h):

- Practice on an open source and/or proprietary ERP (Oracle, . . .)
- Schedule the demonstration of working examples of module integration by a professional (alumni or other integrator profile)
- Case study in groups of 3 to 4: application of BIAIT

PERSONAL WORK
-Writing TD/TP reports

KNOWLEDGE TEST
- 1 Written exam - Note Case study - Participation note

BIBLIOGRAPHY

- J.G Bernard, S. Rivard, B.A. Aubert, "L'exposition au Risque d'implantation d'ERP: Eléments de Mesure et d'atténuation", Revue Système d'Information Et Management, 2005.
- M. Hammer, J. Champy, "Reengineering The Corporation - A Manifesto For Business Revolution", Nicholas Brealy Publishing, 1993.
- C. Godart, O. Perrin, "Les processus métiers: concepts, modèles et systèmes", Hermès, 2009
- J.L. Lequeux, "Manager avec Les ERP - Architecture Applicative", Editions d'Organisation, 2002.
- J.L Thomas, "ERP et PGI - Sélection, Déploiement et Utilisation Opérationnelle", Dunod, 2002.

UEF2.2.2 - Information System Security Engineering and Management (IMSSI)

Knowledge Area: Information Systems

EU Code	Title of the module	Coefficient
UEF2.2.2	I.S. Security Engineering and Management	2

Hourly volumes		
Lectures	TD / TP	TOTAL
15	15	30

Semester :	4

Prerequisites	• Security

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.

CONTENT OF THE MODULE :

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 women (www.cse-cst.gc.ca),
   - American (www.ansi.org).
3. International standards
   - ISO 2700X series

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

PERSONAL WORK
-T.P. will be an opportunity to learn about the tools (Sharepoint or other)

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

BIBLIOGRAPHY

- M. Bennasar, A. Champenois, P. Arnould, T. Rivat, "Manager la sécurité du SI, Planifier, Déployer, Contrôler, Améliorer", DUNOD, 2007
- B. Foray, "La fonction RSSI, Guide des pratiques et retours d'expérience", DUNOD, 2007.
- T. Harlé, F. Skrabacz, "Clés pour la sécurité des Systèmes d'Information", Hermès, 2004
- www.clusif.asso.fr

UEF2.2.3 - Software Architectures (Alog)

Knowledge Area: Software Engineering

EU Code	Title of the module	Coefficient
UEF2.2.3	Software Architectures	4
Hourly volumes		
Lectures	TD / TP	TOTAL
30	30	60
Semester :	4	
Prerequisites	• I.S. analysis and design	

OBJECTIVES :

- Acquire more in-depth knowledge of the technical architectures adopted for the design of Information Systems
- Present the technologies that support SOA architectures
- Acquire the "basic" knowledge of web application development

CONTENT OF THE MODULE :

I. Introduction

II. Strategy for the evolution of IT architectures for IS (3h)

1. Strategy for the evolution of organisations
2. Strategic issues for IT departments
3. Technical and financial objectives

III. Characteristics of current information systems architectures (12h)

1. 1st Generation Architectural Client/Server (2/3)
2. 2nd Generation: Collaborative work
3. Evolution of the 2nd Generation (multi-level cooperative processing): 3 tiers
4. 3rd Generation: Distributed Architecture (distributed processing and data)
5. Towards a universal architecture: WEB
6. The Internet MVC: Model-View-Controller
7. Mobile agents

IV. Component-based architectures (6h)

V. Service Oriented Architectures (9 h)

PERSONAL WORK

-TP/DD on technical architectures adapted to the design and implementation of IS

KNOWLEDGE TEST

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

BIBLIOGRAPHY

- B. Bruller, "Architectures de Systèmes d'Information Modèles, services et protocoles", Vuibert, 2003.
- P. Clements, F. Bachmann, L. Bass, D. Garlan, J. Ivers, R. Little, R. Nord, J. Stafford, "Documenting Software Architectures - Views and Beyond", 2ème edition, Addison Wesley, 2010
- M. Lankhorst, "Enterprise Architecture at Work: Modelling, Communication and Analysis", Springer, 2009
- J. Printz, "Architecture logicielle - Concevoir des applications simples, sûres et adaptables", Dunod, 2009.

UEF2.2.4 - Queuing and Simulation (FAS)

Knowledge Area: Mathematical tools

EU Code	Title of the module	Coefficient
UEF2.2.4	Queues and Simulation	4
Hourly volumes		
Lectures	TD / TP	TOTAL
30	30	60
Semester :	4	
Prerequisites	• I.S. analysis and design	

OBJECTIVES: To present operational research concepts for future decision-makers and project managers

CONTENT OF THE MODULE :

I. Random Process - Examples of Processes; the Poisson Process

II. Markov process

1. Discrete-time Markov chain.
2. Graph associated with a Markov chain
3. Classification of states of a Markov chain.
4. Stationary distribution of a Markov chain.
5. Asymptotic behaviour of a Markov chain

III. Birth and Death Process

IV. Standby systems M/M/....

V. M/G/1 holding systems.

1. Induced Markov chains.
2. Calculation of the performance characteristics of the M/G/1 system

VI. Queueing networks.

1. Open networks
2. Closed networks
3. Multi-class networks

VII. Simulation methods for waiting systems.

1. Notions of system, model and simulation.
2. Concepts related to the simulation method.
3. Approaches to modelling discrete event systems.
   - Event-based approach.
   - Activity-based approach.
   - Process approach.

PERSONAL WORK

KNOWLEDGE TEST

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

BIBLIOGRAPHY

- A. Alj, R. Faure, "Guide de la Recherche Opérationnelle", Tome1, Masson, 1990.
- M. Babes, "Statistics, Queues and Simulation", Opu, 1992.
- S. Fdida, G. Pujolle, "Modèles de Systèmes et de Réseaux", Tomes 1 et 2, Eyrolles, 1989.
- L. Kleinrock, "Queuing Systems", Vol1 and 2, Wiley, 1976.
- P. Quittard, "Eléments de Statistiques, Processus Aléatoires et Queues d'Attente", Opu, 1989.
- Roseaux, R. Faure, "Exercices et Problèmes Résolues de Recherche Opérationnelle", Tome2, Dunod, 2005.
- A. Ruegg, Stochastic Processes with Applications to Expectation and Reliability Phenomena 1989

EMU2.2.1- Accounting and Finance (COFI)

Knowledge area: General training and knowledge Enterprise

EU Code	Module title	Coef/Credits
EMU2.2.1	Accounting and Finance	4

Hourly volumes		
Lectures	TD / TP	TOTAL
30	30	60

Semester :	4
Prerequisites	• Analysis of organisations

The evolution of companies in recent years (after the restructuring of public companies) has profoundly changed 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

OBJECTIVES :

- To familiarise students with accounting documents, their purpose, and the accounting logic which is structured by a codification. To master the transition from one accounting system to another.
- Understand and identify financial statements.

CONTENT OF THE MODULE :

I. General accounting (10 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 (10 h)

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
   - Gap analysis between actual and planned
   - Variance analysis of variable direct costs
   - Gap analysis on indirect costs
   - The difficulties of implementing budgetary control

III. Financial analysis (10 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 its need for working capital
   - 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", Du Renouveau Pédagogique, 2001.
- E. Cohen, "Analyse Financière", Economica, Collection exercices et cas, 6ème edition, 2006.
- B. Colasse, "Comptabilité Générale". 9ème edition, Economica, 2005.
- G. Charreaux, "Gestion financière", Litec, Collection Decf, 6th Edition, 2000.
- Conseil national de la comptabilité, "Plan Comptable Général", Imprimerie Nationale, 2005.
- A. Faure, "Manuel de comptabilité pour les associations", Chiron, 2004.
- F. Lefebvre, "Mémento Pratique Comptable", Francis Lefebvre, 2005.
- R. Obert, "Pratique des normes IASF/IFRS", Dunod, 2004.
- H. Ploix (Preface D. Lebegue), "Corporate governance: for all, managers, directors and investors", Village Mondial, 2006.
- P. Vernimmen, P. Quiry, Y. Le Fur, "Finance d'entreprise", Dalloz, 2005.
- P. Vernimmen, P. Quiry, Y. Le Fur, "Finance d'entreprise", Dalloz, 2005.
- N. Veron, M. Autrer, A. Galichon, "L'information financière en crise", Odile Jacob, 2004.

UEM2.2.2- Specialty Project

EU Code	Title of the module	Coefficient
EMU2.2.2	Specialty Project	4
Hourly volumes		
Lectures	TD / TP	TOTAL
	60	60
Semester : 4		

OBJECTIVES :

To enable students to work in a project team around an information system issue and a given complexity.

- Educational objectives
  - Overall understanding of the IS
  - Standard/specific differentiation
  - Integration of ROI concepts
- Objectives in terms of project management
  - Project life cycle experience
  - Exercising the roles: project owner / project manager (client / supplier)

TARGET COMPETENCES:

- Modelling / methodology
- Functional / business
- Technical
- Project management

CONTENT OF THE MODULE :

I. Pedagogical

1. Case study: Tailored to the speciality
2. Preliminary study
3. Dimensions: project monitoring (scoping file, .. of the CoP), quality (QR plan)

II. Organization

1. Teachers : A teaching team
2. Students in Project Teams
3. Timetable: number of sessions (15) - 4h /session

III. Educational sequencing

1. Types of sessions
2. Educational activities
   - Framing
   - Work in session
   - Customer intervention
   - Review
   - Final presentation
   - Debriefing

PERSONAL WORK

- Carrying out tasks within the assigned role

KNOWLEDGE TEST

- Formative evaluation
  a. Deliverables; b. Presentation; c. Involvement
- Evaluation by the project manager and/or Quality Manager or other

Optional modules in semester 4 and semester 5

UET - Urbanisation of I.S. (URSI)

Knowledge Area: Information Systems

EU Code	Title of the module	Coefficient
ETU	I.S. urbanisation	2

Hourly volumes		
Lectures	TD / TP	TOTAL
15	15	30

Semester :	4

Prerequisites	Information Systems Analysis

OBJECTIVES :

- Acquire the "basic" knowledge of information systems urbanisation
- Acquire more in-depth knowledge in the field of conducting and managing information systems urbanisation projects
- To take charge of the definition and implementation of a global solution allowing to integrate the constraints and the technological evolutions while taking into account the existing information systems and the emergence of new technologies able to generate value for the organisation concerned

CONTENTS

1-Foundations

- Origins and definitions
- The objectives of urbanisation
- The different types of urban planning
- Metaphor of the city
  - The land use plan (POS)
  - Urbanisation concepts (zone, district, block)
  - Guiding principles for urban development
- Concepts and rules

2-Presentation of an urbanisation process through a case study

- presentation of the case
- Urban planning and strategy
- Urban planning and business processes
- Urban planning and functional architecture
- Urban planning and application

architecture 3-Urbanisation approaches

- Veronique Laseur's approach
- Christophe Longépé's approach
- Yann Le Tanou's "Think Service" approach 4-

The dynamics of the actors

- Stakeholders and their roles

5-the SOA approach to IS urbanisation
PERSONAL WORK

KNOWLEDGE TEST
- Written examination - 1 Continuous controls - 1 group work of 4 students (company planning case) Participation grade

BIBLIOGRAPHY
• C. Longépé, R. Colletti, G. Balantzian: Le projet d'urbanisation du SI: Cas concret d'architecture d' entreprise, Dunod, 2009

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

Prerequisites	no

OBJECTIVES :

- 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
- 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		30

Semester :	3 or 4

Prerequisites	

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
Two examinations or one examination and one mark of individual work

ETU - Information Systems Audit (AUSSI)

Knowledge Area: Information Systems

EU Code	Title of the module	Coefficient
ETU	IS audit	2

Hourly volumes		
Lectures	TD / TP	TOTAL
15	15	30

Semester :	4

Prerequisites	TICO HMI Quality Assurance

Objectives:

This course provides a basic understanding of auditing and the general approach to auditing, with particular emphasis on the strategic, tactical and operational aspects of information systems auditing.
The course covers both internal and external audit assignments through its different phases.

Learning objectives for students

Students should be able to answer the following questions at the end of this course:

- Why audit an IS?
- How can we make an objective judgement about an information system?
- What is the procedure for auditing an IS?

What are the benchmarks and standards to be used by top management for I.S. governance?

CONTENTS

1. Audit basics
    - Audit,
    - Issues
    - Audit principles and rules
    - Audit typologies (Internal/ External, ..)
    - Audit Actors
    - General approach to conducting an audit
2. Information System Audit
    - Reminder on the notion of Information System (definition, typology, ..)
    - IS audit categories
        - Audit of the IT function and organisation.
        - Audit of studies and projects
        - Audit of operations (Applications),
        - Security Audit,
        - IT costs
3. General approach to conducting an IS audit

4. The I.S. auditor's tools
    - Standards (ISO 27001,
    - Reference systems (COBIT, Val IT, ITIL, CMMI, ...)
    - Methods (MEHARI, EBIOS, ..)
    - Selection criteria
5. Application cases

PERSONAL WORK

-Analysis of articles and cases

KNOWLEDGE TEST

-1 written exam

BIBLIOGRAPHY

- P. Jouffroy, COBIT, pour une meilleure gouvernance des systèmes d'information, 2ème edition, Eyrolles, 2010
- G. Balantzian, "Le Plan de Gouvernance du S.I", Dunod, 2007 (second edition)
- C. Dumond, ITIL, for an optimal IT service, Eyrolles, 2007
- M. Thorin, Audit informatique, Hermès, 2000

WEBGRAPHY

- ADELI (Association pour la maîtrise des systèmes d'information): www.adeli.org
- AFAI (Association Française de l'Audit et du Conseil Informatiques): www.afai.asso.fr
- IFACI (French Institute of Audit and Internal Control): www.ifaci.com
- ISACA (Information Systems Audit and Control Association): www.isaca.org
- European Club for IS Governance
- http://www.cegsi.eu
- COSO (Committee of Sponsoring Organizations of the Treadway Commission): www.coso.org
- ITIL http://www.itil-officialsite.com/
- CMMI http://www.sei.cmu.edu/cmmi/
- IS and Network Security Observatory http://www.ossir.org/
- AFNOR www.afnor.org
- French Information Security Club: www.clusif.asso.fr/
- Auditor's website with tools and a discussion forumhttp://www.itaudit.org/

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**	
Prerequisites	Basics of Databases, Probability and Statistics, Graph Theory	

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.
- Model geo-spatial or simply geographic data in 2D and 3D to 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
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- 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

UET - Human-Computer Interaction (HCI)

Knowledge Area: Software Engineering

ETU Code	Title of the module	Coefficient
ETU	Human-Computer Interaction (HCI)	2

Hourly volumes		
Lectures	TD / TP	TOTAL
15	15	30

Semester :	3 or 4

Prerequisites	• Object-oriented programming (OOP)

OBJECTIVES :

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

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 Rousselie, Vanessa Vimond "Les dossiersde l'écran : Utilisabilité et technologies IHM ". Editons 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
- C. Kolski, "Analysis and design o f HMI, Human-Computer Interaction for 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
- J.F. Nogier " De l'ergonomie du logiciel au design des sites Web ", Dunod 2001.
- J. Preece, "Computer Human Interaction", Addison Wesley.
- Dan Olsen, "Developing User Interfaces
- JefRaskin, "The Humane Interface
- Card, Moran, Newell, "Psychology Of Human Computer Interaction".

ETU - Web Technology and Development (TDW)

Knowledge Area: Software Engineering

ETU Code	Title of the module	Coefficient
ETU	Technology and web development	4
Hourly volumes		
Lectures	TD / TP	TOTAL
15	45	60
Semester :	3 or 4	
Prerequisites	Software engineering	

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.)
- Learn to use the tools that support web-oriented development.

CONTENTS

I. Static web

1. Introduction to HTML
2. Defining style and layout with CSS
3. Javascript programming

II. Dynamic web

1. History (CGI, DLL, scripting languages, JAVA applet, etc.)
2. Introduction to AJAX
3. Boosting websites with JQuery
4. What's new in HTML5
5. Multimedia with HTML5

III. Semantic Web

1. Metadata and search engines
2. The semantic web with HTML5

IV. Tools to support the creation of websites

1. Website creation with CMS
2. other

KNOWLEDGE TEST

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

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.

UET - Software Quality (QL)

Knowledge Area: Software Engineering

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

Hourly volumes		
Lectures	TD / TP	TOTAL
30	30	60

Semester :	4
Prerequisites	• Introduction to Software Engineering

OBJECTIVES :

- Definition of software quality, verification and validation.
- Distinguish between the different types of tests (unit, integration, acceptance)
- 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 TDs

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

UET - Mobile Technology and Development 1 (TDM1)

Knowledge Area: Software Engineering

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

Hourly volumes		
Lectures	TD / TP	TOTAL
15	15	30

Semester :	4

Prerequisites	• Object-oriented programming (OOP) • Introduction to Software Engineering

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 o f 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

UET - Mobile Technology and Development 2 (TDM2)

Knowledge Area: Software Engineering

EU Code	Title of the module	Coefficient
ETU	Mobile Technology and Development (MTD)	2
Hourly volumes		
Lectures	TD / TP	TOTAL
15	15	30
Semester :	4	
Prerequisites	• Object-oriented programming (OOP) • Introduction to Software Engineering (IGL) • Mobile Technology and Development 1(TDM1)	

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

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		
Prerequisites	SYS1, SYS2, RES1, RES2, Introduction to Computer Security, Software Engineering	

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

- Gildas Avoine, Pascal Junod, Philippe Oechslin " Sécurité Informatique : cours et exercices corrigés", Vuibert, 2010.
- 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

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	
Prerequisites	• Networks I • Networks II	

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 the 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.
- During the course, IPV6 addressing must be included.

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 protocolsdynamic (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: nagisos);
2. Analysis of the SNMP protocol**.**

V. Wide area networks (high speed) (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 anetwork (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%.
- TestTP: 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

Prerequisites	• Algorithms • Mathematical logic • Theory of programming languages and applications • Graph theory

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

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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 - Compilation(COMP)

Knowledge Area: Software Engineering

UEF code	Title of the module	Coefficient
ETU	Compilation	4

Hourly volumes		
Lectures	TD / TP	TOTAL
30	30	60

Semester :	3

Prerequisites	• Theory of programming languages and applications • Programming in one of the two paradigms (Imperative Programming, Object Oriented Programming) • Operating system (assembler, processor registers, etc.)

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
- Programming a compiler from a language to a target machine

CONTENT OF THE MODULE :

II. Reminder Lexical and syntactic analysis (3H)

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

III. Syntactic analysis methods (9H)

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

IV. Semantic analysis and syntax-driven translation (6H)

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)

V. Execution environment (6H)

1. Procedures and activations
2. Organisation of the memory space
3. Access to non-local names
4. Passing parameters
5. *Generation of executable code (6h)*

6. Register machine
7. Flow control (flow graph and DAG)
8. Virtual machine

PERSONAL WORK

- **Face-to-face work**
  - – Presentation of parser generation tools (YACC, JCC, the .NET class, bison...etc)
  - – Top-down syntactic analysis using the tools
  - – Ascending parsing using the tools
  - – Semantic analysis using the tools
  - – Code generation for various machines (Native code and byte code for VM)
- **Project :**
  - – Individual development o f a compiler: the project will be carried out and evaluated in stages during the semester
  - – 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

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- A. Aho, M. Lam, J.D. Ullman, R. Sethi, "Compilers: Principles, Techniques and Tools", 2nd edition, Pearson Education France, 2007, ISBN 978-2-7440-7037-2.
- A. Aho, J. Ullman, R. Sethi. "Compilers: Principles, techniques and tools", Ed. DUNOD, 2000.
- A. Aho, J. Ullman, "Principles of compiler design", Edition: Addison Wesley, 1977.
- R. Bornat, "Understanding and Writing Compilers, A do-it-yourself guide", First published Macmillan, 1979, Internet edition 2007.
- T. Copeland, "Generating Parsers with JavaCC" Ed. Centennial Books, Alexandria, VA, 2007. ISBN: 0-9762214-3-8.
- J.E.F. Friedl, "Mastering Regular Expressions", O'Reilly, 2006, ISBN: 1-56592-257-3.
- 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.
- S. C. Johnson, "Yacc: Yet Another Compiler-Compiler", Computing Science Technical Report No. 32, Bell Laboratories, Murray Hill, NJ 07974.
- J. Levine, T. Mason, D. Brown, "Lex & Yacc", Ed. O'Reilly, 1992. ISBN: 1 56592 000 7
- K.C. Louden, "Compiler Construction: Principles and Practice", Course Technology, 1997. ISBN: 0 534 93972 4.
- N. Silverio, "Réaliser un compilateur, les outils Lex et YACC", Ed. Eyrolles, 1994.

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

Prerequisites	• Operating systems (I and II) • Networks

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)

9. Centralized systems
10. Multiprocessor systems
11. Network systems
12. Large-scale systems
13. 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)

14. Socket-based model (TP)
15. Client-server model (TP)
16. CPR model (TP)
17. RMI model (TP)
18. Service-based model (ST)

III. Coordination in Distributed Systems (10h)

19. Notion of time
- Physical clock
- Logic clock

20. Scheduling of events.
21. Broadcasting
- Causal diffusion
- Atomic scattering
- FIFO broadcasting

22. Global state of a distributed system

23. Distributed Algorithms: Mutual Exclusion and Election Algorithms
- Centralized approach (reminder)
- Fully distributed approach
- Techniques based on the scheduling of events
- Techniques based on token circulation.
- Synchronisation and Termination Detection

24. Handling interlocking
- Static and dynamic prevention (schemes with and without requisition)
- Detection and Healing (Centralized and Fully Distributed Approaches)

IV. Distributed Data Management in Distributed Systems (12h)

25. Space sharing: Distributed virtual memory (consistency, safety, liveliness)
26. Object Management : Location, Fragmentation, Duplication (consistency)
27. Distributed file systems (NFS, AFS, CODA)

V. Implementation of Distributed Applications and Case Studies (3h in class and the rest to be treated in TD/TP):

28. Client-Server application
29. Amoeba
30. Corba
31. JAVA (RMI)

PERSONAL WORK

- Do at least two PTs from the list of PTs below:
  – 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

- 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.
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- 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**
Prerequisites	• Networks Networks I and Networks II • System I and II • Introduction to cryptography

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 o f attacks in a computer network and the countermeasures.
- To show the importance ofauthentication andthe use of cryptographic mechanisms to ensure it.
- 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. Securityof systemsandnetworks (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, phising)

   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, spooofing, 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 of 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). TP (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 Detection Systems (IDS)
7. HoneyPot and HoneyNet TP (6 h) :
   - Implementation of an access control 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 implementation) will be left to the student's initiative.

KNOWLEDGE TEST

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

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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

Prerequisites	• Data structure, THP, ROP1

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 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

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- M. Bazara, C.M., Shetty, "Non Linear Programming, (Theory and Algorithms)", Wiley, 1979.
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ETU - Ethics and Professional Conduct (ECP)

Knowledge area: Business knowledge and general training

EU Code	Title of the module	Coefficient
ETU	Ethics and Professional Conduct (ECP)	2

Hourly volumes		
Lectures	TD / TP	TOTAL
30	0	30

Semester :	3 or 4

Prerequisites	

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

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