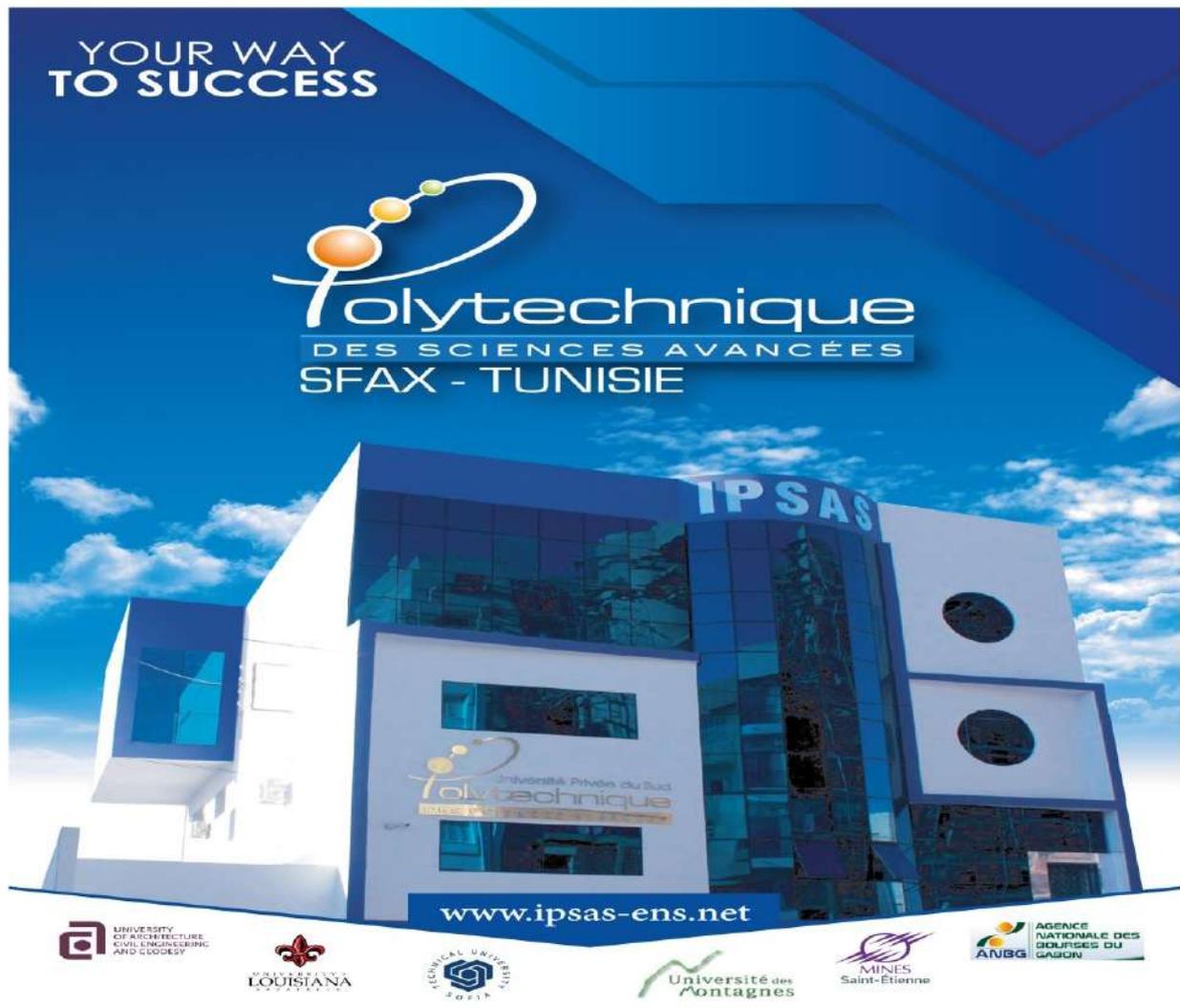


COMPUTER ENGINEERING STUDENT GUIDE



YOUR WAY
TO SUCCESS


Polytechnique
DES SCIENCES AVANCÉES
SFAX - TUNISIE

IP SAS

www.ipsas-ens.net

UNIVERSITY OF ARCHITECTURE, CIVIL ENGINEERING AND GEODESY

UNIVERSITY OF LOUISIANA

TECHNICAL UNIVERSITY OF SOFIA

Université des Montagnes

MINES Saint-Etienne

AGENCE NATIONALE DES BOURSES DU GABON (ANBG)

COMPUTER ENGINEERING STUDENT GUIDE

1. Warm-up speech by the direction	1
2. General hierarchy presentation	1
3. Vision of IPSAS	1
4. Missions.....	2.
5. Objectives	2.
6. Program conception	3
7.Comprehensive presentation of the specialty	4
8.Access conditions	7
9. Skills profile	9
9.1. Competence matrix - objectives - learning outcomes.....	9
9.2. Program plan.....	11
9.3. The module sheets.....	21
10. Regulations	134
11. The student`s chart	152

1. Welcome from the General Management

Twenty-seven (27) years or a little more is not a long time in the life of an institution, but it is enough to be able to stand out from the crowd. In its vision of the training of executives of a continent (Africa) in the making, IPSAS has always proposed to achieve a double objective:

- > To train an engineer to the page of new technologies;
- > To give them the ability to react and adapt to situations where often the minimum of technology is assured.

By choosing IPSAS, you are choosing to learn to think, react and manage situations.

Thanks to a teaching staff totally involved in this process of acquiring a method in addition to knowledge, IPSAS can already be proud of its graduates who are making careers in Tunisia and throughout Africa and the world.

By becoming an IPSAS student, you make a choice, the best one, and you guarantee yourself the possibility to choose your future profession. As you progress through our site, you will hopefully feel part of the IPSAS world, the world of a future that can be achieved.

2. General presentation of the hierarchy

Chairman and Managing Director: Mr Najib KAMOUN

Director: Mr Mohamed Achraf KAMOUN

Secretary General: Mr Mohamed ZGHAL

Director of Studies: Mr George KANTCHEV

Financial Director: Mr Farid KAMOUN

Communication Managers: Mrs Wabo Ulrich Kengne/ Ayman KAMOUN

Quality Manager: Mr Karim JELLALI

Laboratory Manager: Anis KAMOUN

3. IPSAS vision

The vision of the programme is an essential component of the IPSAS strategy and must necessarily reflect the main vocation of our organisation. A strategy clearly described in the IPSAS quality policy based on a fundamental principle that makes the satisfaction of stakeholders (such as students, teachers...) a priority of the organisation. Learner satisfaction should not only be understood as satisfaction during the student's academic career. The vision is broader than this concept because it is closely linked to the creation of programmes that

respect the global evolution in the industrial and technological context and especially the demand imposed by the labour market. This will provide the learner with the opportunity to be an active component in the labour market upon graduation. This makes IPSAS a dynamic player in its societal contribution through the creation of value in the university training sector. A training that is not only based on theoretical training but also on a dynamic vision allowing the training of engineers with a combination of theoretical knowledge and practical know-how allowing the engineer to exercise and impose himself by his achievements as being competent on the labour market. This vision can only be successful if a set of practical elements is implemented with a clear mission.

4. Missions

The missions reflecting the implementation of the strategic vision of IPSAS for all its programmes can be summarised in five main points

- 1) Organise innovative education based on innovative research results to produce graduates who are competent, respectful, entrepreneurial and competitive on a national and international scale;
- 2) To provide the necessary resources for the implementation of this curriculum;
- 3) Develop a quality assurance system for education based on good governance.
- 4) Organise a monitoring and evaluation service for the civil engineering programme to continuously improve its content.
- 5) Develop a network of cooperation with stakeholders related to the application of innovation in learning through the creation of a network of experts to participate in the updating of the programme.

The programme offers students the opportunity to acquire the required competences in the taught field of expertise are expected and needed. The learning outcomes are also determined according to the objectives.

5. The aims

IPSAS aims to :

- 1) Train and certify graduates who are competent in their specific engineering field, entrepreneurial and globally competitive. Engineers who :
 - a.- have widely recognised "business" skills in their specific technological field;

b.- are open-minded, adaptable and highly reactive due to a strong mix of cultures (wide range of recruitment both in terms of profile and social background);

c.- apt to disseminate in the industrial fabric a culture of complex problem solving acquired through the diversity of practical cases studied throughout their course.

2) To deliver training courses:

✓ Able to respond to the national and international needs and problems that concern their sector of activity.

✓ Based on the results of research into recent technologies and the demands of the labour market.

✓ Where consultation with basic and applied industry stakeholders forms a basis for programme design and evaluation.

✓ Capable of responding to specific problems.

4) Strengthen the system of governance, quality assurance and awareness of the programmes.

5) Expand collaborative networks with stakeholders related to their discipline of study.

6. Curriculum design

Learning is no longer focused solely on outcomes, but also on the educational objectives of the civil engineering curriculum. Objectives that focus on producing graduates who are capable of becoming reliable professionals, leaders and change agents in the organization where they regularly practice and contribute to development.

The updating of the programme is an essential element of continuous improvement that allows us to offer training that evolves together with the demands of the labour market, the evolution of technology and the societal expectations of IPSAS. To this end, it is essential to review the competency profile by experts and teachers in the field, periodically to improve the quality of the graduates' profile. This also includes the evaluation and updating of the programme with the participation of the Scientific Council, teaching staff, students and related institutional stakeholders. The procedure for the development of the competency profile related to the redesign of the curriculum is explained below:

1) Assess and redesign the curriculum

2) Implement the follow-up study of graduates in their start-up and career development with the participation of relevant institutional stakeholder

3) Construct the competence profile based on the outcome of the study and the improvement of the curriculum.

The participants in this process are the IPSAS Scientific Board, the students, the programme managers, the organisations with expertise in the field of civil engineering (building and construction companies, consultancies etc.) and the teaching staff. This vision of continuous improvement, based on the intervention of the stakeholders, is the approach that will be taken into account by the IPSAS management.

7. General presentation of the programme

The "Computer Engineering" engineering cycle is a curriculum conceived and designed by the Institut Polytechnique des Sciences Avancées (IPSAS) based in Sfax, Tunisia. This program has been authorized by the Tunisian Ministry of Higher Education since 2002.

Computer Engineering

Job reference system: what are the activities targeted for graduates at the end of the training?

In addition to the adequacy of training/need-local-industry/export-commodity, our training program follows the objectives of the state concretized by the national program of certification of ICT skills launched by the Ministry of Communication Technologies in November 2000 by the decree of creation n°2000-2827. Thus, the pedagogical content of several modules that may be the subject of subsequent certification of skills is set according to the training curriculum defined in the framework of the said national programme. Through the training programme in Computer Engineering, we try to set up a pedagogy adapted to professional purposes, capable of generating future engineers eligible to take the responsibility of projects working in the field of software development. Indeed, the said training programme aims to train engineers capable of designing and building innovative software solutions that meet the needs of industry. At the end of their training, the engineers have transversal skills that are essential for project management, business/technical and methodological skills in software engineering such as IT project management, development processes and methodology (Agile, SCRUM, etc.), web and mobile development, engineering of software architecture components and models, human/machine interaction, analysis and processing of data (Big Data).

Regarding the professions that our training targets and that are aligned with the Tunisian reference system of professions and skills developed by the stakeholders of the ICT sector (MES, Dget, Infotica, etc.), we cite the following

- Database administrator,

- system administrator,

- data analyst,
- designer,
- developer,
- tester,
- computer security specialist

8. Conditions of access

Admission to IPSAS is in accordance with the provisions of Law No. 2000-73 of 25 July 2000 regulating private higher education.

25 July 2000 regulating private higher education. Two types of admission are possible:

- Direct admission: This concerns students who have a Tunisian or foreign baccalaureate.
- Access after decision of admission: It concerns the candidates of Tunisian or foreign nationality, who wish to register in an engineering cycle.
- Tunisian students who have completed a public or private preparatory cycle may apply for enrolment in the engineering cycle.
- The Tunisian student holder of a technological licence having links with the chosen engineering course of study, can apply for a registration in the engineering cycle.
- Foreign students who hold a preparatory cycle, a DUT, Licence, BTS or equivalent obtained in their country of origin can apply for registration in the engineering cycle.

When to fill in an application form?

You must fill in an application form:

When you wish to enrol in a study programme;

- If you have already applied for admission but have not yet registered;
- If you have suspended your enrolment at IPSAS for more than one year and wish to be re-admitted to the same programme;

Admission procedure:

- To be admitted to one of the IPSAS study programmes, you must: Complete an application form to be collected from our premises or online.

- Send the completed application and the required supporting documents to the admissions office in our offices or by email to :

Each form allows you to apply for admission to two programmes according to your first and second choice.

Admission file and required documents:

- A completed application form
- A birth certificate in French
- A complete school file including :
 - For applicants still in high school or in a secondary school at the time of application: transcripts of marks obtained at that date for the current year and the previous year.
 - For applicants who are still in secondary school at the time of application: transcripts of marks obtained at that time for the current and previous years, admission being subject to obtaining the baccalaureate.
 - For all other persons: transcripts of marks obtained during the three previous years as well as those of the current year, if applicable.
 - The diplomas obtained, certified as true copies of the original.
 - Where applicable, the certificate of registration issued by the last university attended.
 - Any additional information deemed useful or necessary.
 - All documents submitted, except the original diplomas, remain the property of IPSAS.

Final admission:

Registration is considered final only after acceptance of the student's file by the university and payment of the tuition fees and other required fees.

NB: Tuition fees are due for the whole year and are payable at the time of registration, unless otherwise agreed by the General Management. Any amount paid remains the property of IPSAS. No refunds or reductions will be made for

cancellation of registration, late entry, absence, illness, voluntary departure or exclusion, etc.

As soon as IPSAS confirms the final admission, the student must complete his/her admission file with the following documents

- 2 identity photos
- A photocopy of the national identity card for Tunisians
- Proof of payment of tuition fees as fixed by the payment procedure for foreign students (additional documents to be produced)

9. Skills profile

9.1. Competence matrix - objectives - learning outcomes

IPSAS: Objectives-Modules-Matrix

The IPSAS skills matrix for the Computer Engineering program and the matrix (SSC) filled in by the department for accreditation show the versatile nature of the training and the targeted skills profile.

The IPSAS skills matrix is established by level (1st year, 2nd year and 3rd year at each level, the skills acquired are divided into 3 categories:

- Technical skills
- Theoretical knowledge
- Soft skills

The proposed training provides the students with both technical and managerial skills. It guarantees them a level that qualifies them to master the fundamentals of the profession,

while acquiring the qualities of innovation and promoting their ability to adapt and integrate.

Indeed, the objective is to provide general and versatile training to prepare for the engineering profession.

This training must follow and highlight the growing progress of both the digital world and computer science domain, that the computer engineer must face with speed and efficiency. In fact, during his training, he must acquire the capacity for lifelong learning, and must be up to date with all the innovations of the domain.

The graduated engineer must imperatively acquire and learn basic engineering sciences so that he would be absolutely able to identify, analyze and synthesize the variables of a given problem that should be solved. Indeed, he must demonstrate his abilities while using his technical and methodological skills, in order to choose the right solution, and apply it while taking into account the managerial and economic consequences of the real world. These skills were acquired gradually throughout the course.

In conclusion, the computer engineers will acquire the following skills:

- Ability to synthesize and analyze in detail and intelligently the problems to be solved.
- Administration of systems and networks.
- Conception of computer systems.
- Ability to anticipate changes in the IT field.
- Ability to succeed in complex projects while taking into account both new projects complexity and client needs.
- Entrepreneurial and leadership skills and the ability to integrate into an organization, to animate it and to develop it.
- Competence in IT development.
- Ability to work in an international context:
 master of one or more foreign languages and cultural openness.

**Table 7: IPSAS- Objectives – Learning outcomes- Modules-Matrix
 for the first year degree**

Polytechnic Institute of Advanced Sciences of Sfax

TABLES

"Curriculum"

Specialty: COMPUTER ENGINEERING

Version: September 2021

ENGLISH VERSION

First Year

Semester I

Computer Engineering

Course Id	Code	Teaching Unit	L	PW	L+PW	Self pr.	T	COEF	ECTS	E	Contents

■ **Compulsory courses**

	GM1.1	Fundamental & Applied Mathematics 1	60	0	60	80	140	3	5	CC+E	Mathematics for engineer Numerical analysis
	GM1.2	System Architecture 1	63	27	90	90	180	5	8	CC+E	Logic systems and circuits Computer architecture Foundations of operating systems
	GM1.3	Algorithms & Programming Fundamentals 1	54	27	81	80	161	4	6	CC+E	Object Oriented Programming with C++ Algorithms & Data Structures
	GM1.4	Web & Multimedia & Networks 1	57	45	102	110	212	6	9	CC+E	Introduction to computer networks (CCNA1) Multimedia Systems Web Computing
	GM1.5	Communication & Engineering Culture 1	42	0	42	40	82	2	2	CC+E	English TOEIC I introduction to the management of business information systems

Total: 276 99 375 400 775 20 30

First Year
Semester II
Computer Engineering

Course Id	Code	Teaching Unit								E	Content
Course Id	Code		L	PW	L+PW	Self pr.	T		ECTS	E	Subject

■ Compulsory courses

	GM2.1	Fundamental & Applied Mathematics 2	42	12	54	50	104	2.5	4	CC+E	Probability Operational research and optimization
	GM2.2	System Architecture 2	63	48	111	105	216	6	8	CC+E	Linux enviroment (LPI 101) System programming Databases
	GM2.3	Algorithms & Programming Fundamentals 2	60	36	96	130	226	5.5	9	CC+E	Competitive programming Language theory and compilation Object Oriented Programming with JAVA
	GM2.4	Web & Multimedia & Networks 2	39	21	60	50	110	4	5	CC+E	Serious games Network administration (CCNA2)
	GM2.5	Communication & Engineering Culture 2	42	0	42	20	62	2	2	CC+E	English TOEIC II Communication techniques I
Total:			246	117	363	355	718	20	28		

■ Stage Ouvrier

											Practical work or additional courses
1.2.13	MGINF12.25	Stage ouvrier	-	60	60	-	60	-	2	-	Worker internship
Total Semestre :			246	177	423	355	778	20	30	-	
Total (Année/Year):			522	276	798	755	1553	40	60	-	

Second Year

Semester I

Computer Engineering

Idnt	CTSE	Intitulé	CI	TP	CI+TP	T.per	T	COEF		E	
Course Id	Code		L	PW	L+PW	Self pr.	T		ECTS	E	Contents

■ Compulsory courses

	GM3.1	Applied Mathematics	75	9	84	90	174	4	7	CC+E	Advanced operational reserach Statistics tools for engineer Numerical Reciepes with Python
	GM3.2	Advanced Information Systems	72	30	102	130	232	6	9	CC+E	Distributed Systems Databases management system LINUX system administration (LPI-102)
	GM3.3	Software Engineering & Development	60	24	84	80	164	4	6	CC+E	Distributed Component Development: WEB (JSP, Servlet, JSTL) Fundamentals of Software Engineering
	GM3.4	Web & Mobile Computing	36	27	63	90	153	4	6	CC+E	Servers Administration and Programming Mobile Computing
	GM3.5	Communication & Engineering Culture 3	42	0	42	20	62	2	2	CC+E	Accounting for engineer Soft skills and communication techniques

Total: 285 90 375 411 786 20 30

Semester II

Computer Engineering

Idnt	CTSE	Intitulé	CI	TP	CI+TP	T.per	T	COEF		E	
Course Id	Code		L	PW	L+PW	Self pr.	T		ECTS	E	Subject

■ **Compulsory courses**

	GM4.1	Business Intelligence	69	42	111	120	231	6	9	CC+E	ERP Development and Intégration ODOO
											Datawarehouse
											Artificial Intelligence & Data Mining
	GM4.2	Advanced Web Computing	63	36	99	110	209	6	8	CC+E	Web services and platforms
											Server virtualization
											Front-End Web Framework
	GM4.3	Advanced Software Development	84	42	126	120	246	6	9	CC+E	JEE Architecture
											Dot Net Architecture
											Software architecture and design pattern
	GM4.4	Communication & Engineering Culture 4	42	0	42	15	57	2	2	CC+E	English TOEIC III
											Computer law and intellectual property
Total:			258	120	378	371	749	20	28		PFA

■ **Optional Courses (Choose 1)**

EUROPEAN CREDIT TRANSFER SYSTEM (ECTS) INFORMATION PACKAGE

	GM4.5	Optional Courses	21	0	21	9	30	1	1	CC+E	Advanced topics in Software Engineering
			21	0	21	9	30	1	1	CC+E	Advanced topics in Artificial Intelligence
			21	0	21	9	30	1	1	CC+E	Advanced topics in Cloud Computing
			21	0	21	9	30	1	1	CC+E	Advanced topics in Information Systems

Total: 258 120 378 371 749 20 28

■ **Stage ingénieur**

Practical work or additional courses

2.2.13	MGINF22.49	Stage technician	-	60	60	-	60	-	2		Technician internship
		Total Semestre/ Semester) :	258	180	438	371	809	20	30		
		Total (Année/Year):	543	270	813	782	1595	40	60		

Third year

Semester I

Computer Engineering

Idnt	CTSE	Intitulé	CI	TP	CI+TP	T.per	T	COEF		E	
Course Id	Code		L	PW	L+PW	Self pr.	T		ECTS	E	Content

■ Compulsory courses

	GM5.1	Data Science & Engineering	42	18	60	100	160	4	6	CC+E	Business Intelligence Data Science
	GM5.2	Advanced Software Engineering	102	54	156	170	326	8	12	CC+E	Software quality and performance engineering Software engineering and agile development DotNet advanced development Development of distributed business components
	GM5.3	Industry 4.0	48	60	108	100	208	6	8	CC+E	Distributed application integration and tutored projects Big Data Internet of things (IOT)
	GM5.4	Entreprise & Project Management	42	9	51	50	101	2	4	CC+E	Business plan Project Management
Total:			234	141	375	420	795	20	30		

■ Optional Courses (Choose 1)

	GM4.5	Optional Courses	21	0	21	9	30	1	1	CC+E	Advanced topics in Software Maintenance
21			0	21	9	30	1	1	CC+E	Advanced topics in Deep Learning	
21			0	21	9	30	1	1	CC+E	Advanced topics in Edge Computing	
21			0	21	9	30	1	1	CC+E	Advanced topics in NoSQL Databases	
Total:			258	120	378	371	749	20	28		

Third year

Semester II

Computer Engineering

Idnt	CTSE	Intitulé	CI	TP	CI+ TP	T.per	T	COEF		E	
Course Id	Code		L	PW	L+PW	Self pr.	T		ECTS	E	Subject

■ **Compulsory courses**

3.2	MGINF32.61	Stage de fin d'études	0	450	450	450	900	0	30	R	
		Total Semestre/ Semester) :	0	450	450	450	900	0	30		
		Total (Année/Year):	234	591	825	852	1677	22	60		

Director's approval	Date :
	Seal & Signature :

	MODULE DESCRIPTION Fundamental & Applied Mathematics Code : GM1.1	Departement : Computer Engineering
		Date : 15/10/2021
		Version : 02
		Semester : 1

Specialty Module	Main Module	Engineering Sciences and Techniques	Preparation for the profession practices
		X	

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Courses	Practical works	Individual work	Total volume
60hrs	00hrs	80hrs	140hrs

Coefficient :	ECTS Credits:
3	5

1. MODULE DESCRIPTION AND COMPETENCES TO BE ACHIEVED

1.1 Description

This course is designed in order to give the future computer scientist some useful mathematical tools. First, some analytical tools/methods are presented. It is a matter of acquiring some basic mathematical tools about vector spaces, matrix algebra and Fourier transformation. Secondly, some numerical tools/methods are presented. It is a matter of acquiring some basic tools about error analysis and floating-point arithmetic, systems of algebraic equations and iterative methods of solving linear equations, and interpolation and approximation. Some applications related to information theory, communication systems, language theory, signal and image processing are highlighted and the choice between analytical or numerical resolution methods is discussed.

	MODULE DESCRIPTION Fundamental & Applied Mathematics Code : GM1.1	Departement : Computer Engineering
		Date : 15/10/2021
		Version : 02
		Semester : 1

In summary, it is a matter of teaching students analytical and numerical methods/tools so that they will be able to choose between an analytical or numerical perspective in order to cope with a given problem.

1.2 Objectives

Students will be able to:

- Master the techniques of matrix calculus and fourier series familiarity with the information, theory and/or subject knowledge
- Master the problem between the vector viewpoint and the matrix viewpoint and present the applications in information theory, language theory" cognitive and practical skills for which knowledge is used
- Solve systems of linear equations
- Determine the eigenvalues of a square matrix, diagonalize and even trigonalize different matrices in other words reduce endomorphisms
- Acquire skills related to the main elementary numerical methods
- Master error analysis, systems of algebraic equations, iterative methods for linear systems and interpolation.

2. MODULES AND DEPENDENCIES

<u>Upstream Modules</u>	<u>Taught Module</u>	<u>Downstream Modules</u>
	GM1.1 : Applied mathematics I	GM2.1 :Applied mathematics II

	MODULE DESCRIPTION Fundamental & Applied Mathematics Code : GM1.1	Departement : Computer Engineering
		Date : 15/10/2021
		Version : 02
		Semester : 1

3. MODULE PLAN

Chapters	Title	Learning outcomes
Chapter 1	Finite-dimensional vector spaces	Students will be able to know : -Generalities on vector spaces. -Free families, generating families, bases -The dimension of a vector space -The rank of a linear application
Chapter 2	Matrix calculation	Students will be able to : -calculate Sum product of two matrices. -find the Inverse of a matrix. -Solve systems of linear equations -calculate determinants
Chapter 3	Reduction of the endomorphisms	Students will be able to -Determination of the characteristic polynomial -Search for eigenvalues and eigenvectors -Diagonalization of matrices -Trigonalization of matrices

	MODULE DESCRIPTION Fundamental & Applied Mathematics Code : GM1.1	Departement : Computer Engineering
		Date : 15/10/2021
		Version : 02
		Semester : 1

Chapters	Title	Learning outcomes
Chapter 4	Fourier series	Students will be able to know -Trigonometric series : - Complex representation and calculation of coefficients -Fourier series : - Dirichlet's theorem - Jordan's theorem - Non-periodic case - Parseval's equality - Links between z-transforms, Fourier transforms and Laplace transforms - Representation by poles and zeros - Parseval relation
Chapter 5	Error analysis	-Students must assimilate : -Modelling errors. -Representation errors. -Floating arithmetic. -Truncation errors.
Chapter 6	Systems of algebraic equations	Students will be able to know : -Linear systems. -Gaussian elimination and complexity. -Decomposition and LU and applications. -Symmetric matrices and Cholesky decomposition. -Ill-conditioned systems. -Overdetermined systems
Chapter 7	Iterative methods for linear systems	Students will be able to know: - Generalities about Iterative methods for linear systems -Jacobi and Gauss-Seidel methods. -Relaxation method and SSOR. -Gradient and conjugate gradient methods.

	MODULE DESCRIPTION Fundamental & Applied Mathematics Code : GM1.1	Departement : Computer Engineering
		Date : 15/10/2021
		Version : 02
		Semester : 1

Chapters	Title	Learning outcomes
Chapter 8	Interpolation	Students will be able to know: -Vandermonde matrix. -Lagrange interpolation. -Newton's polynomial. -Interpolation error. -Cubic splines.

4. ASSESSMENT

Designation	Chapters (s)	Weightening
Mini-project		
Practical work		
Test	Chapter 3, chapter 7	25%
Presentation	-	-
Exam	All chapters	75%

5. BIBLIOGRAPHIC REFERENCES

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- Leroyer L., Tesson P., *“Mathématiques pour l’ingénieur, exercices et problèmes”*, Edition DUNOD, 2009.
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- A. Fortin, *Analyse numérique pour les ingénieurs*. 4^{ème} édition, Presses Internationales Polytechnique.
- J. Stoer, R. Bulirsch, *Introduction to Numerical Analysis*. Text in Applied Mathematics, Springer.

	MODULE DESCRIPTION System Architecture I Code : GM1.2	Departement : Computer Engineering
		Date : 15/10/2021
		Version : 02
		Semester : 1

Specialty Module	Main Module	Engineering Sciences and Techniques	Preparation for the profession practices
	X		

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Courses	Practical works	Individual work	Total volume
63hrs	27hrs	90hrs	180hrs

Coefficient :	ECTS Credits :
5	8

1. DESCRIPTION DU GROUPE MODULE ET COMPETENCES VISEES

1.1 Description

This course is designed in order to give students some theoretical and practical concepts in order to allow them to match relevant execution resources and operating system to application requirements.

Starting from a characterization of the application(s) in terms of execution flow (control-oriented or processing-oriented) and data flow, the relevance of the application/hardware-architecture/operating-system matching is emphasized. First, the execution elements (processor, controller, co-processor), memories, and communication buses are studied in order to be able to determine the good architectural composition which is in adequacy with the application(s). Second,

	MODULE DESCRIPTION System Architecture I Code : GM1.2	Departement : Computer Engineering
		Date : 15/10/2021
		Version : 02
		Semester : 1

some theoretical and technical fundamentals on which the operating systems are based are explained and the code of the Linux kernel (specifically Linux 0.01 kernel source code) is visited. Accordingly, the student will be able, de facto, to understand the choice of an operating system (using an existing system, designing a clean operating system from scratch or, if necessary, using a Linux-based existing distribution while adapting the kernel) which best satisfies the adequacy.

In summary, it is about teaching students that an optimized and reliable computer system relies on a good matching between the application requirements, the operating system, and the execution platform; choose the right operating system and the right execution platform for the application(s) in order to avoid over and under-dimensioning.

1.2 Objectives

The student will be able to:

- Assimilate the basic characteristics of operating systems using the Linux kernel as a study aid,
- Know the different types of operating system kernel architectures such as kernel mirror architecture, monolithic architecture, monolithic architecture with module loading and hybrid architecture (Windows),
- Know the configurations of the usual execution architectures, i.e. the computing elements, the connection buses, the memories,
- Mastering the representation of data, their encoding/decoding, their exchange, etc,
- Design, evaluate in terms of storage capacity, the flow of information exchanged and optimise hardware architectures.

2. MODULES AND DEPENDENCIES

<u>Upstream Modules</u>	<u>Taught Module</u>	<u>Downstream Modules</u>
GM1.3 :Algorithms & Programming Fundamentals I	GM1.2 : Systems Architecture I	GM2.2 : Systems Architecture II

	MODULE DESCRIPTION System Architecture I Code : GM1.2	Departement : Computer Engineering
		Date : 15/10/2021
		Version : 02
		Semester : 1

3. MODULE PLAN

Chapter	Title	Learning outcomes
Chapter 1	Numbering systems and information coding	Students will be able to know: <ul style="list-style-type: none"> -The principle of each binary coding of decimal numbers is shown. -The properties of each binary code are specified. -how to treat in detail the methods of conversion between numbering systems; -how to deal with arithmetic operations on numbers in different bases and their corrections -how to study the information correction code: Hamming code
Chapter 2	Fonctions Logiques	Students will be able to: <ul style="list-style-type: none"> - Give the summary table of logical operators and use indifferent states -Know the approach of solving a combinatorial logic problem (specifications, truth table, simplification, logigram, etc.) -Study some combinatorial logic systems: encoder, decoder, transcoder, incremental logic sensor, display...
Chapter 3	General information on architectures	Students will be able to differentiate between the different architectures: Von Neuman, Havard, I/O .
Chapter 4	General information on architectures	Students will be able to differentiate between the different architectures: Von Neuman, Havard, I/O
Chapter 5	Representation and processing of information	Students know the: <ul style="list-style-type: none"> -Representation of integers -Character representation -Floating point representation -Arithmetic of integer operations -Arithmetic of floating-point operations
Chapter 6	Architecture and programming of a processor	Students know the: <ul style="list-style-type: none"> -Programme cycle -Compilation/ interpretation -Internal processor structure -ALU -Registers -Sequencer -RISC/CISC

	MODULE DESCRIPTION System Architecture I Code : GM1.2	Departement : Computer Engineering
		Date : 15/10/2021
		Version : 02
		Semester : 1

Chapter	Title	Learning outcomes
		<ul style="list-style-type: none"> -Instruction cycle -Parallel architecture
Chapter 7	Assembler programming	Students will know the : <ul style="list-style-type: none"> -Processor model -Data transfer instructions -Arithmetic and logic instructions -Shift and rotation instructions -Sequence break instructions -Instruction format -Assembly program
Chapter 8	Operating systems basics	The student will be able to assimilate the basic characteristics of operating systems such as the exploitation of material resources for the benefit of programs, the kernel, the interaction layer with user applications, processes, time sharing, memory rings, file systems, etc.
Chapter 9	Operating systems architecture	The student will be able to distinguish between different types of operating system kernel architectures such as micro-kernel architecture (UNIX, Minix, FreeBSD, etc.) and monolithic architecture with modules loading (Linux) and hybrid architecture (Windows).
Chapter 10	The processes: presentation, hierarchy, interruption	The student will be able to assimilate the concept of process through the analysis of the struct task_struct data structure defined in the source code of Linux 0.01.
Chapter 11	States of a process, Change of context	The state will include the dynamic aspect of the processes governed by the state / transition diagram. Students will be able to assimilate the notion of context of a process and the transition functions allowing the passage of a process from one state to another such as the <code>schedule()</code> function described in the source code of the Linux kernel 0.01 allowing scheduling of processes. At the same time, he will discover The <code>switch_to()</code> function which allows the context change.
Chapter 12	Process scheduling	The student will be able to assimilate the dimensions of a scheduling problem as well as the usual scheduling algorithms. The <code>schedule()</code> function is used this time to focus on the table management of the <code>task [NR_TASKS]</code> processes. The Round Robin algorithm will be detailed through the code of the <code>schedule()</code> function.
Chapter 13	Interlocking	The student will be able to identify an inter-process blocking situation by verifying the four deadlock conditions, namely mutual exclusion, non-shareable resources, holding and waiting and circular

	MODULE DESCRIPTION System Architecture I Code : GM1.2	Departement : Computer Engineering
		Date : 15/10/2021
		Version : 02
		Semester : 1

Chapter	Title	Learning outcomes
		waiting. . In addition, they will know that solving deadlock problems is never the responsibility of operating systems.
Chapter 15	Memory management	By the end of this chapter the student will learn that memory management is done partly by the processor (addressing memory) and partly by the operating system (allocation and virtualization). Virtual memory is presented and the concept of pagination is detailed through the functions implemented in the source code of Linux 0.01 namely <code>copy_page_tables ()</code> , <code>put_page ()</code> , <code>un_wp_page ()</code> , <code>do_wp_page ()</code> , <code>do_no_page ()</code> , <code>calc_mem ()</code> .
Chapter 16	Operating systems basics	The student will be able to differentiate between FAT, NTFS, BSDFs, Ext1Fs, Ext2Fs and Ext3Fs file systems. Particular attention is given to the Ext1Fs filesystem and a tour of the Linux 0.01 source code related to the management of index tables and blocks is taken.

4. ASSESSMENT

Designation	Chapters (s)	Weightening
Mini-project		
Practical work		
Test	Chapter 3, Chapter 12, Chapter14	25%
Presentation	-	-
Exam	All chapters	75%

5. BIBLIOGRAPHIC REFERENCES

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- Ben Amara M.et Gâaloul K., "*Systèmes Logiques (1) Logique combinatoire*", Institut Supérieur des Etudes Technologiques de Nabeul-Tunisie, 2016.
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- Maurice B., "*La conception du système Unix*", Masson
- Daniel P., Marco C., "*Understanding the linux kernel*", O'Reilly, 1st edition
- Michael G., Michel V., "*Architecture des systèmes d'exploitation*", Hermes



MODULE DESCRIPTION
System Architecture I
Code : **GM1.2**

Departement : Computer Engineering

Date : 15/10/2021

Version : 02

Semester : 1

	MODULE DESCRIPTION Algorithms & Programming Fundamentals I Code : GM1.3	Departement : Computer Engineering
		Date : 15/10/2021
		Version : 02
		Semester : 1

Specialty Module	Main Module	Engineering Sciences and Techniques	Preparation for the profession practices
	X		

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Courses	Practical works	Individual work	Total volume
54hrs	27hrs	80hrs	161hrs

Coefficient :	ECTS Credits :
4	6

1. MODULE DESCRIPTION AND COMPETENCES TO BE ACHIEVED

1.1 Description

This course is designed in order to give students fundamentals of algorithm design and programming's good practices. It is about using all the rules and techniques that are involved in the definition and design of algorithms in order to provide solutions to a given problem. The first step is to introduce in a pragmatic and rigorous manner the algorithms and data structures fundamentals. Usual algorithms on arrays, strings, structures, files, stacks, queues, linked-lists, trees, and graphs are detailed from their basic principle to their programming in C language. It should be noted that fundamentals of algorithms spread over the second semester to take place also in course "Algorithm & programming fundamentals II".

The second step consists of teaching students good programming practices in structuring code when developing a desktop application. The students get into the habit of proceeding by a simple hierarchical organization of their code; they learn to break their code down into small subprograms

	MODULE DESCRIPTION Algorithms & Programming Fundamentals I Code : GM1.3	Departement : Computer Engineering
		Date : 15/10/2021
		Version : 02
		Semester : 1

in order to be easily understood and maintained. The programming languages C and C++ are chosen for their ability to better instill in the student's mind good practices related to structured programming.

In summary, the first step is devoted to improving students' ability to solve algorithmic problems while listing the most important data structures. It is subsequently a matter of fine-tuning this ability by teaching students some techniques for code structuring in order to have an easily understandable and maintainable program by taking advantage of the possibilities offered by the C and C++ languages.

1.2 Objectifs

The student will be able to :

- Acquire the prerequisite knowledge of algorithms.
- Write simple algorithms: simple actions and alternative structures.
- Write algorithms with iterative processing (loops).
- Master the Array, Matrix and String types.
- Apply the concepts Function and Procedure to write algorithms.
- Understand and execute three sorting algorithms.
- Know basic programming concepts such as type forcing, dynamic allocation, compound types, I/O, modularity.
- Know how to manipulate and test the notions seen in the course.
- The students are able to create a modular C project, optimize it by following the good practices in force.
- Understand the interest of saving data in complex data structures.
- Use the means provided (assertions) by the C language to reduce the gap between specification and implementation.
- Define libraries specific to data structures.
- Understand the structure of a library (interface and implementation).
- Test libraries defined by students during the practical sessions

2. MODULE AND DEPENDENCIES

<u>Upstream Modules</u>	<u>Taught Module</u>	<u>Downstream Modules</u>
	GM1.3 : Algorithms & Programming Fundamentals I	GM2.3 : Algorithms & Programming Fundamentals II

	MODULE DESCRIPTION Algorithms & Programming Fundamentals I Code : GM1.3	Departement : Computer Engineering
		Date : 15/10/2021
		Version : 02
		Semester : 1

3. MODULE PLAN

Chapters	Title	Learning outcomes
Chapitre 1	Introduction to algorithms and data structures	The student will be able to define an algorithm correctly
Chapter 2	Structure of an algorithm and elementary actions	The student will be able to : <ul style="list-style-type: none"> - Distinguish between data types - Use basic instructions in an algorithm
Chapter 3	Conditional structures	The student will be able to differentiate between different conditional structures
Chapter 4	Iterative structures	The student will be able to differentiate between different iterative structures
Chapter 5	character strings	The student will be able to define strings of characters
Chapter 6	Functions and procedures	The student will be able to split a program into functions and procedures
Chapter 7	Tables	The student will be able to define and use tables
Chapter 8	Background and general concepts	The student will be able to know how to create a project and have the ability to input and display on screen
Chapter 9	Conditional connections and Loops	The student will be able to <ul style="list-style-type: none"> -understand the purpose of Conditional Connections and -loops and know the principle of each one.
Chapter 10	The tables a. The Tables b. Two-dimensional tables c. Strings	The student will be able to create and manipulate all types of tables
Chapter 11	The functions a. Declaring a function b. Calling a function c. Visibility rules for	The student will be able to : <ul style="list-style-type: none"> - declare a function and use it. - Know the rules of visibility of variables - Pass parameters by value

	MODULE DESCRIPTION Algorithms & Programming Fundamentals I Code : GM1.3	Departement : Computer Engineering
		Date : 15/10/2021
		Version : 02
		Semester : 1

Chapters	Title	Learning outcomes
	variables d. Passing parameters by value e. Function returning a value to the program f. Passing parameters by value and by address g. Passing arrays to functions	- Be able to implement a function that returns a value to the program - Pass parameters by value and by address - Pass tables to functions
Chapter 12	Pointers a. The importance of pointers b. Addressing modes c. Definition of a pointer d. Pointers and operators e. Pointers and arrays f. Pointers and strings g. Pointers and two-dimensional tables h. Table of pointers	The student will be able to know the different ways of using pointers and tables.
Chapter 13	The allocation a. Static allocation b. Dynamic allocation	The student will be able to : - Differentiate between static and dynamic allocation. - create a static or dynamic memory allocator
Chapter 14	The structures a. Areas of use b. Declaration and terminology c. Structure type manipulation d. Table of structures	The student will be able to create a structure and be able to manipulate a table of structures
Chapter 15	The files	The student will be able to Know how to read and write from a file.

	MODULE DESCRIPTION Algorithms & Programming Fundamentals I Code : GM1.3	Departement : Computer Engineering
		Date : 15/10/2021
		Version : 02
		Semester : 1

Chapters	Title	Learning outcomes
Practical work	PW1: Background and general concepts	Create a first project, allowing you to carry out the basic operations
	PW2 : Conditional connections and Loops	Enrich TP1 with the notions of conditional connections and loops
	PW3 : The tables	Be able to create, browse and perform basic operations on tables
	PW4: The functions	Be able to make previous projects modular or implement new modular projects.
	PW5 : Pointers	Master the different ways of using pointers and arrays
	PW6 : The allocation	Achieve a static or dynamic memory allocator by implementing the necessary functions.
	TP7 : The structures	Be able to create a structure and apply the notions seen in class in a modular project
	TP8 : The files	Be able to read and write from a file

4. ASSESSMENT

Designation	Chapters (s)	Weighting
Mini-project	Chapter 10 .. Chapter15	10%
Practical work		
Test	Chapter 4..Chapter 12	20%
Presentation	-	-
Exam	All chapters	70%

5. BIBLIOGRAPHIC REFERENCES

- Aho A.V , Hopcroft J.E , Ullman J.D, "*Data Structures and Algorithms*", Ed. Addison-Wesley
- Robert S., Kevin W., "*Algorithms, 4th Edition*", Addison-Wesley Professional
- Delannoy C., "*Programmer en langage C: cours et exercices corrigés*", Eyrolles, 2009
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	MODULE DESCRIPTION Web & Multimedia & Networks I Code : GM1.4	Departement : Computer Engineering
		Date : 15/10/2021
		Version : 02
		Semester : 1

Specialty Module	Main Module	Engineering Sciences and Techniques	Preparation for the profession practices
	X		

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Courses	Practical works	Individual work	Total volume
57hrs	45hrs	110 hrs	212hrs

Coefficient :	ECTS Credits :
6	9

1. DESCRIPTION OF THE MODULE AND COMPETENCES TO BE ACHIEVED

1.1 Description

This course is designed in order to introduce networks and web design fundamentals. The first step consists of teaching students the basic fundamentals of the OSI model. The OSI layers are briefly presented from the Physical layer to the Application one. The main protocols related to each layer are presented and explained, and special attention is given to communication between two terminals connected to the Internet. Secondly, multimedia objects' processing and user interfaces design are discussed in a Web context. User experience is also taken into consideration when designing interfaces. It is about instilling in the minds of the students the best practices of user-centered interface design.

	MODULE DESCRIPTION Web & Multimedia & Networks I Code : GM1.4	Departement : Computer Engineering
		Date : 15/10/2021
		Version : 02
		Semester : 1

Thirdly, designing a website in a Web 1.0 context takes place and the programming languages, development environments, and relative Web hosting environments are briefly presented. From learning the fundamentals of client-server communication to hosting the website on a remote hosting server, including learning HTML5 for designing web pages and styling them using CSS3, learning the JavaScript web scripting language for dynamic client-side content design, and learning to write AJAX code to send and receive data from a remote source, the student will be able to ensure good conduct of a website design project in a Web 1.0 context.

In summary, it is a matter of teaching students some usual network tools, programming languages, development and deployment/hosting environments, web design, and multimedia objects' processing so that they can create and deploy websites in a Web 1.0 context. It is still an introduction to allow students to begin developing web applications in a Web 2.0 context.

1.2 Objectives

The student will be able to:

- Introduce the basic concepts and technologies related to computer networks. The student will be able to understand the functioning of a computer network and the communication protocols. The main layers of the OSI model will be studied with the example of a network based on Ethernet and IP (IPv4 and IPv6 addressing).
- Acquire a general knowledge of network architecture in terms of hardware (Modem, Hub, Switch, Router, Wifi AP,...), interconnection (Wifi, Ethernet, ADSL, RTC,), topology (physical and logical) and support (optical fibre, copper,...).
- Know how information is conveyed between two network devices on the Internet.
- Set up a local network (IPv4 and IPv6) and quickly locate network failures (physical or logical).
- Acquire the theoretical foundations concerning the digital image, its types and analysis and its various treatments.
- Apply retouching and desired effects on raster images
- Draw vector illustrations.
- Acquire the theoretical concepts of HMI design.
- Design HMIs according to the rules of the trade.
- Create and design Web pages using HTML5
- Master the new features of HTML5
- Create and style HTML5 pages
- Add interactivity to an HTML5 page using JavaScript
- Create HTML5 forms using different input types and validate user input using HTML5 attributes and JavaScript code
- Send and receive data to and from a remote data source using XMLHttpRequest objects and jQuery Ajax operations

	MODULE DESCRIPTION Web & Multimedia & Networks I Code : GM1.4	Departement : Computer Engineering
		Date : 15/10/2021
		Version : 02
		Semester : 1

- Style HTML5 pages using CSS3
- Create well-structured and maintainable JavaScript code
- Use HTML5 application programming interfaces (APIs) in interactive web applications
- Create web applications that support offline operations

2. MODULES AND DEPENDENCIES

<u>Upstream Modules</u>	<u>Taught Module</u>	<u>Downstream Modules</u>
GM1.3 : Algorithmiques & Programming Fundamentals I	GM1.4 : Web & Multimedia & Networks I	GM2.4 : Web & Multimedia & Networks II GM3.3 : Software Engineering & Development

3. MODULE PLAN

Chapters	Title	Learning outcomes
Chapter 1	General information on LAN and WAN networks	Students will be able to know OSI and TCP/IP models.
Chapter 2	Hardware components of networks (physical layer of the OSI model)	Students will be able to: -Know the different signal transmission media and the collision domain. -Know the operating principle of repeaters (hubs)
Chapter 3	LAN and WAN Technologies (data link layer of the OSI model)	Students will be able to: - Know the Ethernet, WIFI, PPP frames, MAC address and broadcast domain. - Know the operating principle of switches

	MODULE DESCRIPTION Web & Multimedia & Networks I Code : GM1.4	Departement : Computer Engineering
		Date : 15/10/2021
		Version : 02
		Semester : 1

Chapters	Title	Learning outcomes
Chapter 4	IPv4 and IPv6 addressing (network layer of the OSI model)	Students will be able to: -Know the design of IPv4 addressing and the role of the subnet mask. -Know the design of IPv6 addressing
Chapter 5	The basic protocols of the network layer (network layer of the OSI model)	Students will be able to: -Know the role of the IP protocol fields and the operating principle of the routing protocols (RIP, OSPF, EIGRP) -Know the operating principle of routers
Chapter 6	The basic protocols of the transport layer (transport layer of the OSI model)	Students will be able to know the role of the fields of the TCP and UDP protocols and their operating principles.
Chapter 7	The basic protocols of the Application layer of the OSI model	Students will be able to know the basic application layer services (FTP, DHCP, DNS and NAT)
Chapter 8	Network interconnections	Students will be able to set up a local network (physical and logical)
Chapter 9	Multimedia processing	Students will be able to know theoretical foundations of multimedia objects
Chapter 10	Digital image	Students will be able to process and create different types of images (raster and vector).
Chapter 11	UI design	Students will be able to know the rules and good practices of HMI design

	MODULE DESCRIPTION Web & Multimedia & Networks I Code : GM1.4	Departement : Computer Engineering
		Date : 15/10/2021
		Version : 02
		Semester : 1

Chapters	Title	Learning outcomes
Chapter 12	User experience	Students will be able to analyse the user experience and exploit it for the design of ergonomic and adaptive UIs
Chapter 13	WEB basics	Students will be able to: -know the basics of the Web -distinguish between terms related to the Web, -understand the client-server communication's principle, and also the principle of the Web server and Internet access.
Chapter 14	HTML5 language	Students will be able to structure the content of web pages as well as the new features provided with HTML5.
Chapter 15	Cascading style sheets: CSS3	Students will be able to define the style of the web pages already created with HTML5.
Chapter 16	JavaScript language	Students will be able to make web pages interactive and validate user input via input fields on forms, using the JavaScript language.
Chapter 17	AJAX	Students will be able to send and receive data to and from a remote source using XML HTTP Request objects and jQuery AJAX operations.

4. Assessment

Designation	Chapters (s)	Weighting
Mini-project	Chpater9..Chapter12	10%
Practical work	Chpater9..Chapter12	10%
Test	Chapter 3, chapter 6,Chapter 14	10%
Presentation	-	-
Exam	All chapters	70%

	MODULE DESCRIPTION Web & Multimedia & Networks I Code : GM1.4	Departement : Computer Engineering
		Date : 15/10/2021
		Version : 02
		Semester : 1

5. Bibliographic references

- Luc V., *“Ajax:Développez pour le web 2.0”*,Eni Editions, 2015
- Denis M., *“Apprenez les langages HTML5 et CSS3”*, Eni Editions, 2020
- Cours en ligne CISCO (CCNA1 V6.0)

	MODULE DESCRIPTION Communication & Engineering Culture I Code : GM1.5	Département : Génie Informatique
		Date : 15/10/2021
		N° version : 02
		Semestre : 1

Specialty Module	Main Module	Engineering Sciences and Techniques	Preparation for the profession practices
		X	

IPSAS STAFF

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Courses	Practical works	Individual work	Total volume
57h	45h	110 h	212h

Coefficient :	ECTS Credits:
6	9

1. MODULE DESCRIPTION AND COMPETENCES TO BE ACHIEVED

1.1 : Description

This course consists of preparing students for the TOEIC certification exam and instill in them business English. It covers the essential concepts for anyone working in an international and dynamic professional environment. The TOEIC is a standardized test used to attest to a person's skills in business English. It allows students to increase their credibility, helping them to enter the business world or obtain promotions.

To achieve the levels of English required for these purposes, the course is based on two books. In the case of the TOEIC preparation, this is the Longman Preparation Series for the NEW TOEIC Test Intermediate Course (4th edition). For preparation for the business world, the New Headway provides a flexible environment for students of all levels (Beginner, elementary, pre-intermediate, intermediate, upper-intermediate, advanced).

	MODULE DESCRIPTION Communication & Engineering Culture I Code : GM1.5	Département : Génie Informatique
		Date : 15/10/2021
		N° version : 02
		Semestre : 1

1.2 Objectifs

Students should :

- have sufficient knowledge in terms of vocabulary and structures to understand and produce accurate essays and talks.
- be familiar with certain contexts, mainly international, cross-cultural and professional ones.
- get the minimum pack of vocabulary in themes of communications, careers and workplaces.
- be able to understand a native speaker's talk in different contexts (job interview, phone calls, conferences, etc.)
- be able to deliver an accurate talk. Then, he should be familiar with the conversation codes and etiquettes in English contexts.

2. MODULES AND DEPENDENCIES

<u>Upstream Modules</u>	<u>Taught Module</u>	<u>Downstream Modules</u>
	GM1.5 : Communication & Engineering Culture I	GM2.5 : Communication & Engineering Culture II

3. MODULE PLAN

Chapters	Title	Learning outcomes
Chapter 1	Placement test (identifying the minimum levels)	Identifying mistakes and focusing on the main areas of weakness in English language
Chapter 2	1- CAREERS 2- Workplaces 3- Communication Grammar: articles / nouns/ Wh questions/ prepositions of place/ simple present tense Vocabulary: job interviews and talks/ office description and communication at	The main outcome of this unit is to have students familiar with vocabulary related to the professional life and able to talk about experiences and describe workplaces. The end of the unit is a presentation on a chosen theme.

	MODULE DESCRIPTION Communication & Engineering Culture I Code : GM1.5	Département : Génie Informatique
		Date : 15/10/2021
		N° version : 02
		Semestre : 1

Chapters	Title	Learning outcomes
	work/ telephoning , media and news	
		The main outcome of the unit is to make students able to take part in talks about business contexts.
Chapter3	1- Retailing 2- Industry 3- Trade Grammar: comparative forms/ tag questions/the passive/causative verbs/future forms/ cause and effects Vocabulary: shopping and products information/ factory and industrial problems/ markets and meetings	Upgrade the level of the students in terms of understanding and communication, and preparing presentations.
Chapter4	TOEIC PRACTICE TESTS: LISTENING AND READING (SAMPLE TOEIC TESTS from the Cambridge tests)	Have students aware of the main parts of a presentation both in academic and professional contexts
Chapter 5	Practice of presentations on a continuous basis.	The main outcome of the unit is to make students able to take part in talks about business contexts.
Chapter 6	Introduction	<ul style="list-style-type: none"> ● Define the company ● Explain the financial, economic and social role of the company.
Chapter 7	The business environment.	<ul style="list-style-type: none"> ● Explain the relationship of the company with its environment.
Chapter 8	The company and the manager	<ul style="list-style-type: none"> ● Define the management functions and the role of the manager
Chapter 9	The management process	<ul style="list-style-type: none"> ● Define the business process -Describe the four functions of management: planning, organising, directing and controlling

	MODULE DESCRIPTION Communication & Engineering Culture I Code : GM1.5	Département : Génie Informatique
		Date : 15/10/2021
		N° version : 02
		Semestre : 1

4. ASSESSMENT

Désignation	Chapitre (s)	Pondération
Mini-projet	-	-
Travaux Pratiques	-	-
Contrôle continu	chapters 1-5	-
Exposé	-	-
Examen Final	all chapters	-

5. BIBLIOGRAPHIC REFERENCES

- Charles Talcott, Braham Tullis. Target score: A communicative course for TOEIC test preparation. Ed, Cambridge University Press.
- Trew, Grant .Tactics for TOEIC Test Listening and Reading.
- Online practice tests : <https://yourenglishtest.com/>
- <https://www.4tests.com/toeic>
- Christelle Capo-Chichi ; Le CV. Studyrama. Collection Emploi
- Uriel Megnassan ; Le CV et la lettre de motivation, Mettez du punch dans vos candidatures. Collection Eyrolles.
- Uriel Megnassan : Décrochez le Job de vos rêves en 5 rounds. Collection Eyrolles.
- Patrick De Sainte Lorette : La lettre de motivation spécial étudiants et jeune diplômé. Edition d'organisations.

	MODULE DESCRIPTION Fundamental & Applied Mathematics II Code : GM2.1	Department : Computer Engineering
		Date : 15/10/2021
		N° version : 02
		Semester : 2

Speciality module	Main module	Engineering Sciences and Techniques	Preparation for the profession practices
		X	

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Courses	Practical works	Individual works	Volume total
42hrs	12hrs	50hrs	104hrs

Coefficient :	ECTS credits :
2.5	4

1. DESCRIPTION OF THE COURSE AND COMPETENCES TO BE ACHIEVED

1.1 Description

This course is designed in order to give the students some useful descriptive mathematics tools for solving decision-making problems. Firstly, descriptive statistics fundamentals take place. This involves learning a few basics of statistical distributions, cumulative density functions, and the characteristics of central and dispersion tendency. Secondly, a part which concerns the probabilities is exposed. This involves acquiring some basic concepts of combinatorial analysis, conditional probability, and discrete and continuous random variables; an essential tool in the case of decision-making problems under uncertainty.

A third part of this course is devoted to the presentation of some operational research methods. This involves presenting to the students a set of tools and methods allowing them to solve combinatorial problems. The student will be able to identify the problems for which operations research could be efficient. It is also a question of enabling them to understand the possibilities and the limits of this type of method.

In summary, it is about teaching students some tools and methods based on descriptive mathematics allowing them to be sufficiently equipped to cope with a combinatorial decision-making problem.

	MODULE DESCRIPTION Fundamental & Applied Mathematics II Code : GM2.1	Department : Computer Engineering
		Date : 15/10/2021
		N° version : 02
		Semester : 2

1.2 Objectives

students will be able to:

- acquire a thorough knowledge of some techniques considered as basic methods in Operations Research
- apply these techniques on simple cases, application on Software.
- make the theoretical foundations of statistics and probability

2. MODULES AND DEPENDENCIES

<u>Upstream Modules</u>	<u>Taught Module</u>	<u>Downstream Modules</u>
GM1.1 : Fundamental & Applied Mathematics I	GM2.1 : Fundamental & Applied Mathematics II	

3. MODULE PLAN

Chapter	Title	Learning Outcomes
Chapter1	Generalities of statistics Statistical Distribution & Statistical Tables	student must master statistical vocabulary and statistical tables
Chapter 2	The graphical representation The Cumulative function	Student must draw a statistical study and calculate the proportions of a population
Chapter 3	Central tendency, dispersion and shape characteristic	Student should master the mode, median and arithmetic mean
Chapter 4	Probabilities	Student should master: Elements of Probability computing: -Basic Probability -Combinatorial analysis -Conditional probability -Bayes-Independence formula

	MODULE DESCRIPTION Fundamental & Applied Mathematics II Code : GM2.1	Department : Computer Engineering
		Date : 15/10/2021
		N° version : 02
		Semester : 2

Chapter	Title	Learning Outcomes
Chapter 5	The random variables	Student must understand : -Discrete random variable -Continuous random variable
Chapter 6	Integer Linear Programming	Students will be able to : - master the formulation of a linear integer program PLNE. -know how to solve PLNE by the Gomory cut method. -Use Branch and Bound method
Chapter 7	The Dynamic Programming	Students are able to break down a problem into steps, determine the characteristics of the problem, and solve it using a backward chaining procedure.
Chapter 8	Graphs Theory	Students will master the basic elements of graph theory, and the application of some algorithms such as FORD and Fulkurson.

4. ASSESSMENT

Designation	Chapters (s)	Weightening
Mini-project		
Practical work		
Test	Chapter 3, chapter 6,Chapter 14	25%
Presentation	-	-
Exam	All chapters	75%

5. BIBLIOGRAPHIC REFERENCES

- Leszko R.,« *Continuous Delivery with Docker and Jenkins* »,
- Smart J.F., « *Jenkins: The Definitive Guide: Continuous Integration for the Masses* »,1st edition
- Papapetrou P., « *SonarQube in Action* » ,
- Eychenne Y., Cointot J.C., « *Big data : de la révolution à l'action* », DUNOD, 2014

	MODULE DESCRIPTION Fundamental & Applied Mathematics II Code : GM2.1	Department : Computer Engineering
		Date : 15/10/2021
		N° version : 02
		Semester : 2

- Chokogoue J., « *Maîtrisez l'utilisation des technologies Hadoop : initiation à l'écosystème Hadoop* », Eyrolles, 2018
- Bruchez R., « *Les bases de données NoSQL et le Big Data* », Eyrolles, 2015
- Chokogoue J., « *Hadoop, Devenez opérationnel dans le monde du Big Data* », ENI, 2017
- Lacomme P., Aridhi S., Phan R., « *Bases de données NoSQL et Big Data* », ellipses, 2014

	MODULE DESCRIPTION System Architecture II GM2.2	Departement : Computer Engineering
		Date : 15/10/2021
		Version : 02
		Semester : 2

Specialty Module	Main Module	Engineering Sciences and Techniques	Preparation for the profession practices
*			

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Courses	Practical works	Individual work	Total volume
63hrs	48hrs	105hrs	216hrs

Coefficient :	ECTS Credits:
6	8

1. MODULE DESCRIPTION AND COMPETENCES TO BE ACHIEVED

1.1 : Description

This course is set up to allow students to learn, as a first step, Linux-based operating systems from setting up to advanced configuration in order to prepare them to pass LPIC1 certification exam. In this part, special attention is given to Linux file management systems and common commands. Secondly, this course allows students to familiarize themselves with the system calls offered by the Linux kernel in order to accomplish any system-programming task. Based on the prerequisites learned throughout the GM1.2 (Linux 0.01 source code analysis) and GM1.3 (C programming knowledge), and the first part of this course, the student will be able to code, in C language, multi-process and/or multi-thread applications in a Linux environment. The third part of this course is devoted to some basic concepts of relational databases. The entity-relationship diagram model, the relational model, normalization, the SQL query language, and the manipulation of the data query database through the SQL language are presented.

	MODULE DESCRIPTION System Architecture II GM2.2	Departement : Computer Engineering
		Date : 15/10/2021
		Version : 02
		Semester : 2

In summary, the student should be able to pass the LPIC1 certification exam and to distinguish between files and databases and understand that database management systems (the subject of the GM3.2 course) generally constitute a software layer above the file management system.

1.2 Objectives

Students will be able to :

- recognize the hardware and specifics of Linux as a virtualized system.
- know how to install and configure a GNU/Linux system on a PC workstation, and how to use the runtime levels,
- install and uninstall programs on the Debian family of distributions, use the Linux command line (Bash, vi), manage common disks, partitions and file systems and finally manage files: permissions and properties, search and link.
- deepen the mechanisms of access to the operating system using the C and JAVA programming languages.
- master parallel programming in C using processes, inter-process communication, synchronization, threads... as well as network programming for Client/Server programming using sockets in JAVA.
- assimilate the fundamental concepts of databases
- design an Entity/Association model
- master the concepts of the relational model
- master the transformation from the Entity/Association model to the relational model
- understand and apply the normalization process
- introduce the SQL language
- master the SQL commands for data definition
- master SQL commands for data manipulation
- master SQL commands related to querying data

2. MODULE AND DEPENDENCIES

<u>Upstream Modules</u>	<u>Taught Module</u>	<u>Downstream Modules</u>
GM1.3 : Algorithms & Programming Fundamentals I GM1.2 : System Architecture I	GM2.2 : System Architecture II	

	MODULE DESCRIPTION System Architecture II GM2.2	Departement : Computer Engineering
		Date : 15/10/2021
		Version : 02
		Semester : 2

3. MODULE PLAN

Chapters	Title	Learning outcomes
Chapter 1	System architecture 101.1 Determining and configuring hardware parameters 101.2 Booting the system 101.3 Changing systemd runlevels/boot targets and shutting down or rebooting the system	Students will be able to : <ul style="list-style-type: none"> - determine and configure the basic system hardware, - guide the system through the boot process, - manage the SysVinit runlevel or systemd boot target of the system.
Chapter 2	Linux installation and package management 102.1 Designing the partitioning scheme 102.2 Installing a boot manager 102.3 Managing shared libraries 102.4 Using the Debian package manager 102.5 Using the RPM and YUM package managers 102.6 Linux as a hosted virtual system	Students will be able to : <ul style="list-style-type: none"> - design a disk partitioning scheme for a Linux system, - select, install and configure a boot manager - determine libraries and install them if necessary. - Perform package management using Debian package tools, - perform package management using RPM, YUM - understand the implications of virtualization and cloud computing on a Linux guest system
Chapter 3	GNU and Unix commands 103.1 Working with the command line 103.2 Processing text streams with filters 103.3 Basic file management 103.4 Using streams, pipes and redirects 103.5 Creating, controlling and terminating processes 103.6 Changing process priorities 103.7 Searching text files with regular expressions 103.8 Simple file editing	Students should be able to: <ul style="list-style-type: none"> -interact with shells and commands using the command line. The objective assumes the Bash shell. - apply filters to text streams - use basic Linux commands to manage files and directories - redirect streams and connect them to process text data efficiently. Tasks include redirecting standard input, standard output and standard error, passing the output of one command to the input of another command, using the output of one command as the arguments of another command, and sending the output to both standard output and a file - perform basic process management - manage process execution priorities - manipulate files and text data using regular expressions. This objective includes creating simple regular expressions containing several elements of notation and understanding the differences between basic and extended regular expressions. It

	MODULE DESCRIPTION System Architecture II GM2.2	Departement : Computer Engineering
		Date : 15/10/2021
		Version : 02
		Semester : 2

Chapters	Title	Learning outcomes
		<p>also includes using regular expression tools to perform searches,</p> <ul style="list-style-type: none"> - editing text files using vi. This objective includes vi navigation, vi modes, inserting, editing, deleting, copying and searching text. It also includes setting the default editor,
Chapter 4	<p>Disks, Linux file systems, standard file tree</p> <p>104.1 Creating partitions and file systems</p> <p>104.2 Maintaining file system integrity</p> <p>104.3 Mounting and unmounting file systems</p> <p>104.5 Managing file permissions and ownership</p> <p>104.6 Creating and modifying physical and symbolic links on files</p> <p>104.7 Finding files and placing files in the right places</p>	<p>Students should be able to :</p> <ul style="list-style-type: none"> -configure disk partitions and then create file systems on media such as hard disks. This includes managing swap partitions, - maintain a standard file system, as well as the additional data associated with a journaling file system, - Manually mounting and unmounting file systems, - controlling access to files through appropriate use of permissions and ownership - Create and manage physical and symbolic links to a file, - be fully familiar with the file system hierarchy standard.
Parctical work	TP1 : System architecture	<p>Students should be able to :</p> <ul style="list-style-type: none"> -Enable and disable embedded devices. -Determine hardware resources of devices. -Test tools and utilities for listing various hardware information (e.g. lsusb, lspci, etc.). -Test tools and utilities for handling USB devices. -Provide options to the kernel at boot time. -Check boot events in log files. -Set the default runlevel or boot target. -Switch between runlevels/boot targets, including single user mode. -Shut down and restart from the command line. -Alert users before changing runlevels/boot targets or other major system events. -Terminate processes correctly..
	TP2 : Linux installation and package management	<p>Students should be able to :</p> <ul style="list-style-type: none"> -Allocate file systems and swap space to separate partitions or disks, -Provide alternative boot locations and a backup boot option, - Identify and load shared libraries. -Identify typical system library locations. - Install, upgrade and uninstall Debian binary packages.

	MODULE DESCRIPTION System Architecture II GM2.2	Departement : Computer Engineering
		Date : 15/10/2021
		Version : 02
		Semester : 2

Chapters	Title	Learning outcomes
		<ul style="list-style-type: none"> -Search for packages containing specific files or libraries. - Manage packages
	TP3 : GNU and Unix commands	<p>Students should be able to :</p> <ul style="list-style-type: none"> -Use simple shell commands and one-line command sequences to perform basic command-line tasks. -Use and modify command history. - Send text files and output streams through text utility filters to modify output using standard UNIX commands - Use basic Linux commands to manage files and directories - Redirect standard input, standard output and standard error. -Direct the output of one command to the input of another command. -Use the output of one command as arguments to another command. -Send output to both standard output and a file. - Monitor active processes. Select and sort the processes to be displayed. -Send signals to processes. - Change the priority of a running process. - Create simple regular expressions containing multiple notation elements. -Use regular expression tools to search a file system or the contents of a file. -Use regular expressions to delete, modify and replace text. - Insert, edit, delete, copy and search text in vi
	TP4 : Disks, Linux file systems, standard file tree	Here is a partial list of files, terms and utilities used: fdisk, parted, mkfs, mkswap, du, df, fsck, mount, umount, chmod, umask, chown, chgrp, ln, find, locate
Chapter 5	Program Arguments and Environment Variables	Students are able to develop C applications in the Unix kernel.
Chapter 6	Processes and inter-process communication.	Students are able to manage processes
Chapter 7	Network programming	Students are able to assimilate the Client/server paradigm
Chapter 8	Threads	Students are able to understand the Parallel programming
PW	Development of multi-threaded client server applications using : TCP, UDP and Multicast	
Chapter 9	Introduction to databases	Students are able to assimilate the fundamental concepts of databases

	MODULE DESCRIPTION System Architecture II GM2.2	Departement : Computer Engineering
		Date : 15/10/2021
		Version : 02
		Semester : 2

Chapters	Title	Learning outcomes
Chapter 10	Entity-Association Model	Students are able to design an Entity/Association model
Chapter 11	Relational model	Students are able to master the concepts of the relational model
Chapter 12	Standardisation	Students are able to master the transformation from the Entity/Association model to the relational model
Chapter 13	SQL Language	Students are able to understand and apply the normalization process
Chapter 14	Data Definition with SQL	Students are able to present the SQL language
Chapter 15	Data manipulation with SQL	Students are able to master SQL commands related to data definition
Chapter 16	Data Query with SQL	Students are able to master SQL commands related to data manipulation
PW	Data definition Data manipulation Data querying	

4. ASSESSMENT

Designation	Chapters (s)	Weighting
Mini-project	Chapter1..Chapter8	10%
Practical work	Chapter9..Chapter12	10%
Test	Chapter 1, chapter 3,Chapter 4 Chapter7	10%
Presentation	-	-
Exam	All chapters	70%

5. BIBLIOGRAPHIC REFERENCES

- Gardarin G., *“Bases de données Objet & relationnel”*, Edition Eyrolles, 1999.
- Salah I., *“Les bases de données relationnelles conception et réalisation”*, Edition Hermès, 1994.
- Delobel C., Abida M., *“Bases de données et systèmes relationnel”*, édition Bordas, 1982
- Brouard F., Bruchez R., Soutou C., « *SQL* », Pearson Education, 2010.
- Beaulieu A., *«Learning SQL Generate, Manipulate, and Retrieve Data »*, O'Reilly, 2020
- Rohaut S., *“LINUX Préparation à la certification LPIC-1”*, eni éditions
- Malgouyres R., *“Programmation Système (en C sous linux)”*, Université Clermont 1, Aubière, janvier 2017
- Harold E., *“Java Network Programming : Developing Networked Applications”*, O'Reilly Media, October 2013.

	MODULE DESCRIPTION Algorithms & Programming Fundamentals II Code : GM2.3	Department : Computer Engineering
		Date : 15/10/2021
		N° version : 02
		Semester : 2

Speciality module	Main module	Engineering Sciences and Techniques	Preparation for the profession practices
	X		

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Courses	Practical work	Individual work	Volume total
60hrs	36hrs	130hrs	226hrs

Coefficient :	ECTS credits :
5.5	9

1. DESCRIPTION OF THE COURSE AND COMPETENCES TO BE ACHIEVED

1.1 Description

Like in the «Algorithms & programming fundamentals I» course, this one is designed in order to give students more algorithms' design fundamentals as well as some fundamentals related to compilers design and programming paradigms.

Firstly, fundamentals of data structures and algorithms are picked up again in this course in order to boost students' problem-solving skills. Secondly, the fundamentals related to compilation and the languages' theory are exposed. This involves teaching students designing compilers with, over time, a presentation of the required basics of languages' theory on which the different layers of a compiler are based. In this direction lexical analysis', syntax analysis, semantic analysis' layers are presented from their operating principles to their implementation techniques.

Thirdly, the Java language is introduced. At this level, the students will discover another programming paradigm which is the object paradigm, unlike the procedural programming paradigm with which they are familiar. Classes and objects, and the three fundamentals related to object-oriented programming (encapsulation, inheritance, and polymorphism) are briefly presented.

	MODULE DESCRIPTION Algorithms & Programming Fundamentals II Code : GM2.3	Department : Computer Engineering
		Date : 15/10/2021
		N° version : 02
		Semester : 2

In summary, the first step is to boost the students' ability to solve algorithmic problems while explaining the different data structures. It is then a matter of teaching him the basics of compilation with special attention given to the compilers' design. Students will be able to understand the procedural programming paradigm with which they are familiar by preparing them to the object-oriented programming paradigm through Java programming.

1.2 Objectives :

Students will be able to :

- Master the fundamental concepts dedicated to the design and implementation of compilers.
- Define languages from informal specification to regular expressions,
- Implement the lexical analyzer and the syntactic analyzer and some aspects related to semantic analysis such as type checking.
- Present the classical algorithmic structures: lists, stacks, queues, trees, as well as the classical algorithms concerning them. Recursive approaches will be emphasized. We will insist on the modeling of these structures by arrays or chained lists and on the notion of abstract data types allowing to approach object programming.
- To give efficient methods to design complex algorithms and develop them. In particular, the design and decomposition of an algorithm into simpler subparts will be emphasized.
- Assimilate the basic principles of Object Oriented Programming (OOP)
- Master the process of compiling and executing a Java program
- Master the basic elements of the Java language
- Implement classes and objects in Java
- Handle strings and collections
- Master the concepts of inheritance and polymorphism
- Implement abstract classes and interfaces
- Handling exceptions in Java

2. MODULES AND DEPENDENCIES

<u>Upstream Modules</u>	<u>Taught Module</u>	<u>Downstream Modules</u>
GM1.3 : Algorithms & Programming Fundamentals I	GM2.3 : Algorithms & Programming Fundamentals II	GM3.2 : Advanced Information Systems GM3.3 : Software Engineering & Development

	MODULE DESCRIPTION Algorithms & Programming Fundamentals II Code : GM2.3	Department : Computer Engineering
		Date : 15/10/2021
		N° version : 02
		Semester : 2

3. MODULE PLAN

Chapters	Title	Learning outcomes
Chapter 1	Words and languages	Student should be able assimilate the basics on language theory that define the language (alphabet and words, lexical units, lexemes, dictionaries, types, etc.) as well as the representation model through regular expressions for the case of regular languages (object of the module).
Chapter 2	Automata	<p>Student will be able to :</p> <ul style="list-style-type: none"> -Present the formal model of the automata designed on the basis of a finite state machine / transitions in order to provide a representation of expressions. -Define deterministic finite state automata, non-deterministic finite state automata and minimal finite state automata. -Acquire fundamentals of transfer model.
Chapter 3	Regular languages and automata	<p>Student will be able to :</p> <ul style="list-style-type: none"> -Define regular expressions for lexical units starting from informal models. - Pass expressions to associated automata. -Deduct the expressions from the given automata. -Use of the determinization algorithms for non-deterministic finite state automata. -Use of deterministic finite state automata minimization algorithms -Acquire fundamentals of model transfer.
Chapter4	Introduction to compilation	<p>Student will be able to :</p> <ul style="list-style-type: none"> -Classifie of advanced programming languages according to the criteria: paradigm, target execution architecture (compiled, semi-compiled, double compiled and interpreted), formal / semi-formal / non-formal -Recognise the compiler environment -Assimilate the two passes of compilation (front-end and back-end) by instructions examples written in the C

	MODULE DESCRIPTION Algorithms & Programming Fundamentals II Code : GM2.3	Department : Computer Engineering
		Date : 15/10/2021
		N° version : 02
		Semester : 2

Chapters	Title	Learning outcomes
		<p>language (from the expression to the generation of the associated binary code).</p> <ul style="list-style-type: none"> -The front-end encompasses the phases related to the source code, namely lexical analysis, syntactic analysis and semantic analysis. -The back-end encompasses the phases related to the target code, namely generation of intermediate code, code optimization and translation into relocatable language.
Chapter 5	Lexical analysis: languages and automata	<p>Student will be able to :</p> <ul style="list-style-type: none"> -Define the regular expressions of some lexical units of the C language. -Create a non-deterministic finite state automata; application on examples of lexical units of the C language. - Create a deterministic finite state automata; application on examples of lexical units of the C language and determinization algorithm. - Create the minimal deterministic finite state automata; application on examples of lexical units of the C language and minimization algorithm. -Implementation of an automatic lexical analyzer
Chapter 6	Syntactic Analysis	<p>Student will be able to :</p> <ul style="list-style-type: none"> - Understand the formal definition of grammars of regular languages (ambiguous, unambiguous grammar, etc.) - Learn to write derivation expressions for an input language based on terminal and non-terminal symbols. -Construct of derivation shafts according to derivation expressions -Assimilate the ascendant and descendant approach -Apply of the first and following calculation algorithms -Construct the LL analysis table
Chapter 7	Semantic analysis	<p>Student will be able to :</p> <ul style="list-style-type: none"> - Assimilate Syntax-driven definition

	MODULE DESCRIPTION Algorithms & Programming Fundamentals II Code : GM2.3	Department : Computer Engineering
		Date : 15/10/2021
		N° version : 02
		Semester : 2

Chapters	Title	Learning outcomes
		-Definition of semantic attributes and actions -Construction of abstract trees. -Identify scope according to the language -Control variable types.
Chapter 8	Generation of the intermediate code	Student will be able to: -Product the 3-address code. -Product the simplified 3-address code.
Practical Work	PW1: Implementation of automata for lexical analysis	
	PW2: Implementation of the first and following calculation algorithms	
	PW3: Implementation of syntax trees and stacks for syntax checking	
	PW4: Type checking for semantic checking	
Chapter 9	Recordings	Student must define records
Chapter 10	Complexity of algorithms	Student must determine temporal and spacial complexities
Chapter 11	Sequential structures	Student must master fundamentals of algorithmic structures: lists, trees piles, files,....
Chapter 12	Hierarchical structures	Student must ditinguish between different iterative structures
Chapter 13	Graphs	Students must recognise the different methods to handle graphs
Chapter 14	General introduction to object-oriented programming	Student will be able to : - Assimilate the basics of the Object Oriented Programming -Master the compilation and execution process of a Java program
Chapter 15	Basic elements of the Java language	Student will be able to master the basic elements of the Java language
Chapter 16	Classes and Objects in Java	Student will be able to master the compilation and execution process of a Java program

	MODULE DESCRIPTION Algorithms & Programming Fundamentals II Code : GM2.3	Department : Computer Engineering
		Date : 15/10/2021
		N° version : 02
		Semester : 2

Chapters	Title	Learning outcomes
Chapter 17	Arrays and strings	Student will be able to handle strings and collections
Chapter 18	Inheritance and polymorphism	Student will be able to master the concepts of inheritance and polymorphism
Chapter 19	Abstract classes and interfaces	Student will be able to implement abstract classes and interfaces
Chapter 20	Exception handling	Student will be able to handle exceptions in Java
Practical work	Basic elements of the Java language Classes and Objects in Java Arrays and strings Inheritance and polymorphism Abstract classes and interfaces Exception handling	

4. ASSESSMENT

Designation	Chapters (s)	Weightening
Mini-project		
Practical work	Chpater15..Chapter20	20%
Test	Chapter 2, chapter 3 ,Chapter 1 Chpater 12, Chapter 15	20%
Presentation		
Exam	All chapters	60%

5. BIBLIOGRAPHIC REFERENCES

- Leszko R.,« *Continuous Delivery with Docker and Jenkins* »,
- Smart J.F., « *Jenkins: The Definitive Guide: Continuous Integration for the Masses* »,1st edition
- Papapetrou P., « *SonarQube in Action* » ,
- Eychemme Y., Cointot J.C., « *Big data : de la révolution à l'action* », DUNOD, 2014
- Chokogoue J., « *Maîtrisez l'utilisation des technologies Hadoop : initiation à l'écosystème Hadoop* », Eyrolles, 2018
- Bruchez R., « *Les bases de données NoSQL et le Big Data* », Eyrolles, 2015
- Chokogoue J., « *Hadoop, Devenez opérationnel dans le monde du Big Data* », ENI, 2017
- Lacomme P., Aridhi S., Phan R., « *Bases de données NoSQL et Big Data* », ellipses, 2014

	MODULE DESCRIPTION Web & Multimedia & Networks II Code : GM2.4	Department : Computer Engineering
		Date : 15/10/2021
		N° version : 02
		Semester : 2

Speciality module	Main module	Engineering Sciences and Techniques	Preparation for the profession practices
	X		

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Courses	Practical works	Individual works	Volume total
39hrs	21hrs	50hrs	110hrs

Coefficient :	ECTS credits :
4	5

1. DESCRIPTION OF THE COURSE AND COMPETENCES TO BE ACHIEVED

1.1 Description

Unlike the other courses, this one is based on purely technical aspects related to the 2D games design in Unity environment and the administration of networks in a CISCO environment.

First, the process of game conceptualization and production is introduced and game development under Unity environment is presented. Scenario's design, creation of 2D multimedia objects, animation management, and sound are emphasized. The design of user-experience-centered design of user interfaces is further discussed, and the integration of the game modules into a web application is shown.

Secondly, the administration of a network in a CISCO environment is emphasized. Indeed, the principles of static and dynamic routing are discussed and the associated routing protocols are presented. In this direction, special attention is given to switched networks and virtual local area networks (VLANs).

In summary, through this course, the student will learn to design 2D games under Unity environment. He will also learn how to manage a local area network in a CISCO environment.

	MODULE DESCRIPTION Web & Multimedia & Networks II Code : GM2.4	Department : Computer Engineering
		Date : 15/10/2021
		N° version : 02
		Semester : 2

1.2 Objectives

Students will be able to :

- Acquire knowledge about the principle of data routing (IPv4 and IPv6 packet) in the Internet network using static and dynamic routing.
- Manage and secure a very large traffic in a high speed local area network by using VLAN technology for broadcast domain segmentation and by using ACLs to limit unwanted traffic.
- Administer and optimize the performance of local network resources and locate network failures or bottlenecks.
- Design and build 2D games using Unity Environment

2. MODULES AND DEPENDENCIES

<u>Upstream Modules</u>	<u>Taught Module</u>	<u>Downstream Modules</u>
GM1.4 : Web & Multimedia & Networks I	GM2.4 : Web & Multimedia & Networks II	

3. MODULE PLAN

Chapter	Title	Learning outcomes
Chapitre 1	General Concepts	process of game production Conceptualization
Chapitre 2	Game components	Students learn to design: <ol style="list-style-type: none"> 1. Game Interfaces 2. Sprites 3. Buttons
Chapitre 3	Gamification	Students will acquire : <ol style="list-style-type: none"> 1. Gamification concepts 2. Gamification examples 3. Game mechanics 4. Learning Activities 5. Gamer types
Chapitre 4	Development	Students will be able to : <ol style="list-style-type: none"> 1. Animations 2. Event Handlers 3. Sound effects 4. Physical effects simulation

	MODULE DESCRIPTION Web & Multimedia & Networks II Code : GM2.4	Department : Computer Engineering
		Date : 15/10/2021
		N° version : 02
		Semester : 2

Chapter	Title	Learning outcomes
Travaux Pratiques	Students will able to : Develop 2D games with animations, sound effects,etc.	
Chapitre 5	Principles of Routing	Students will able to handle the functions of a router and the basic configuration of a CISCO router
Chapitre 6	Static routing principle	Students will able to understand the role of the different types of static routes and their limits of use and to configure static routes on a CISCO router
Chapitre 7	Principle of Dynamic Routing	Students will assimilate the operating principle of dynamic routing protocols (RIP, OSPF, EIGRP). - Configure dynamic RIP routing on a CISCO router
Chapitre 8	Switched Networks	- Students will assimilate the operating principle of switches , the security problems in switched networks and the basics of a CISCO switch configuration
Chapitre 9	Virtual Local Area Networks (VLANs)	Students will be able to : -segment the broadcast domain without going to the network layer of the OSI model, using VLANs - implement the Inter-VLAN routing - Configure VLANs on several CISCO switches
Chapitre 10	Network security with ACLs	Students will be able to : - know how ACLs work on routers in order to secure a local network - Configure ACLs (IPv4 and IPv6) on a CISCO router

4. ASSESSMENT

Designation	Chapters (s)	Weightening
Mini-project	Chpater1..Chapter4	10%
Practical work	Chpater1..Chapter4	10%
Test	Chapter 2, chapter 6,Chapter7	10%
Presentation	-	-
Exam	All chapters	70%

	MODULE DESCRIPTION Web & Multimedia & Networks II Code : GM2.4	Department : Computer Engineering
		Date : 15/10/2021
		N° version : 02
		Semester : 2

5. BIBLIOGRAPHIC REFERENCES

- Leszko R., « *Continuous Delivery with Docker and Jenkins* »,
- Smart J.F., « *Jenkins: The Definitive Guide: Continuous Integration for the Masses* », 1st edition
- Papapetrou P., « *SonarQube in Action* »,
- Eychenne Y., Cointot J.C., « *Big data : de la révolution à l'action* », DUNOD, 2014
- Chokogue J., « *Maîtrisez l'utilisation des technologies Hadoop : initiation à l'écosystème Hadoop* », Eyrolles, 2018
- Bruchez R., « *Les bases de données NoSQL et le Big Data* », Eyrolles, 2015
- Chokogue J., « *Hadoop, Devenez opérationnel dans le monde du Big Data* », ENI, 2017
- Lacomme P., Aridhi S., Phan R., « *Bases de données NoSQL et Big Data* », ellipses, 2014

	MODULE DESCRIPTION Communication & Engineering Culture II Code : GM2.5	Departement : Computer Engineering
		Date : 15/10/2021
		Version : 02
		Semester : 2

Specialty Module	Main Module	Engineering Sciences and Techniques	Preparation for the profession practices
			X

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Courses	Practical works	Individual work	Total volume
42hrs	0hrs	20 hrs	62hrs

Coefficient :	ECTS Credits :
2	2

1.DESCRPTION OF THE MODULE AND COMPETENCES TO BE ACHIEVED

1.1 : Description

This course consists of preparing students for the TOEIC certification exam and instill in them business English. It covers the essential concepts for anyone working in an international and dynamic professional environment. The TOEIC is a standardized test used to attest to a person's skills in business English. It allows students to increase their credibility, helping them to enter the business world or obtain promotions.

To achieve the levels of English required for these purposes, the course is based on two books. In the case of the TOEIC preparation, this is the Longman Preparation Series for the NEW TOEIC Test Intermediate Course (4th edition). For preparation for the business world, the New Headway provides a flexible environment for students of all levels (Beginner, elementary, pre-intermediate, intermediate, upper-intermediate, advanced).

	MODULE DESCRIPTION Communication & Engineering Culture II Code : GM2.5	Departement : Computer Engineering
		Date : 15/10/2021
		Version : 02
		Semester : 2

Subsequently, the course allows students to acquire some French communication skills. It also teaches them how to make their CV and how to prepare for oral presentations and for job overviews.

1.2 Objectives

The student should be able to :

- understand a native speaker's talk in different contexts (job interview, phone calls, conferences, etc.)
- deliver an accurate talk, then should be familiar with the conversation codes and etiquettes in English contexts.
- have a sufficient knowledge in terms of vocabulary and structures to understand and produce accurate essays and talks.
- be familiar with certain contexts, mainly international, cross-cultural and professional ones.
- get the minimum pack of vocabulary in themes of communications, careers and workplaces.

2. MODULES AND DEPENDENCIES

<u>Upstream Modules</u>	<u>Taught Module</u>	<u>Downstream Modules</u>
GM1.5 : Communication & Engineering Culture I	GM2.5 : Communication & Engineering Culture II	GM3.5 : Communication & Engineering Culture III

3. MODULE PLAN

Chapters	Title	Learning outcomes
Chapter 1	Retailing/ industry / Trade 1-listening : -starting a new business venture -shopping -product information -factory tour	Students should be able: -to talk about business, shopping and meetings. -master spoken English in international contexts.

	MODULE DESCRIPTION Communication & Engineering Culture II Code : GM2.5	Departement : Computer Engineering
		Date : 15/10/2021
		Version : 02
		Semester : 2

Chapters	Title	Learning outcomes
	<ul style="list-style-type: none"> -industrial problem -news report -Art market -coffee costs -meetings 2- Grammar Check : <ul style="list-style-type: none"> -comparatives and superlatives -question tags -The passive -causative verbs -future forms Cause and effects 3- Vocabulary builder: <ul style="list-style-type: none"> -separable prefixes -synonyms and antonyms -idiomatic expressions 4- writing and speaking: <ul style="list-style-type: none"> -product description - talking about costs and production -meeting conversations 	
Chapter 2	<p>Leisure/money/travel/environment</p> <p>1-listening : leisure trends / eating out/ spare time activity expenditure /personal finance / LETS travel announcement/ airport enquiries /negotiating travel</p> <p>2- Grammar Check : -Relative pronouns/ indirect questions -Talking about trends/modals of possibility -The language of obligation / conditionals</p> <p>3- Vocabulary builder: -Participles as adjectives (ING/ED) -Phrasal verbs -Adjectives and adverbs</p> <p>4- writing and speaking: Talking about leisure favorites</p>	<p>Students should be able:</p> <ul style="list-style-type: none"> - To Understand more written and spoken English with an improved range of vocabulary c. Apply strategies for reading and understanding business texts in English d. -Apply strategies for listening to and understanding conversations in English. e. Comment on situations and topics common in a business environment

	MODULE DESCRIPTION Communication & Engineering Culture II Code : GM2.5	Departement : Computer Engineering
		Date : 15/10/2021
		Version : 02
		Semester : 2

Chapters	Title	Learning outcomes
	Talk about best visited places (description and naming places around the world) Write about personal income and expenditure Write about experiences	
Chapter 3	Group work Writing conversations about chosen topic Rehearsal of group conversations Communicative tasks (oral skills) Rehearsal of a short presentation	
Chapter 4	Sample TOEIC PRACTICE TESTS	
Chapter 5	Communication	The student masters the elements of the communication situation and the language registers.
Chapter 6	Letter of application	The student is able to: - write an effective cover letter and to distinguish between a spontaneous cover letter and a cover letter following an advertisement.
Chapter 7	CV	The student is able to write a standard CV.
Chapter 8	The job interview	The student is able to: -pass a job interview; he/she is able to present him/herself correctly and answer the questions often asked during an interview.
Practical works	Presentations on chosen topics. Workshops	Upon successful completion of this course, students will be able to:

	MODULE DESCRIPTION Communication & Engineering Culture II Code : GM2.5	Departement : Computer Engineering
		Date : 15/10/2021
		Version : 02
		Semester : 2

Chapters	Title	Learning outcomes
		-understand the basic vocabulary and grammar in TOEIC, and to use the skills and strategies in both listening and reading sections

4. ASSESSMENT

Désignation	Chapitre (s)	Pondération
Mini-projet	-	-
Travaux Pratiques	-	-
Contrôle continu	chapters 1-4	-
Exposé	-	-
Examen Final	all chapters	-

5. BIBLIOGRAPHIC REFERENCES

- Charles Talcott, Braham Tullis. Target score: A communicative course for TOEIC test preparation. Ed, Cambridge University Press.
- Trew, Grant .Tactics for TOEIC Test Listening and Reading.
- Online practice tests : <https://yourenglishtest.com/>
- <https://www.4tests.com/toEIC>
- Christelle Capo-Chichi ; Le CV. Studyrama. Collection Emploi
- Uriel Megnassan ; Le CV et la lettre de motivation, Mettez du punch dans vos candidatures. Collection Eyrolles.
- Uriel Megnassan : Décrochez le Job de vos rêves en 5 rounds. Collection Eyrolles.
- Patrick De Sainte Lorette : La lettre de motivation spécial étudiants et jeune diplômé. Edition d'organisations.

	MODULE DESCRIPTION Applied Mathematics Code : GM3.1	Departement : Computer Engineering
		Date : 15/10/2021
		Version : 02
		Semester : 3

Specialty Module	Main Module	Engineering Sciences and Techniques	Preparation for the profession practices
X			

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Courses	Practical works	Individual work	Total volume
75hrs	9hrs	90hrs	174hrs

Coefficient :	ECTS Credits:
4	7

1. DESCRIPTION OF THE COURSE AND COMPETENCES TO BE ACHIEVED

1.1 : Description

This course is designed to give students some common problem-solving tools. This is the second level of operations research training and is a continuation of the GM2.1 course. Integer programming is discussed, and the modeling and solving (Gomory cutting plane method, branch & bound method) of a linear integer program is experienced. Subsequently, the basic concepts related to dynamic programming and graph theory are presented.

The second part of this course is devoted to introducing the python language. Particular attention is given to the possibilities offered by python through its API for problem-solving and/or simulation. The fundamentals of python are exposed and data structures, containers, files, and modules are highlighted.

	MODULE DESCRIPTION Applied Mathematics Code : GM3.1	Departement : Computer Engineering
		Date : 15/10/2021
		Version : 02
		Semester : 3

In summary, it is about teaching students some tools and methods based on advanced operational research allowing them to be sufficiently equipped to cope with a decision-making problem.

1.2 Objectives

Student will be able to :

- solve integer linear programs, dynamic programming and graph theory.
- study the stochastic behaviour of industrial systems and to analyse them using continuous and discrete random methods.

2. MODULES AND DEPENDENCIES

<u>Upstream Modules</u>	<u>Taught Module</u>	<u>Downstream Modules</u>
GM2.1 Fundamental & Applied Mathematics II GM1.3 Algorithms & Programming Fundamentals I	GM3.1 Applied Mathematics	

3. MODULE PLAN

Chapter	Title	Learning outcomes
Chapter 1	Integer Linear Programming	Student will be able to: <ul style="list-style-type: none"> - master the formulation of a linear integer program PLNE. - know how to solve PLNE by the Gomory cutting plane method. - solve by the Branch and Bound method
Chapter 2	The Dynamic Programming	Student will be able to: <ul style="list-style-type: none"> - break down a problem into steps, - determine the characteristics of the problem - Solve it using a backward chaining procedure.
Chapter 3	Graphs Theory	Student will be able to: <ul style="list-style-type: none"> - master the basic elements of graph theory, and the application of some algorithms such as FORD and

	MODULE DESCRIPTION Applied Mathematics Code : GM3.1	Departement : Computer Engineering
		Date : 15/10/2021
		Version : 02
		Semester : 3

Chapter	Title	Learning outcomes
		Fulkurson.
Chapter 8	Python Fundamentals	Student will be able to: - master data structures and algorithms, Strings and text, Numbers, dates, and times, Iterators and generators.
Chapter 9	Containers and files	Student will be able to: - master Lists, Tuples, Dictionnaires, Sets, Files I/O. Data encoding and processing.
Chapter 10	Functions and classes	Student will be able to: - define functions, classes and objects. - learn Inheritance. Polymorphism. Encapsulation.
Practical works	Modules and exceptions	Student will be able to: - develop modules and packages on the basis of test, Debugging and Exceptions.

4. ASSESSMENT

Designation	Chapters (s)	Weighting
Mini-project		
Practical work		
Test	Chapters 1-7	25%
Presentation	-	-
Exam	All chapters	75%

5. BIBLIOGRAPHIC REFERENCES

- Dreyfus S., « *Richard Bellman on the birth of Dynamic Programming* », Operations Research, 2002
- Bellman R., “*Dynamic Programming*”, Princeton University Press, 1 2003
- Nemhauser G.L., et Wolsey L.A., “*Integer and Combinatorial Optimization*”, Wiley, New York, 1988.
- Norbert Y., Ouellet R., Parent R., “*La recherche opérationnelle*”, Gaetan Morin Editeur, Montreal-Paris, 1995.
- Jmal T., Ellouz A, « *Statistiques et probabilités* » Tome1 et tome 2.
- Lecoutre J.P , « *Statistique et probabilités* », DUNOD 5ème édition, 2012
- Phan T. and Rowenczyk J., « *Exercices et problèmes de Statistique et probabilités* », DUNOD, 2012
- Beazley D., Jones B.K., “*Python cookbook.*”, Edition O’Reilly.
- Ramalho L., “*Fluent Python.*”, Edition O’Reilly.

	MODULE DESCRIPTION Advanced Information Systems GM3.2	Departement : Computer Engineering
		Date : 15/10/2021
		Version : 02
		Semester : 3

Specialty Module	Main Module	Engineering Sciences and Techniques	Preparation for the profession practices
X			

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Courses	Practical works	Individual work	Total volume
72hrs	30hrs	130hrs	232hrs

Coefficient :	ECTS Credits:
6	9

1. MODULE DESCRIPTION AND COMPETENCES TO BE ACHIEVED:

1.1 Description

This course allows students to understand Linux system administration fundamentals, software architectures, software-based distributed services development and deployment.

1.2 Objectives

Student will be able to :

- design and implement distributed applications.
- model and develop a computer application based on distributed services. They will be able
- determine the distributed objects that constitute the application while specifying the contracts and interactions between its components.
- model the types of data exchanged between the various third parties in the application.

	MODULE DESCRIPTION Advanced Information Systems GM3.2	Departement : Computer Engineering
		Date : 15/10/2021
		Version : 02
		Semester : 3

- to develop distributed solutions that meet certain criteria such as interoperability, scalability, security, adaptability and fault tolerance.
- master key notions around software architectures and prepare for Model Driven Engineering (MDE).
- Students recognize accessibility tools and network concepts essential to system administration
- know how to "configure the shell and write simple Bash scripts, install and configure the graphical interface,
- install and configure essential services: messaging, printing, system clock, system logs
- perform basic administration tasks: manage users, use automatic tasks and set up a level of security on workstations.
- Learn the basics of DBMS and understand the ANSI/SPARC standard architecture

understand the architecture of the Oracle DBMS

2. MODULE AND DEPENDENCIES:

<u>Upstream Modules</u>	<u>Taught Module</u>	<u>Downstream Modules</u>
GM2.2 : System Architecture II GM2.3 : Algorithms & Programming Fundamentals II GM2.4 : Web & Multimedia & Networks II	GM3.2 : Advanced Information Systems	GM4.3 : Advanced Software Development GM4.1 : Business Intelligence

3. MODULE PLAN

Chapter	Title	Learning outcomes
Chapter 1	Introduction to the Oracle DBMS	Students are able to: -Understand the basic concepts of DBMS and the ANSI/SPARC standard architecture -Understand the architecture of the Oracle DBMS
Chapter 2	Basic PL/SQL language elements	Students are able to: -Master the basic elements of the PL/SQL language -Implement procedural programs with PL/SQL.
Chapter3	Gestion des exceptions	Students are able to Handle internal and user exceptions.
Chapter 4	The cursors	Students are able to master the notion of PL/SQL cursor and deal with implicit cursors and explicit cursors
Chapter 5	Stored procedures and functions	Students are able to create functions and catalogued procedures.

	MODULE DESCRIPTION Advanced Information Systems GM3.2	Departement : Computer Engineering
		Date : 15/10/2021
		Version : 02
		Semester : 3

Chapter 6	Packages	Students are able to Manage packages.
Chapter 7	The update triggers	Students are able to Manage update triggers.
Chapter 8	Object-relational databases	Students are able to manage processes
Chapter9	Handling of the BDORs	Students are able to assimilate the Client/server paradigm
Chapter10	Mapping Objet-relationnel	Students are able to understand the Parallel programming
Practical works	PL/SQL basics, exceptions Cursors Stored units BDOR	
Chapter 11	Entity-Association Model	Students are able to design an Entity/Association model
Chapter 12	Relational model	Students are able to master the concepts of the relational model
Chapter 13	Standardisation	Students are able to master the transformation from the Entity/Association model to the relational model
Chapter 14	SQL Language	Students are able to understand and apply the normalization process
Chapter 15	Data Definition with SQL	Students are able to present the SQL language
Chapter 16	Data manipulation with SQL	Students are able to master SQL commands related to data definition
Chapter 17	Data Query with SQL	Students are able to master SQL commands related to data manipulation
PW	Data definition Data manipulation Data querying	
Chapter 18	Shells and Shell Scripting 105.1 Customize and use the shell environment 105.2 Customize or write simple scripts	Students are able to: - customize shell environments to meet users' needs. -to modify global and user profiles.
Chapter 19	User Interfaces and Desktops 106.1 Install and configure X11 106.2 Graphical Desktops 106.3 Accessibility	Students are able to: - install and configure X11 - be familiar with the major Linux workstations and the protocols used to access remote desktop sessions. - Have basic knowledge of visual settings, themes
Chapter 20	Administration tasks 107.1 Management of user accounts and groups as well as the system files concerned	Students are able to: - add, delete, suspend and modify user accounts. - use cron and systemd timers to run tasks at regular intervals and use at to run tasks at a specific time

	MODULE DESCRIPTION Advanced Information Systems GM3.2	Departement : Computer Engineering
		Date : 15/10/2021
		Version : 02
		Semester : 3

	107.2 Automation of administration tasks by scheduling jobs 107.3 Regional settings and languages	<ul style="list-style-type: none"> - localize a system in a language other than English. - understand why LANG = C is useful when creating scripts
Chapter 21	Essential system services 108.1 Managing the system clock 108.2 System logs 108.3 Mail Transfer Agent (MTA) Basics 108.4 Managing printers and printing	Students are able to: <ul style="list-style-type: none"> - correctly maintain system time and synchronize clock via NTP - Query the systemd log. - Filter systemd log data by criteria such as date, service or priority. - Configure systemd log persistent storage and log size. - Delete old systemd log data. - Recover systemd log data from a rescue system or a copy of the filesystem. - Know the commonly available MTA programs and perform basic forward and alias configuration on a client host. - manage print queues and user print jobs using CUPS and the LPD compatibility interface.
Chapter 22	Network Basics 109.1 Internet Protocol Basics 109.2 Persistent network configuration 109.3 Solving simple network problems 109.4 Configuring name resolution	Students are able to : <ul style="list-style-type: none"> - Manage the persistent network configuration of a Linux host - Debug some problems associated with network configuration. - configure DNS on a client host
Chapter 23	Security 110.1 Security administration tasks 110.2 Configuring System Security 110.3 Securing data with encryption	Students are able to : <ul style="list-style-type: none"> - Know how to review the system configuration to ensure host security in accordance with local security policies. - know how to implement a basic level of host security - use public key techniques to secure data and communication

	MODULE DESCRIPTION Advanced Information Systems GM3.2	Departement : Computer Engineering
		Date : 15/10/2021
		Version : 02
		Semester : 3

Practical work	TP1 : Shells and scripts Shell <ul style="list-style-type: none"> - Set environment variables (e.g. PATH) at login or when spawning a new shell. - Write Bash functions for frequently used sequences of commands. - Maintain skeleton directories for new user accounts. - Set command search path with the proper directory. - Use standard sh syntax (loops, tests). - Use command substitution. - Test return values for success or failure or other information provided by a command. - Execute chained commands. - Perform conditional mailing to the superuser. - Correctly select the script interpreter through the shebang (!) line. 	
	TP2 : Interfaces user desktop - get an idea about the X11 installation and configuration	
	TP3 : Administration tasks <ul style="list-style-type: none"> - Add, modify and delete users and groups. - Manage user / group information in password / group databases. - Create and manage special and limited accounts. - Manage cron jobs. - Configure user access to cron services - Configure regional settings and environment variables. - Configure time zone settings and environment variables. 	
	TP4 : Essential system services <ul style="list-style-type: none"> - Set the system date and time. - Set the hardware clock to the correct time in UTC. - Configure the correct time zone. - Basic NTP configuration, - Filter systemd log data by criteria - Configure persistent systemd log storage and log size. - Delete old systemd log data. - Create email aliases. - Configure email forwarding. - Basic CUPS configuration. - Manage user print queues. 	
	TP 5 : Basic concepts of networks <ul style="list-style-type: none"> - Managing the Persistent Network Configuration of a Linux Host - Use NetworkManager - Debug some problems associated with network configuration. - Configure DNS on a client host 	
Chapter 24	Switching from object to component	Students are able to detect and understand the problems to be solved when moving from classical to distributed programming and introduction of notions such as software architectures, models, design patterns involved

	MODULE DESCRIPTION Advanced Information Systems GM3.2	Departement : Computer Engineering
		Date : 15/10/2021
		Version : 02
		Semester : 3

		in solving these problems.
Chapter 25	Java RMI	Students are able to use the Java RMI API to specify, publish and call remote services
Chapter 26	General architecture of CORBA	Students are able to use of the CORBA API and especially standard components such as the CORBA middleware ORB, the POA and the POA manager to share services according to a well-defined software architecture.
Chapter 27	IDL: Interface Description Language	Students are able to : -specify services in IDL while respecting the multi-language programming aspect. -Know the syntactic constraints of IDL.
Chapter 28	Projection from IDL to JAVA	Students are able to compile the IDL and see the possible results obtained (in java) for each IDL type used.
Practical work	<ol style="list-style-type: none"> 1. Practical work on managing bank accounts in RMI 2. Practical work distributed clock in CORBA 3. Practical work on a distributed calendar in CORBA 	Students are able to use the theoretical concepts studied during the course sessions.

4. ASSESSMENT

Designation	Chapters (s)	Weighting
Mini-project		
Practical work	Chpater19..Chapter22	20%
Test	Chapter 2, chapter 3 ,Chapter 1 Chpater 12, Chapter 15, Chapter19	20%
Presentation		
Exam	All chapters	60%

5. BIBLIOGRAPHIC REFERENCES

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- Brouard F., Bruchez R., Soutou C., « SQL », Pearson Education, 2010.
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	MODULE DESCRIPTION Advanced Information Systems GM3.2	Departement : Computer Engineering
		Date : 15/10/2021
		Version : 02
		Semester : 3

- Malgouyres R., *“Programmation Système (en C sous linux)”*, Université Clermont 1, Aubière, janvier 2017
- Harold E., *“Java Network Programming : Developing Networked Applications”*, O'Reilly Media, October 2013.

	MODULE DESCRIPTION Software Engineering & Development Code : GM3.3	Department : Computer Engineering
		Date : 15/10/2021
		N° version : 02
		Semester : 3

Speciality module	Main module	Engineering Sciences and Techniques	Preparation for the profession practices
	X		

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Courses	Practical work	Individual work	Volume total
60hrs	24hrs	80hrs	164hrs

Coefficient :	ECTS credits :
4	6

1. DESCRIPTION OF THE COURSE AND COMPETENCES TO BE ACHIEVED

1.1 Description

This course is designed to give students some basic concepts related to engineering and the development of information systems. Object-oriented modeling is explained and UML is briefly introduced through the associated diagrams to allow students to learn to represent the static and dynamic views of a software application. An overview of use case, class, sequence, activity, package, component and deployment diagrams is stated. This part of the course ends with an access management application case study. The case study is modeled using UML diagrams and developed later in a Java EE environment.

The second part of this course is devoted to teaching students the fundamentals of development in a Java EE environment. The JEE architecture is exposed and the concepts related to servlets, JSP, and object/relational mapping highlighting the Hibernate Framework are presented.

At the end of this course, the student will have some basic tools to read the specifications of an application, model it using UML language and materialize it by implementing it in a JEE environment.

	MODULE DESCRIPTION Software Engineering & Development Code : GM3.3	Department : Computer Engineering
		Date : 15/10/2021
		N° version : 02
		Semester : 3

1.2 Objectives

Students will be able to :

- Employ UML Diagram for the design of an Information System
- Familiarise students with web development using the JavaEE platform.
- Use servlets, JSP pages, java beans and relational and object data persistence.

2. MODULES AND DEPENDENCIES

<u>Upstream Modules</u>	<u>Taught Module</u>	<u>Downstream Modules</u>
GM2.3 : Algorithms & Programming Fundamentals II GM1.4 :Web & Multimedia & Networks 1	GM3.3 : Software Engineering & Development	GM4.3 : Advanced Software Development

3. MODULE PLAN

Chapters	Title	Learning outcomes
Chapter 1	Introduction to object-oriented design of IS	Student must : -Assimilate the fundamental concepts related to the field of information systems (IS) analysis and design. -Define the dimensions of IS modelling according to the UML language.
Chapter 2	Use case diagram	Student should develop use case diagrams
Chapter 3	Class diagram	Student should develop class diagrams
Chapter4	Sequence diagram	Student should develop sequence diagrams
Chapter 5	State-transition diagram	Student should develop state-transition diagrams
Chapter 6	Activity diagram	Student should develop activity diagrams
Chapter 7	Package diagram	Student could Organise the IS into packages
Chapter 8	Component diagrams	Student will be able to create a component diagram
Chapter 9	Deployment diagrams	Student will be able to create a component diagram
Practical work	Use case diagram	

	MODULE DESCRIPTION Software Engineering & Development Code : GM3.3	Department : Computer Engineering
		Date : 15/10/2021
		N° version : 02
		Semester : 3

Chapters	Title	Learning outcomes
	Class diagram Sequence diagram State-transition, activity diagrams Component diagram, deployment	
Chapter 10	Presentation of the JEE architecture	Presenting to Student software architecture
Chapter 11	Servlets Programming Model	Student will master servlet programming
Chapter 12	Follow-up Sessions	Student will Know how to use sharing spaces
Chapter 13	The JSP	Student master the programming of dynamic views in JSP
Chapter 14	Expressions of language	Student will be able to use the language expressions
Chapter 15	JSTL : How it is implemented	Student acquire knowledge about the use of TagLibs in dynamic views
Chapter 16	Access to Databases (JDBC / Hibernate)	Student master relational and object data access.
Practical work	Development of an access management application Part 1: Servlet controllers and views Part 2: Views in JSP Part 3: Using Sessions and Applications Part 4: Data Persistence in Hibernate Mastery of the : Eclipse JEE Mastery of the application server Tomcat Mastery of the MySQL DBMS and the Hibernate framework	

	MODULE DESCRIPTION Software Engineering & Development Code : GM3.3	Department : Computer Engineering
		Date : 15/10/2021
		N° version : 02
		Semester : 3

4. ASSESSMENT

Désignation	Chapitre (s)	Pondération
Mini-projet	-	10%
Travaux Pratiques	-	10%
Contrôle continu	-	10%
Exposé	-	-
Examen Final	-	70%

5. BIBLIOGRAPHIC REFERENCES

- Leszko R., « *Continuous Delivery with Docker and Jenkins* »,
- Smart J.F., « *Jenkins: The Definitive Guide: Continuous Integration for the Masses* », 1st edition
- Papapetrou P., « *SonarQube in Action* »,
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- Chokogoue J., « *Hadoop, Devenez opérationnel dans le monde du Big Data* », ENI, 2017
- Lacomme P., Aridhi S., Phan R., « *Bases de données NoSQL et Big Data* », ellipses, 2014

	MODULE DESCRIPTION Web & Mobile Computing Code : GM3.4	Department : Computer Engineering
		Date : 15/10/2021
		N° version : 02
		Semester : 3

Speciality module	Main module	Engineering Sciences and Techniques	Preparation for the profession practices
X			

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Courses	Practical work	Individual work	Volume total
36hrs	27hrs	90hrs	153hrs

Coefficient :	ECTS credits :
4	6

1. DESCRIPTION OF THE COURSE AND COMPETENCES TO BE ACHIEVED

1.1 Description

This course is designed to give students an introduction to the development of mobile and web applications through two open source frameworks. The Flutter framework is used for rapid mobile application development and the Symfony one will be used for web application development.

1.2 Objectives

Students will be able to :

- Learn the life cycle of a mobile application
- Know the components (Views) and how to handle them.
- Develop a mobile application in Android (This application must interact with an external and internal database).
- Use a Framework (Flutter) to develop an Android application.
- Use the best practices of PHP and Symfony 5 development.
- Develop a server side dynamic web application using PHP/Symfony 5.
- Develop an Oriented Object web application based on MVC architecture.

	MODULE DESCRIPTION Web & Mobile Computing Code : GM3.4	Department : Computer Engineering
		Date : 15/10/2021
		N° version : 02
		Semester : 3

- Secure server side web application.
- Rapidly extend Symfony application using PHP packages.
- Prepare APIs and webservice to be consumed by Mobile and/or FrontEnd applications.

2. MODULES AND DEPENDENCIES

<u>Upstream Modules</u>	<u>Taught Module</u>	<u>Downstream Modules</u>
GM1.4: Web & Multimedia & Network I GM2.2 : System Architecture II GM2.3: Algorithms & Programming Fundamentals II	GM3.4: Web & Mobile Computing	GM4.2 : Advanced Web Computing

3. MODULE PLAN

Chapters	Title	Learning outcomes
Chapter 1	Introduction, environment and first Example	The student will know the architecture of the OS The student will install the development environment and create a first example
Chapter 2	Views and layouts	The student will handle the different layouts and components
Chapter 3	Adapters	How to prepare data for display
Chapter 4	SQLITE	Using SQLite as a local database
Chapter 5	Web service and remote database	Interacting with a Web Service and Accessing a Remote Database
Chapter 6	Flutter	The student will create a Mobile application with the Flutter Framework
Practical work	<ul style="list-style-type: none"> - Create a Hello World application - Create a calculator - Create an authentication application - Display the services offered by IPSAS through an adapter (SQLITE) 	

	MODULE DESCRIPTION Web & Mobile Computing Code : GM3.4	Department : Computer Engineering
		Date : 15/10/2021
		N° version : 02
		Semester : 3

Chapters	Title	Learning outcomes
		<ul style="list-style-type: none"> - Modify the application to interact with a web service and an external database - Create an application with Flutter
Chapter 7	From PHP to Web Framework	The student will understand the importance and the need of web framework
Chapter 8	Symfony commands for rapid application développement	The student must master symfony commands to generate an application core rapidly
Chapter 9	Routing and Controllers	The student must be able to configure routing and write a basic controller code
Chapter 10	Managing Forms	The student must be able to create and configure forms classes
Chapter 11	Doctrine ORM	<ul style="list-style-type: none"> - The student must be able to fetch/persist data using Doctrine methods - The student must be able to write custom queries using Doctrine Query Language
Chapter 12	Templating with Twig Engine	The student must be able to write application template to render dynamic contents/data, customize forms and User interface.
Chapter 13	Application Security	<p>The student must be able to configure application security and user roles.</p> <p>The student must be able to create a secure authentication and login forms.</p>
Chapter 14	Rapid BackOffice Développement with EasyAdmin	The student must be able to quickly generate and a fonctionnal backoffice using EasyAdminBundle
Chapter 15	Generating API and Service with API platform	The student must be able to generate secure APIs on symfony application to be consumed by Mobile and Front-End Applications

	MODULE DESCRIPTION Web & Mobile Computing Code : GM3.4	Department : Computer Engineering
		Date : 15/10/2021
		N° version : 02
		Semester : 3

4. ASSESSMENT

Designation	Chapters (s)	Weightening
Mini-project	Chpater9..Chapter12	10%
Practical work	Chpater9..Chapter12	10%
Test	Chapter 3, chapter 6,Chapter 14	10%
Presentation	-	-
Exam	All chapters	70%

5. BIBLIOGRAPHIC RFERENCES

- Leszko R.,« *Continuous Delivery with Docker and Jenkins* »,
- Smart J.F., « *Jenkins: The Definitive Guide: Continuous Integration for the Masses* “,1st edition
- Papapetrou P., « *SonarQube in Action* » ,
- Eychenne Y., Cointot J.C., « *Big data : de la révolution à l'action* », DUNOD, 2014
- Chokogoue J., « *Maîtrisez l'utilisation des technologies Hadoop : initiation à l'écosystème Hadoop* », Eyrolles, 2018
- Bruchez R., « *Les bases de données NoSQL et le Big Data* », Eyrolles, 2015
- Chokogoue J., « *Hadoop, Devenez opérationnel dans le monde du Big Data* », ENI, 2017
- Lacomme P., Aridhi S., Phan R., « *Bases de données NoSQL et Big Data* », ellipses, 2014

	MODULE DESCRIPTION Communication & Engineering Culture 3 Code : GM3.5	Departement : Computer Engineering
		Date : 15/10/2021
		Version : 02
		Semester : 3

Specialty Module	Main Module	Engineering Sciences and Techniques	Preparation for the profession practices
			X

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Courses	Practical works	Individual work	Total volume
42hrs	0hrs	20 hrs	62hrs

Coefficient :	ECTS Credits :
2	2

1. DESCRIPTION OF THE MODULE AND COMPETENCES TO BE ACHIEVED

1.1 : Description

This course allows students to familiarize themselves with business knowledge and French communication skills.

First, basic accounting and financial techniques are presented and discussed. Terminologies like assets, liabilities, equity, expense, and income are explained and the balance sheet and income statements are stated.

Secondly, some communication techniques related to speaking and writing improvement are given and the repetitive exercises to improve quality of CV presentation and job interviews preparation are done.

	MODULE DESCRIPTION Communication & Engineering Culture 3 Code : GM3.5	Departement : Computer Engineering
		Date : 15/10/2021
		Version : 02
		Semester : 3

1.2 Objectives

This course aims to:

- introduce the basic financial statements: balance sheet and income statement, and define their elements: assets, liabilities, equity, expense, income.
- calculate the enterprise's result by the two methods (asset method, transaction method)
- account for the enterprise's current operations in the appropriate accounts;
- draw up annual accounts in simple cases.
- develop student's skills in speaking and writing
- develop student's skills to Well-write CV, e-mail, formal letter, etc.

2. MODULES AND DEPENDENCIES

<u>Upstream Modules</u>	<u>Taught Module</u>	<u>Downstream Modules</u>
GM1.5 : Communication & Engineering Culture I GM2.5 : Communication & Engineering Culture II	GM3.5 : Communication & Engineering Culture III	Professional practices

3. MODULE PLAN

Chapters	Title	Learning outcomes
Chapter 1	Company and accounting	At the end of this chapter, the student should know in particular: - the role of accounting within the company, the users and the objectives of financial statements,

	MODULE DESCRIPTION Communication & Engineering Culture 3 Code : GM3.5	Departement : Computer Engineering
		Date : 15/10/2021
		Version : 02
		Semester : 3

		<p>- the role of a company, its different functions, its partners and the economic flows</p> <p>-The role of accounting within the company, the users and objectives of financial statements.</p>
Chapter 2	The balance sheet and the determination of the result	<p>The student will be able:</p> <ul style="list-style-type: none"> - to present a stable balance sheet (respecting the double-entry principle) at the end of this chapter. In particular, he/she will have to know the different components of a balance sheet by distinguishing between current and non-current items. -to determine the result of the company by the two methods (asset method, transaction method).
Chapter 3	The account	At the end of this chapter, the student will be able to record current business transactions in the appropriate accounts
Chapter 4	The accounting process	<p>At the end of this chapter, the student should be:</p> <ul style="list-style-type: none"> -familiar with the various stages of the accounting process. They will be able to record the enterprise's current operations in the journal, reproduce them in the general ledger, present a balance sheet and control the accounts. He/she will then have to know the different types of errors in accounting (arithmetical errors, imputation errors, non-exhaustiveness, double recording) and the different methods of rectifying errors in the journal (reversal method, transfer method, zero complement method, negative cancellation method).
Chapter 5	Communication in the company	The student masters the characteristics, forms, types and networks of communication within the company.
Chapter 6	The memorandum	The student is able to write a memo.

	MODULE DESCRIPTION Communication & Engineering Culture 3 Code : GM3.5	Departement : Computer Engineering
		Date : 15/10/2021
		Version : 02
		Semester : 3

Chapter 7	The briefing note	The student is able to write a briefing note.
Chapter 8	The circular	The student is able to write a circular
Chapter 9	The e-mail	The student is able to write a professional email
Chapter 10	The oral presentation	The student masters the techniques of public speaking.

4. ASSESSMENT

Designation	Chapters (s)	Weighting
Mini-project		
Practical work		
Test		25%
Presentation	-	-
Exam	All chapters	75%

5. BIBLIOGRAPHIC REFERENCES

- Ayed A. (2002), Comptabilité générale de l'entreprise Tome 1, Principes de base et enregistrement des opérations courantes, Edition C.L.E.
- Ayed A. (2002), "Comptabilité générale de l'entreprise Tome 2" , Travaux comptables de fin d'exercice, Edition C.L.E.
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	MODULE DESCRIPTION Communication & Engineering Culture 3 Code : GM3.5	Departement : Computer Engineering
		Date : 15/10/2021
		Version : 02
		Semester : 3

- Fayel A. and Pernot D. (1998), Comptabilité générale de l'Entreprise, DPECF n° 4, coll. « Expert Sup», Dunod.
- Nikitin M. and Régent M-O. (1999), Introduction à la comptabilité, 2ème Edition, Armand colin.
- Plan des comptes (2000), Edition C.L.E.Thabet K. (1997), "Comprendre le nouveau système comptable des entreprises", Collection Manuels.
- Yaich A. (2000), "Préparation et présentation des états financiers", éditions Raouf Yaich.
- Bouquet, Brigitte. "Diversité et enjeux des écrits professionnels", Vie sociale, vol. 2, no. 2, 2009, pp. 81-93.
- Joly, Bruno. "La communication en entreprise", La communication. Sous la direction de Joly Bruno. De Boeck Supérieur, 2009, pp. 69-129.
- Leibovitz, Annie. "La boîte à outils pour prendre la parole en public". Dunod, 2020
- Riffault, Jacques. "La formation aux écrits professionnels : présentation d'un dispositif pédagogique ouvert à la question du sens", Vie sociale, vol. 2, no. 2, 2009, pp. 71-80.

	MODULE DESCRIPTION Business Intelligence Code : GM4.1	Department : Computer Engineering
		Date : 15/10/2021
		N° version : 02
		Semester : 4

Speciality module	Main module	Engineering Sciences and Techniques	Preparation for the profession practices
X			X

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Courses	Practical works	Individual works	Volume total
69h	42h	120h	231h

Coefficient :	ECTS credits :
6	9

1. DESCRIPTION OF THE COURSE AND COMPETENCES TO BE ACHIEVED

1.1 Description

This course is set up to allow students to familiarize themselves with basic tools and technologies useful in the development of software applications for workflow digitization and management for companies. First, database management systems are put forward by retaining Oracle as the supporting database management system. Students are encouraged to discover the technical architecture of the Oracle database server, to master user management (profiles, roles, and privileges), to handle tablespaces and data files, to manage the Oracle database instance and listening processes, to test database backup and recovery techniques, and to understand Oracle database optimization techniques.

Secondly, enterprise resource planning (ERP) systems are put forward and Odoo is retained as supporting ERP. Students are encouraged to understand the basis of software integration, to master the integration lifecycle, and to understand the Odoo architecture and master the development and integration of new software modules on Odoo.

	MODULE DESCRIPTION Business Intelligence Code : GM4.1	Department : Computer Engineering
		Date : 15/10/2021
		N° version : 02
		Semester : 4

Thirdly, artificial intelligence is introduced. Students are led to learn and to formalize problems. They are also led to develop strategies for optimal solutions, to apply an uninformed search algorithm (Like A* one) for optimal action plans search. Moreover, this part of the course allows students to familiarize themselves with theoretical and practical aspects of machine learning, learning algorithms, and artificial neural networks. They are led to manipulate the TensorFlow library, implement neural architectures, and study convolutional neural networks, autoencoders, GANs, etc.

In summary, it is about teaching students basic tools allowing them not only to create applications for the digitization of the company's internal management workflows but also to analyze the data to help the company make decisions.

1.2 Objectives

- Assimilate the fundamental notions related to the DB administration domain.
- Understand the technical architecture of the Oracle DB server
- Master the management of users, roles and privileges
- Master the management of user profiles
- Handle tablespaces and data files
- Manage the Oracle DB instance and listening processes
- Handle control files and log files
- Test database backup and recovery techniques
- Understand Oracle DB optimization techniques
- Understand the principle of software integration
- Master the Software Integration Life Cycle
- Understand the architecture of the Odoo ERP
- Master the integration on Odoo
- Learn how to formalize problems and develop optimal solution search strategies,
- Apply the A* algorithm on examples of problems to find optimal action plans, compare between different variants of the algorithm,
- Apply the STRIPS language to formalize abstract action plans, apply the solution algorithms on STRIPS-type problems,
- Study machine learning, the theoretical foundations and algorithms of machine learning and artificial neural networks,
- Handle the TensorFlow library to implement neural architectures,
- Study convolutional neural networks, auto-encoders, GANs...

	MODULE DESCRIPTION Business Intelligence Code : GM4.1	Department : Computer Engineering
		Date : 15/10/2021
		N° version : 02
		Semester : 4

2. MODULES AND DEPENDENCIES

<u>Upstream Modules</u>	<u>Taught Module</u>	<u>Downstream Modules</u>
GM2.2 : System Architecture II GM2.3 : Algorithms & Programming Fundamentals II GM3.2 : Advanced Information Systems GM4.3 : Advanced Software Development	GM4.1 : Business intelligence	GM5.2 : Advanced Software Engineering GM5.2 : Industry 4.0

3. MODULE PLAN

Chapters	Title	Learning outcomes
Chapter 1	Introduction to DB administration and security	Student will be able to assimilate the fundamental notions related to the field of DB administration.
Chapter 2	General Oracle Architecture	Student will be able to understand the technical us for the architecture of the Oracle DB server
Chapter 3	Managing users, roles and privileges	Student will be able to master the management of users, roles and privileges
Chapter 4	User profile management	Student will be able to master the management of user profiles
Chapter 5	Tablespace and data file management	Student will be able to handle tablespaces and data files
Chapter 6	Instance management and listening processes	Student will be able to manage the Oracle DB instance and listening processes
Chapter 7	Management of control files and log files	Student will be able to handle control files and log files
Chapter 8	Backup and recovery	Student learn how to test database backup and learn about recovery techniques use
Chapter 9	Oracle Optimisation	Student will understand Oracle DB optimization techniques
Practical work	<ul style="list-style-type: none"> - User management, roles and privileges, profiles - Tablespace and data file management - Instance and listening process management - Management of control files and log files - Backup and recovery - Oracle optimization 	

	MODULE DESCRIPTION Business Intelligence Code : GM4.1	Department : Computer Engineering
		Date : 15/10/2021
		N° version : 02
		Semester : 4

Chapters	Title	Learning outcomes
Chapter 10	Using the Odoo framework (Task Management Application)	Student will be able to reuse a basic module and create a new module using the odoo framework
Chapter 11	Installation of the Odoo development environment	Student will be able to prepare the development environment
Chapter 12	Creation of a new module (Library Project: Management of books, publishers, authors and implementation of the ISBN check method)	Student will be able to create a new module using the development environment
Chapter 13	Extension of a module (Library Project: Membership Management)	Student will be able to reuse a basic module using the development environment
Chapter 14	Import, Export and Module Data (Library Project: Demo Data)	Student will be able to use the odoo data import and export tool and add demo data,
Chapter 15	Structuring application data (Library Project: Application Improvement)	Student will be able to structure the data application
Chapter 16	Recordsets - Using model data	Student will be able to use Recordsets
Chapter 17	Business logic (Library project: Borrowing/return management)	Student will be able to implement the project's business logic,
Practical works	PW1 : Implement the "Task Management" project using the Odoo framework Use the framework odoo	
	PW2 : Installation of Docker, Pycharm. Creation of the docker compose script. Installation of the docker plugin on pycharm. Prepare a development environment	
	PW3 :Creation of the Book Management module and the Publisher Management module) Create an odoo module using the development environment	
	PW4 : Creation of the Author Management module and implementation of the check ISBN method Implement the relationship between odoo models	
	PW5 : Creation of the Member Management module by extending the basic Contact module. Reuse a basic odoo module	
	PW6 :Importation, exportation et données de démonstration des modules créés Automate the installation of demo data in odoo	
	PW7 : Improvement of the application by structuring the application data Improve the quality of an odoo application,	
	PW8 : Use of model data (Recordsets) Using odoo template data	
	PW9 : Implement the borrowing/return process Using odoo's workflow engine	

	MODULE DESCRIPTION Business Intelligence Code : GM4.1	Department : Computer Engineering
		Date : 15/10/2021
		N° version : 02
		Semester : 4

Chapters	Title	Learning outcomes
Chapter 18	Search for solutions, heuristic search	
Chapter 19	Algorithm A*	
Chapter 20	STRIPS: Solving planning problems	
Chapter 21	Heuristics for solving planning problems	
Chapter 22	Formal logic	
Chapter 23	PROLOG	
Chapter 24	Neural networks and automatic recognition	
Chapter 25	Gradient descent	
Chapter 26	Gradient backpropagation, machine learning	
Chapter 27	Convolutional neural networks	
Chapter 28	Tensorflow (linear and polynomial regression, automatic classification)	
Chapter 29	Convolutional neural networks	

4. ASSESSMENT

Designation	Chapters (s)	Weighting
Mini-project		10%
Practical work	Chapter19..Chapter22	10%
Test	Chapter 2, chapter 3 ,Chapter 1 Chapter 12, Chapter 15, Chapter19	10%
Presentation		
Exam	All chapters	70%

5. BIBLIOGRAPHIC REFERENCES

- Leszko R., « *Continuous Delivery with Docker and Jenkins* »,
- Smart J.F., « *Jenkins: The Definitive Guide: Continuous Integration for the Masses* », 1st edition
- Papapetrou P., « *SonarQube in Action* »,
- Eychenne Y., Cointot J.C., « *Big data : de la révolution à l'action* », DUNOD, 2014
- Chokogoue J., « *Maîtrisez l'utilisation des technologies Hadoop : initiation à l'écosystème Hadoop* », Eyrolles, 2018
- Bruchez R., « *Les bases de données NoSQL et le Big Data* », Eyrolles, 2015
- Chokogoue J., « *Hadoop, Devenez opérationnel dans le monde du Big Data* », ENI, 2017
- Lacomme P., Aridhi S., Phan R., « *Bases de données NoSQL et Big Data* », ellipses, 2014

	MODULE DESCRIPTION Advanced Web Computing Code : GM4.2	Department : Computer Engineering
		Date : 15/10/2021
		N° version : 02
		Semester : 4

Speciality module	Main module	Engineering Sciences and Techniques	Preparation for the profession practices
X			X

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Courses	Practical works	Individual works	Volume total
63hrs	36hrs	110hrs	209hrs

Coefficient :	ECTS credits :
6	8

1. DESCRIPTION OF THE COURSE AND COMPETENCES TO BE ACHIEVED

1.1 Description

This course is set up to teach students how to create a web application with its back-end and front-end parts. Virtualization of hardware execution is also presented to allow students to assimilate the basic concepts related to the environment for deploying web applications on a virtualized remote infrastructure.

Initially, the development of web services in Java is highlighted. Particular attention is given to SOAP web services, REST web services, and the types of data representation exchanged between the producer (back-end) and the consumer (front-end), namely XML and JSON. In the case of each of the two styles of web services, the student will be required to design and develop them with Java.

Secondly, the Angular framework is chosen for the development of the front-end part. The learning begins with an overview of the Angular framework and its advanced mechanisms with the implementation of a client REST server for querying REST API web services end-point.

	MODULE DESCRIPTION Advanced Web Computing Code : GM4.2	Department : Computer Engineering
		Date : 15/10/2021
		N° version : 02
		Semester : 4

Third, infrastructure virtualization and web application deployment takes place. This is to present the principles and tools of virtualization of hardware infrastructures. Special attention is given to virtualization in a cloud environment.

In summary, through this module, the aim is to train students to become full-stack web application developers with additional skills relating to the deployment and outsourcing of "virtualized" infrastructures.

1.2 Objectives

- Organize and modularize JavaScript developments with a framework
- Discover the features of the Angular Framework
- Know how to develop a new adaptive Web application
- Know the advanced mechanisms of the Angular Framework
- Use and consume a REST API web service
- Acquire skills in the area of SOAP extended web services
- Design and develop SOAP web services with JAVA
- Acquire skills in Restful web services
- Design and develop Restful web services with JAVA
- Understand the concepts of virtualization
- Discover the different virtualization technologies
- Discover the types of clouds, their architectures and examples of clouds
- Understand the concepts of virtualization
- Discover the different virtualization technologies
- Discover the types of clouds, their architectures and examples of clouds

2. **MODULES AND DEPENDENCIES**

<u>Upstream Modules</u>	<u>Taught Module</u>	<u>Downstream Modules</u>
GM1.2 : System Architecture I GM1.3 : Algorithms & Programming Fundamentals I GM1.4 : Web & Multimedia & Networks I GM2.3 : Algorithms & Programming Fundamentals II GM3.3 : Software Engineering & Development	GM4.2 : Advanced Web Computing	GM5.3 : Industry 4.0

	MODULE DESCRIPTION Advanced Web Computing Code : GM4.2	Department : Computer Engineering
		Date : 15/10/2021
		N° version : 02
		Semester : 4

3. MODULE PLAN

Chapters	Title	Learning Outcomes
Chapter 1	Presentation of frontend frameworks	Student will be able to implement JavaScript application using a framework
Chapter 2	Framework Angular : architecture and routing system	Student will be able to describe the architecture of the Angular Framework
Chapter 3	Framework Angular : Responsive form and JavaScript	Student could build a form with responsive JavaScript
Chapter 4	Framework Angular : Consumption of a REST API web service	Student could use a RESTFUL web service
Practical Works	PW1 : Getting started with Angular PW2 : Communication: DataBinding PW3 : Routing information PW4 : Directives and Pipes PW5 : Consumption of a Restful API Student will be able to develop a rich adaptive web application through the Angular Framework	
Chapter 5	Introduction to web services	Student will acquire knowledge about service-oriented architecture and mainly the difference between Client/Server and Web-based architectures
Chapter 6	Database repairing	Student will manipulate data in XML and Json format
Chapter 7	SOAP Extended Type Web Services	Student will know the namespace, the concept of extended web services (WSDL, SOAP, UDDI) and will see a first example
Chapter 8	JAVAX.WS	Student will employ the java library JAVAX.ws which allows to create a web service and to use it by a client
Chapter 9	Web Services of Type Restful	Student will be able to define the http protocol and its methods Restful web services
Chapter 10	JAVAX.RS	Student will be able to create a mobile application with the Flutter Framework

	MODULE DESCRIPTION Advanced Web Computing Code : GM4.2	Department : Computer Engineering
		Date : 15/10/2021
		N° version : 02
		Semester : 4

Chapters	Title	Learning Outcomes
Practical works	<ul style="list-style-type: none"> - Defining The Json representation - Creating SOAP web services - Creating a Java client application to consume the SOAP web service - Creating a PHP client application to consume the SOAP web service - Creating a Restful web service. - Creating a Java client application to consume the RESTFUL web service - Creating a PHP client application to consume the RESTFUL web service 	
Chapter 11	Principles of virtualization	Student will be able to : <ul style="list-style-type: none"> - To know how to define the concept of virtualization, - Learn about the areas of virtualization, - Identify the advantages and disadvantages of virtualization, - Understand the different types of virtualization
Chapter 12	Virtualization : Case study	Student will be able to make the choice between different solutions of virtualization of hardware infrastructures using: <ul style="list-style-type: none"> - XEN -KVM -VMware ESX - Hyper-V - OpenVZ - LXC - Proxmox
Chapter 13	Cloud Computing	Student will be able to : <ul style="list-style-type: none"> - Understand the concepts of cloud computing and its benefits - recognise the different architectures and typologies of clouds
Chapter 14	Cloud Computing : Case Study	Student will acquire knowledge concerning:

	MODULE DESCRIPTION Advanced Web Computing Code : GM4.2	Department : Computer Engineering
		Date : 15/10/2021
		N° version : 02
		Semester : 4

Chapters	Title	Learning Outcomes
		- different opensource and paid cloud solutions: - Openstack - Amazon Cloud - Google Cloud - Microsoft Azur
Practical works	PW1: Deployment of a complete virtualization solution based on Proxmox VE PW2: Deployment of an isolator virtualization solution based on OpenVZ PW3: Deployment and testing of Openstack	

4. ASSESSMENT

Designation	Chapters (s)	Weightening
Mini-project	Chpater5..Chapter10	10%
Practical work	Chpater5..Chapter10	10%
Test	Chapter 2, chapter 3 ,Chapter 8 Chpater 9, Chapiter13	10%
Presentation		
Exam	All chapters	70%

5. BIBLIOGRAPHIC RFERENCES

- Leszko R.,« *Continuous Delivery with Docker and Jenkins* »,
- Smart J.F., « *Jenkins: The Definitive Guide: Continuous Integration for the Masses* “,1st edition
- Papapetrou P., « *SonarQube in Action* » ,
- Eychemme Y., Cointot J.C., « *Big data : de la révolution à l'action* », DUNOD, 2014
- Chokogoue J., « *Maîtrisez l'utilisation des technologies Hadoop : initiation à l'écosystème Hadoop* », Eyrolles, 2018
- Bruchez R., « *Les bases de données NoSQL et le Big Data* », Eyrolles, 2015
- Chokogoue J., « *Hadoop, Devenez opérationnel dans le monde du Big Data* », ENI, 2017
- Lacomme P., Aridhi S., Phan R., « *Bases de données NoSQL et Big Data* », ellipses, 2014

	MODULE DESCRIPTION Advanced Software Development Code : GM4.3	Department : Computer Engineering
		Date : 15/10/2021
		N° version : 02
		Semester : 4

Speciality module	Main module	Engineering Sciences and Techniques	Preparation for the profession practices
X			X

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Courses	Practical works	Individual works	Volume total
84hrs	42hrs	120hrs	246hrs

Coefficient :	ECTS credits :
8	8

1. DESCRIPTION OF THE COURSE AND COMPETENCES TO BE ACHIEVED

1.1 Description

This course is set up to boost the software engineering skills of students. It begins by equipping students with the most used design patterns in order to enable them to understand and design software according to good design practices and to find standard solutions to classic and recurrent software engineering problems.

The remainder of the module is devoted to an overview of two software development technologies, namely .NET / C # and Java EE. The .NET framework is in fact put forward. A presentation of the architecture of the .NET framework and the C # language is done and particular attention is paid to the collections management, databases connection with ADO.NET. The LINQ query language and the ORM entity framework are also highlighted.

Subsequently, Java EE technology takes place and the Spring framework is in fact put forward. A presentation of the Java EE architecture, the concept of dependency injection, and the data persistence concepts are done and a study of the Spring framework is highlighted.

	MODULE DESCRIPTION Advanced Software Development Code : GM4.3	Department : Computer Engineering
		Date : 15/10/2021
		N° version : 02
		Semester : 4

In summary, through this course, the aim is to train students for a job in software engineering on the basis of two technologies, namely .NET / C # and Java EE.

In summary, the aim of this module is to train students in software engineering based on two technologies, namely .NET/C# and Java EE.

1.2 Objectives

- Develop applications with the C# language with mastery of object concepts, collection management, data access techniques such as Linq, Ado.net, Entity Framework and
- Serialization/deserialization of data.
- Develop a web application with JAVA
- Implement a JAVA distributed software architecture
- Discover the JAVA solution for JEE enterprise applications
- Present the JEE architecture (components, containers, specifications, API...)
- Master the notion of dependency injection
- Implement a JEE application with the Spring framework
- Build a persistence module with the JPA API (Hibernate, Spring DATA)
 - o a web module with Spring Web
 - o Build an MVC model with Spring MVC and the Tymeleaf engine
 - o Realize the data validation
 - o Develop a REST web service and test it

2. MODULES AND DEPENDENCIES

<u>Upstream Modules</u>	<u>Taught Module</u>	<u>Downstream Modules</u>
GM2.2 : System Architecture II GM2.3 : Algorithm & Programming Fundamntals II GM3.2 : Advanced Information System GM3.3 : Software Engineering & Development GM4.2 : Advanced Web Computing	GM4.3 : Advanced Software Development	GM5.2 : Advanced Software Engineering

	MODULE DESCRIPTION Advanced Software Development Code : GM4.3	Department : Computer Engineering
		Date : 15/10/2021
		N° version : 02
		Semester : 4

3. MODULE PLAN

Chapters	Title	Learning outcomes
Chapter 1	History & Motivation	Student will be able to discover design patterns
Chapter 2	the pattern « Strategy »	Student will be able to model the "Strategy" pattern
Chapter3	the pattern «Observe »	Student will be able to model the " Observe " pattern
Chapter4	the pattern «Decorator»	Student will be able to model the " Decorator " pattern
Chapter5	the pattern «Factory»	Student will be able to model the " Factory " pattern
Chapter6	the pattern «Singleton»	Student will be able to model the " Singleton " pattern
Chapter7	the pattern «Command»	Student will be able to model the "Command " pattern
Chapter 8	the pattern «Adapter»	Student will be able to modeling the " Adapter " pattern
Chapter 9	the pattern «Front»	Student will be able to modeling the " Front " pattern
Chapter 10	Review & Summary	Student will be able to module utility evaluation
Practical works	Implementation of the different design patterns	Student will be able to implement the patterns strategy, Observer, Decorator, Factory, singleton, Command, Adapter et Front
Chapter 11	Introduction to the .NET Framework	Student will acquire knowledge about the .NET Framework and its architecture
Chapter 12	Basic syntax of the C# language	Student will know how to manipulate the basic instructions of the C# language and write complex programs.
Chapter 13	Commonly used .NET classes	Student will acquire knowledge about the use the Framework classes to solve problems.
Practical works	Object concepts in C#	Student will apply the language's object concepts in a .NET application
Chapter 14	Collection management	Student will acquire knowledge to manipulate collections of objects of type List, ArrayList, Queue
Chapter 15	Accessing databases with ADO.NET	Student will able to develop an application with access to a database via ADO.NET
Chapter 16	The LINQ query language	Student could interrogate data through specific LINQ methods.
Chapter 17	The ORM Entity Framework	Student could access databases with Entity Framework in a .NET application and master the techniques used by the ORM.
Chapter 18	File management and data serialisation	Student could write programs using text or binary files, xml, json and apply the concept of serialization.

	MODULE DESCRIPTION Advanced Software Development Code : GM4.3	Department : Computer Engineering
		Date : 15/10/2021
		N° version : 02
		Semester : 4

Chapters	Title	Learning outcomes
Practical works	PW1: basic syntax Handling the basic syntax of C#	
	PW2: Object concepts and collection management Applying the object concepts of the C# language in a .NET application	
	PW3: ADO.NET data access technique Developing an application with access to a database with ADO.NET	
	PW4: The LINQ query language Querying data sources such as collections, xml files or databases.	
	PW5: Entity Framework Handling the Entity Framework relational object mapping tool for database access.	
Chapter 19	Application web JAVA	Student will be able to handle the web components of a JAVA application
Chapter 20	JEE architecture (containers, components, specifications, API...)	<ul style="list-style-type: none"> -JEE concepts - JEE benefits - JEE container types - List of APIs - Global JEE architecture
Chapter 21	The concept of dependency injection	Student will be able to master the principle of dependency injection (static, dynamic, by XML file, by annotations)
Chapter 22	Data persistence : JPA	Student will be able to develop JPA entities by : <ul style="list-style-type: none"> - Using the JPA entity validation API - Handling Object/Relational Mapping (ORM) - Mapping association relationships (OneToOne, OneToMany, ManyToOne, ManyToMany) - Mapping the notion of inheritance between entities Managing the concept of repository <ul style="list-style-type: none"> - Realising query methods - Handling the HQL language
Practical works	-The Spring framework : <ul style="list-style-type: none"> - Benefits of Spring - Spring Concepts - Spring Structure - Spring modules Building a JEE application with the Spring framework PW1 : Create a MAVEN project to manage the dependencies PW2 : Manage the persistence part (JPA, Hibernate, Spring DATA) <ul style="list-style-type: none"> -Developing JPA entities -Using the API for validating JPA entities -Handling Object/Relational mapping (ORM) -Mapping association relationships (OneToOne, OneToMany, ManyToOne, ManyToMany) 	

	MODULE DESCRIPTION Advanced Software Development Code : GM4.3	Department : Computer Engineering
		Date : 15/10/2021
		N° version : 02
		Semester : 4

Chapters	Title	Learning outcomes
		-Mapping the notion of inheritance between entities -Managing the concept of repository -Realising query methods -Handling the HQL language PW3 : Developing the business part of an enterprise application PW4 : Developing the web components (controllers and presentation web pages) PW5 : Using the Thymeleaf engine and Spring MVC to improve the layout of web pages and implement an MVC model PW 6 :Using layouts to manage the layout of web graphical elements PW7 : Managing data pagination Develop and test REST web services with the ARC tool

4. ASSESSMENT

Designation	Chapters (s)	Weightening
Mini-project		
Practical work	Chpater19..Chapter22	20%
Test	Chapter 2, chapter 3 ,Chapter 1 Chpater 12, Chapiter 15, Chapter19	20%
Presentation		
Exam	All chapters	60%

5. BIBLIOGRAPHIC REFERENCES

- Leszko R.,« *Continuous Delivery with Docker and Jenkins* »,
- Smart J.F., « *Jenkins: The Definitive Guide: Continuous Integration for the Masses* »,1st edition
- Papapetrou P., « *SonarQube in Action* » ,
- Eychenne Y., Cointot J.C., « *Big data : de la révolution à l'action* », DUNOD, 2014
- Chokogoue J., « *Maîtrisez l'utilisation des technologies Hadoop : initiation à l'écosystème Hadoop* », Eyrolles, 2018
- Bruchez R., « *Les bases de données NoSQL et le Big Data* », Eyrolles, 2015
- Chokogoue J., « *Hadoop, Devenez opérationnel dans le monde du Big Data* », ENI, 2017
- Lacomme P., Aridhi S., Phan R., « *Bases de données NoSQL et Big Data* », ellipses, 2014

	MODULE DESCRIPTION Communication & Engineering Culture IV Code : GM4.4	Departement : Computer Engineering
		Date : 15/10/2021
		Version : 02
		Semester : 4

Specialty Module	Main Module	Engineering Sciences and Techniques	Preparation for the profession practices
		X	

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Courses	Practical works	Individual work	Total volume
42hrs	0hrs	15hrs	57hrs

Coefficient :	ECTS Credits:
2	2

1. MODULE DESCRIPTION AND COMPETENCES TO BE ACHIEVED

1.1 Description

This course focuses on business topics and enhances the communicative skills of the students, as well as his writing and reading competences. It enables the students to get accustomed to English expressions and structures in the field of business, use them properly and help him to produce in an oral and a written way. e-commerce, negotiating, and dealing with customers, are topics presented in this part.

In a second part, knowledge about legal rules governing the computer contract and the relationship between the computer professional and his client are presented. In fact, this part enables the student to recognize the legal rules of intellectual property protection against trademark in business and investment fields.

	MODULE DESCRIPTION Communication & Engineering Culture IV Code : GM4.4	Departement : Computer Engineering
		Date : 15/10/2021
		Version : 02
		Semester : 4

1.2 Objectives

The student will be able to :

- develop basic skills to deal with people in business context.
- acquiring the competence of communicating in business oriented contexts.
- highlight knowledge on e-commerce, persuasive language, and problem solving. .
- developed its communication skills and reach B2 level in the four skills
- be prepared to the professional life.
- to know the legal rules organising and the relationship between the different parties in the professional environment and to protect oneself against trademark infringements in the IT field.

2. MODULES AND DEPENDENCIES

<u>Upstream Modules</u>	<u>Taught Module</u>	<u>Downstream Modules</u>
GM2.5 Communication & Engineering Culture II	GM4.4 Communication & Engineering Culture IV	

3. MODULE PLAN

Chapter	Title	Learning outcomes
Chapter 1	E-commerce	Student will be able to: - be familiar with the world of e-commerce and e-trade. - be familiar with internet terms,
Chapter 2	Raising finance	Student will be able to: - use the language and structures of negotiating. - be familiar with idiomatic expressions related to finance. - write e-mails to respond to given situations.
Chapter 3	Customer service	Student will be able to: - know on what customers complain about. - handle complaints. - write a report.
Chapter 4	Revision and practice	Student will be able to: - wrap-up all vocabulary and grammatical points.

	MODULE DESCRIPTION Communication & Engineering Culture IV Code : GM4.4	Departement : Computer Engineering
		Date : 15/10/2021
		Version : 02
		Semester : 4

Chapter	Title	Learning outcomes
		- practice written exercises: Writing reports/ answering e-mails of complaints.
Presentations	In every class a group of students should write about and introduce a chosen topic in a presentation.	
Chapter 6	Introduction	Student will be able to: <ul style="list-style-type: none"> - know what computer law . - identify the sources of computer law
Chapter 7	The specifics of the IT contract	Student will be able to: <ul style="list-style-type: none"> - Know the specificities of IT contracts in terms of their formation and execution
Chapter 8	Execution of the IT contract	Student will be able to: <ul style="list-style-type: none"> - know the forms of non-performance of the IT contract and the sanctions that go with it.
Chapter 9	The protection of computer inventions in the context of literary and artistic property	Student will be able to: <ul style="list-style-type: none"> -Know the general principles of the protection of artistic and literary works -Determine the owner of a right to protection of a literary and artistic work.
Chapter 10	Computer inventions protected under industrial property law	Student will be able to: <ul style="list-style-type: none"> - know the different types of industrial property - know the formal and substantive conditions for the protection of an industrial property - Define what is a trademark infringement and what are the criteria of mimicry

4. Assessment:

Designation	Chapters (s)	Weighting
Mini-project		
Practical work		
Test	Chapter 2, chapter 3 ,Chapter 7 Chpater 8	25%
Presentation		
Exam	All chapters	75%

5. Bibliographic references

- D. Cotton., D. Falvey., S. Knet ., "Market leader: Intermediate Practice File", ed Longman.
- O. Josephine. "English for Business". Ed, Thomson Heiln.
- J. Walker, (Ed), "Practice tests for the Bec preliminary, Students' book.", Express Publishing.

	MODULE DESCRIPTION Communication & Engineering Culture IV Code : GM4.4	Departement : Computer Engineering
		Date : 15/10/2021
		Version : 02
		Semester : 4

- P. Strutt, *“Business Grammar and Usage”*. Longman.
- C. Ethani BARNAT, *“cours droit de l’informatique”*, Université de la Manouba, Ecole Supérieure d’Economie Numérique, Année universitaire 2014/2015.
- S. Dhaoui, *“code des obligations et des contrats : interprétation, commentaires et jurisprudence”*, Groupe Latrach du livre spécialisé, Tunis, 2009.
- M. Ben Jamii, *“cours du droit de la propriété intellectuelle”*, faculté des sciences juridiques, politiques et sociales Tunis III, année universitaire 2002-2003.
- M. El Kachoua, *“commentaire de l’arrêt de cassation n°72601 du 23-10-2019”*, colloque de l’investissement, Sfax, 2020.

	MODULE DESCRIPTION Data Science & Engineering Code : GM5.1	Department : Computer Engineering
		Date : 15/10/2021
		N° version : 02
		Semester : 5

Speciality module	Main module	Engineering Sciences and Techniques	Preparation for the profession practices
	X		X

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Courses	Practical works	Individual works	Volume total
42h	18h	100h	160h

Coefficient :	ECTS credits :
4	6

1. DESCRIPTION OF THE COURSE AND COMPETENCES TO BE ACHIEVED

1.1 : Description

This course is designed with the aim of training students in data science & engineering and data warehouse.

First, data science is introduced with an emphasis on the workflow and the conduct of data science projects followed by a data scientist. The two types of context that a data scientist can face are presented, namely the context of regression and the context of classification. Two types of regression are then presented and discussed (linear and polynomial) with the associated model evaluation methods. The problems of supervised and unsupervised classification are also discussed and some classification algorithms are exposed and experimented on a test dataset.

Secondly, data warehouses take place. Multidimensional modeling and data warehouse design are presented and some basic concepts related to data mining are explained.

This course ends with a workshop allowing students to understand the leading business intelligence projects.

	MODULE DESCRIPTION Data Science & Engineering Code : GM5.1	Department : Computer Engineering
		Date : 15/10/2021
		N° version : 02
		Semester : 5

1.2 Objectives

The student engineer will be able :

- to conduct a business intelligence project
- to analyze data and transform it into operational information
- to enable business managers and non-technical users to make decisions

2. MODULES AND DEPENDENCIES

<u>Upstream Modules</u>	<u>Taught Module</u>	<u>Downstream Modules</u>
GM2.1 : Fundamental & Applied Mathematics GM2.2 : System Architecture II GM2.5 : Communication & Engineering Culture GM3.2 : Advanced Information Systems GM4.1 : Business Intelligence	GM5.1 : Data Science & Engineering	Professional Practices

3. MODULE PLAN

Chapters	Title	Learning outcomes
Chapitre 1	Introduction à la science des données	Introduction et motivation. Type d'apprentissages automatiques. Cycle de vie d'un projet Data Science.
Chapitre 2	Apprentissage supervisé : Régression	Régression linéaires simple et multiple. Régression polynomiale. Evaluation de la performance des modèles de régressions. Features selection. Backward elimination.
Chapitre 3	Apprentissage supervisé : Classification	Classification. Régression logistique. <i>k</i> -plus proches voisins. Machine à vecteurs de support. Arbre de décision. Evaluation de la performance des modèles de classifications.

	MODULE DESCRIPTION Data Science & Engineering Code : GM5.1	Department : Computer Engineering
		Date : 15/10/2021
		N° version : 02
		Semester : 5

Chapters	Title	Learning outcomes
		Bagging et Boosting. Features selection.
Chapitre 3	Apprentissage non supervisé	Clustering k-Means. Clustering hiérarchique. Analyse de la composante principale.
Travaux Pratiques	Apprentissage supervisé (classification et régression). Apprentissage non supervisé.	Prédiction du Churn des clients. Prédiction du profit des startups. Segmentation des clients.
Chapitre 4	Problématique de l'entreprise pour la prise de décision	Déterminer le besoin des entreprises pour la prise de décision
Chapitre 5	Modélisation multidimensionnelle et conception des entrepôts	Concevoir et modéliser un entrepôt de données
Chapitre 6	Conduite d'un projet de Business Intelligence (ETL, OLAP, Reporting)	Connaître les étapes de mise en place d'un projet de business intelligence
Chapitre 7	Data Mining ou fouille de données	Connaître les différents modèles et techniques de fouille de données
Travaux Pratiques	Conduite d'un projet de business intelligence	Etre capable de mener un projet de business intelligence

4. ASSESSMENT

Designation	Chapters (s)	Weightening
Mini-project	-	10%
Practical work	All chapters	10%
Test	Chapters 1-4	10%
Presentation	-	-
Exam	All chapters	70%

5. BIBLIOGRAPHIC REFERENCES

- R. Kimball œ L. Reeves œ M. Ross œ W.Thorthwaite « *Concevoir et déployer un data warehouse, Guide de conduite de projet* », Eyrolles, 2000
- R. Kimball, « *Entrepôts de données, Guide pratique du concepteur de data warehouse* », Thomson Publishing (WILEY), 1996
- J.-M. Franco ,S. de Lignerolles , « *Piloter l'entreprise grâce au data warehouse* », Eyrolles
- J.-M. Franco « *Le Data warehouse, Le data Mining* », Eyrolles
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- C. Noirault, « *Business Intelligence avec Oracle 10g* »
- B. Burquier, « *Business intelligence avec SQL Server* »
- A.C. Muller, S. Guido, "*Introduction to Machine Learning with Python*", Edition O'Reilly
- A. Géron, "*Hands-On Machine Learning with Scikit-Learn & Tensorflow*", Edition O'Reilly

	MODULE DESCRIPTION Data Science & Engineering Code : GM5.1	Department : Computer Engineering
		Date : 15/10/2021
		N° version : 02
		Semester : 5

- E. Biernat, M. Lutz, *"Data Science: fondamentaux et études de cas"*, Edition EYROLLES
- J. VanderPlas, *"Python Data Science Handbook"*, Edition O'Reilly
-

	MODULE DESCRIPTION Advanced Software Engineering Code : GM5.2	Department : Computer Engineering
		Date : 15/10/2021
		N° version : 02
		Semester : 5

Speciality module	Main module	Engineering Sciences and Techniques	Preparation for the profession practices
X			X

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Courses	Practical works	Individual works	Volume total
102hrs	54hrs	170hrs	326hrs

Coefficient :	ECTS credits :
8	12

1. DESCRIPTION OF THE COURSE AND COMPETENCES TO BE ACHIEVED

1.1 : Description

This course is designed to deepen the knowledge and skills of students in software engineering. This is a course that is mainly based on the GM3.2 GM 3.3 GM4.3 courses taken during semesters 3 and 4. The knowledge acquired on .NET technologies, Java EE, and databases and database management systems are refreshed and boosted by adding other advanced knowledge and skills related to software behavioral analysis and testing, database optimization, and agile software development methods. Particular attention is given to ASP.NET core MVC technology for the development of web applications, and to ASP.NET Web API technology for the development of REST-type web services.

In summary, at the end of this course, students will be able to have the knowledge and skills necessary to lead a full-stack software development project based on .NET technologies.

	MODULE DESCRIPTION Advanced Software Engineering Code : GM5.2	Department : Computer Engineering
		Date : 15/10/2021
		N° version : 02
		Semester : 5

1.2 Objectives

- Exposing business services of an application for remote access:
- Independent of the client platform
- Independent of programming languages (JAVA, PHP, .NET,..)
- Isolate the business part from other technical modules (web, persistence, Aspect...)
- Use various technologies to promote the distribution of the business part:
- EJB technology (JAVA solution for companies)
- Use of the JMS API
 - o Use of web services (REST and SOAP)
 - o Use of the RMI protocol
 - o Use of web components
 - o Use of microservices
- Develop and deploy web applications with ASP.NET Core MVC technology, and REST web services with asp.net Web Api technology.

2. MODULES AND DEPENDENCIES

<u>Upstream Modules</u>	<u>Taught Module</u>	<u>Downstream Modules</u>
GM2.2 : System Architecture II GM2.3 : Algorithms & Programming Fundamentals II GM3.3 : Software Engineering & Development GM3.2 : Advanced Information Systems GM4.3 : Advanced Software Development	GM5.2 : Advanced Software Engineering	Professional practices

3. MODULE PLAN

Chapters	Title	Learning outcomes
Chapter 1	Concepts and definitions	Student will be able to understanding the interest and importance of software correctness and validation

	MODULE DESCRIPTION Advanced Software Engineering Code : GM5.2	Department : Computer Engineering
		Date : 15/10/2021
		N° version : 02
		Semester : 5

Chapters	Title	Learning outcomes
Chapter 2	Test strategies	Student will be able to understanding the interest and importance of software correctness and validation
Chapter 3	Designing a test plan	Student will be able to acquire knowledge about the types and methods of the most commonly used tests
Chapter 4	Manual and automatic testing	Student will master manual and automatic functional tests,
Practical work	Installation and training on TestLink and Selenium tools	Student could set up a software quality audit environment and tools
Chapter 5	Introduction to load testing	Student could master the methodology of load testing and performance monitoring tools
Practical work	Load testing and performance monitoring of a web application Student will master the methodology of load testing and performance monitoring tools	
Chapter 6	Database Optimisation	Student will get best practice techniques for database optimization
Practical work	Oracle Optimisation Student will get best practice techniques for database optimization	
Chapter 7	Software engineering	Student will be able to : -Assimilate the key notions of software engineering - Know the software quality criteria
Chapter 8	Software Lifecycle Model	Student will be able to Identify the different software cycle models
Chapter 9	Business Process Modeling with BPMN2.0	Student will be able to model business processes with the BPMN 2.0 standard
Chapter 10	The agile approach	Student will understand the concept of agility, as well as the values and principles of the agile manifesto
Chapter 11	The Unified Process method	Student will understand the UP (Unified Process) phases
Chapter 12	The XP method	Student will be able to assimilate the practices of the XP method
Chapter 13	Scrum	Student could master the Scrum method
Practical works	BPMN 2.0 Scrum	
Chapter 14	Presentation of EJBs	Student will be able to create business components for the company (Entity EJB, Session EJB)
Chapter 15	Remote access to an EJB Session	Student will be able to develop examples of remote invocation of business methods from various clients:

	MODULE DESCRIPTION Advanced Software Engineering Code : GM5.2	Department : Computer Engineering
		Date : 15/10/2021
		N° version : 02
		Semester : 5

Chapters	Title	Learning outcomes
		<ul style="list-style-type: none"> - Thick client - Web client - Local/remote client - Client managed by an EJB container - Client not managed by an EJB container
Chapter 16	Exposing business components using web services	<ul style="list-style-type: none"> - Student could provide the business part via web services - REST - SOAP Use : - JAVA - PHP
Chapter 17	THE JMS API	-Student master the exchanging business services via asynchronous messages
Practical works	Developing business components for the company Developing examples of remote invocation of business methods from various clients: <ul style="list-style-type: none"> - Thick client - Web client - Local/remote client - Client managed by an EJB container - Client not managed by an EJB container Providing the business part via web services <ul style="list-style-type: none"> - REST - SOAP Use : - JAVA - PHP Exchanging business services via asynchronous messages	
Chapter 18	ASP.NET Core 5 Basic Concepts	Know the Basic Components of an ASP.NET Core project
Chapter 19	ASP.NET Core MVC	Developing an ASP.NET Core Web project with the MVC architecture
Chapter 20	Data Access With Entity Framework Core and ASP.NET Core	Developing a web application using the Entity Framework Core ORM to access a database
Chapter 21	Web Services with ASP.NET Core Web API	Create and test a web service.
Chapter 22	The Framework ASP.NET Blazor	Develop the front end of a web application with Blazor and consume a Rest API web service.
Practical works	PW1 : basic concepts Creating a first project and know the necessary configuration.	
	PW2 : ASP.NET Core MVC Creating a web application with the MVC architecture	

	MODULE DESCRIPTION Advanced Software Engineering Code : GM5.2	Department : Computer Engineering
		Date : 15/10/2021
		N° version : 02
		Semester : 5

Chapters	Title	Learning outcomes
	PW3 : File upload et Entity Framework Creating an MVC application using File Upload techniques	
	PW4 : Web service Creating a web services project and test it with the Postman or swagger tool	
	PW5 : The Framework SPA Blazor Creating a Blazor project and consume the web service created in PW4	

4. ASSESSMENT

Designation	Chapters (s)	Weighting
Mini-project	-	10%
Practical work	All chapters	10%
Test	Chapters 1-15	10%
Presentation	-	-
Exam	Full chapters	70%

5. BIBLIOGRAPHIC REFERENCES

- Leszko R., « *Continuous Delivery with Docker and Jenkins* »,
- Smart J.F., « *Jenkins: The Definitive Guide: Continuous Integration for the Masses* », 1st edition
- Papapetrou P., « *SonarQube in Action* »,
- Eychenne Y., Cointot J.C., « *Big data : de la révolution à l'action* », DUNOD, 2014
- Chokogoue J., « *Maîtrisez l'utilisation des technologies Hadoop : initiation à l'écosystème Hadoop* », Eyrolles, 2018
- Bruchez R., « *Les bases de données NoSQL et le Big Data* », Eyrolles, 2015
- Chokogoue J., « *Hadoop, Devenez opérationnel dans le monde du Big Data* », ENI, 2017
- Lacomme P., Aridhi S., Phan R., « *Bases de données NoSQL et Big Data* », ellipses, 2014

	COURSE DESCRIPTION Industry 4.0 Code : GM5.3	Department : Computer Engineering
		Date : 15/10/2021
		N° version : 02
		Semester : 5

Speciality module	Main module	Engineering Sciences and Techniques	Préparation for the profession practices
X			X

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Courses	Practical works	Individual works	Volume total
48hrs	60hrs	100hrs	208hrs

Coefficient :	ECTS credits :
6	8

1. DESCRIPTION OF THE COURSE AND COMPETENCES TO BE ACHIEVED

1.1 : Description

This course is designed to teach students how to use the most popular source code and project management tools in professional software development environments. In addition, an opening to the IoT industry is given through the presentation of some concepts and related software tools and environments.

First, a presentation of continuous integration techniques based on the JENKINS continuous integration server is stated. Source code management tools are also presented and special attention to Git and SVN servers is given. Likewise, automatic source code analysis tools and techniques take place, and experimentation with the SONARQube source code analysis server is carried out.

Secondly, useful software environments and tools in the IoT industry are presented. Big Data technologies are presented and discussed and NoSQL databases are exposed. This is to give students

	COURSE DESCRIPTION Industry 4.0 Code : GM5.3	Department : Computer Engineering
		Date : 15/10/2021
		N° version : 02
		Semester : 5

openness to the IoT application domains. Special attention is given to Industry 4.0 as a fashionable application area.

At the end of this course, students will have the necessary knowledge and skills required for a DevOps engineer position. In fact, DevOps skills with solid knowledge and advanced full-stack development skills justify the high employability of IPSAS graduates in Computer Engineering.

1.2 Objectives

Students will be able to :

- understand the concepts of continuous integration,
- acquire knowledge about source code managers,
- acquire knowledge for building automation tools,
- knowledge about deliverable managers,
- master source code analysis tools,
- understand the objectives of using Big data.

2. MODULES AND DEPENDENCIES

<u>Upstream Modules</u>	<u>Taught Module</u>	<u>Downstream Modules</u>
GM1.4 : Web & Multimedia & Networks GM3.3 : Software Engineering & Development GM4.3 : Advanced Software Development	GM5.3 : Software Engineering & Development	Professional practices

3. MODULE PLAN

Chapters	Title	Learning outcomes
Chapter 1	Introduction to continuous integration	Student will discover the concepts of continuous integration
Chapter 2	Source Manager GIT/SVN	Student will acquire knowledge about source managers
Chapter3	Automation of builds	Student will acquire knowledge for building automation tools
Chapter4	JENKINS Continuous Integration Server	Student will acquire knowledge about the continuous integration engine
Chapter5	Nexus/Archiva Delivery Manager	Student will get knowledge about deliverable managers
Chapter6	Test automation	Student will master the test of application

	COURSE DESCRIPTION Industry 4.0 Code : GM5.3	Department : Computer Engineering
		Date : 15/10/2021
		N° version : 02
		Semester : 5

Chapters	Title	Learning outcomes
Chapter7	Code quality management via Sonarqube	Student will master source code analysis tools
Practical work	<ul style="list-style-type: none"> -Git-Lab installation and configuration -Jenkins installation and configuration -Sonar installation and configuration -Archiva installation and configuration -Implementation of a specification provided in accordance with the Dev-ops environment set up. <p>Student will be able to:</p> <ul style="list-style-type: none"> - Set up the Dev-Ops environment, - Implement case studies, - master the use of dev-ops tools 	
Chapter 8	Introduction to Big Data	Student will understand the objectives of using Big data
Chapter 9	Hadoop & MapReduce	Student will understand master the design and architecture of the Hadoop ecosystem
Chapter 10	HDFS: architecture and basic commands	Student will be able : <ul style="list-style-type: none"> - to acquire knowledge about Architecture of Hadoop Distributed File System, block size and notion of DATANODE. -to ensure the Data storage and access with HDFS Basic commands of HDFS
Chapter 11	MapReduce : architecture and implementation	Student will be able to acquire : <ul style="list-style-type: none"> -Notion of NodeManager, Application Master, task tracker -Notion of map type tasks and Reduce type tasks
Chapter 12	Big Data and NOSQL	Student will be able to understand : Big data and their characteristics and the different types of Big data
Chapter 13	Apache SQOOP : Relational Databases and HDFS	Student will master the data exchange between relational databases and the Hadoop file system
Chapter 14	Apache SPARK	
Practical works	WordCount program in Java and Python Apache Pig Latin Scripting Language Apache Hive HBASE MongoDB Apache SPARK	Student could : <ul style="list-style-type: none"> -Implement the WordCount algorithm with Java and Python -Implement MapReduce algorithms with Apache Pig -Transform semi-structured and unstructured data into structured data with Hive, Hbase and MongoDB -Process Big data with Apache SPARK
Chapter 15	Introduction to the Internet of	Student will be able to :

	COURSE DESCRIPTION Industry 4.0 Code : GM5.3	Department : Computer Engineering
		Date : 15/10/2021
		N° version : 02
		Semester : 5

Chapters	Title	Learning outcomes
	Things « IOT »	- know what a connected object is and its application areas. - understand the structure of an IOT system.
Chapter 16	The Raspberry card .	Student will be able to : - understand the architecture of the Raspberry board. - know how to implement different sensors on the Raspberry board
Chapter 17	WEB interfacing for IOT	Student will be able to : - know how to apply the FLASK Framework - design web applications for the IOT
Chapter 18	Cloud-based IOT applications, MQTT, Socket	Student will be able to build IOT applications using the cloud, MQTT and socket
Practical Works	TP1 : Implementation of the Raspberry board. TP2 : WEB design for IOT TP3 : IOT applications: cloud, MQTT, Socket	

4. ASSESSMENT

Designation	Chapters (s)	Weighting
Mini-project	-	10%
Practical work	All chapters	10%
Test	Chapters 1-10	10%
Presentation	-	-
Exam	All chapters	70%

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	MODULE DESCRIPTION Entreprise & Project Management Code : GM5.4	Departement : Computer Engineering
		Date : 15/10/2021
		Version : 02
		Semester : 5

Specialty Module	Main Module	Engineering Sciences and Techniques	Preparation for the profession practices
		X	

IPSAS STAFF

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Courses	Practical works	Individual work	Total volume
42hrs	9hrs	50hrs	101hrs

Coefficient :	ECTS Credits:
2	4

1. MODULE DESCRIPTION AND COMPETENCES TO BE ACHIEVED

1.1 : Description

This course is designed with the objective of instilling an entrepreneurial culture in students. This involves presenting them with the interests of entrepreneurship, the incentive codes defined in the "Startup ACT" Law; a legal framework dedicated to startups in Tunisia published in the Official Journal in April 2018 under number N° 2018-20.

First, students learn to structure and improve their startup ideas through ideation workshops. They learn the building and refinement of the business model canvas. Tools for modeling and identifying personas are presented and discussed, and techniques for developing an efficient business plan are exposed.

	MODULE DESCRIPTION Entreprise & Project Management Code : GM5.4	Departement : Computer Engineering
		Date : 15/10/2021
		Version : 02
		Semester : 5

1.2 Objectives

Students will be able to :

- Familiarize themselves with startups concepts,
- Understand and build efficient business model canvas,
- Understand and build efficient business plan,
- Do a good pitch.

2. MODULE AND DEPENDENCIES

<u>Upstream Modules</u>	<u>Taught Module</u>	<u>Downstream Modules</u>
GM3.5 Communication & Engineering Culture 3 GM5.2 Advanced Software Engineering	GM5.4 Entreprise & Project Management	

3. MODULE PLAN

Chapters	Title	Learning outcomes
Chapter 1	Entrepreneurship, the entrepreneur and the entrepreneurial process	The student should know in particular: -What entrepreneurship is, especially innovative entrepreneurship. -How to be an innovative entrepreneur. -The risks associated with ICT projects -The entrepreneurial process
Chapter 2	Business Plan	Students will be able to: -know what a business plan is, the different uses of a business plan and its main components. - present their future project through this document.
Chapter3	Presentation of the projects	Students will be able to: -manage stage fright, -have the attention of their audience, -adopt good physical posture, -express themselves orally effectively -be enthusiastic and positive.
Chapter 4	Key concepts of project management	Students will be able to appropriate the key notions of project management;
Chapter 5	The usefulness of project management methodology	Understand the functioning of the IT project mode in a company or a team
Chapter 6	Tasks in project management	Students will be able to understand the methods and operational tools used to prepare, manage and carry out an IT project (preliminary study, specifications,

	MODULE DESCRIPTION Entreprise & Project Management Code : GM5.4	Departement : Computer Engineering
		Date : 15/10/2021
		Version : 02
		Semester : 5

Chapters	Title	Learning outcomes
		cost estimates, planning, communication, scheduling, reporting, etc.)
Chapter 7	The role of the project manager	Students will be able to identify the profile, role and responsibilities of the project manager;
Chapter 8	The breakdown of a project and life cycle models Workload estimation	Students will be able to understand the methods and operational tools used to prepare, manage and carry out an IT project (preliminary study, specifications, cost estimates, planning, communication, scheduling, reporting, etc.)
Chapter 9	Preliminary study and specifications	
Chapter10	Techniques and tools for planning deadlines	
Chapter11	Project management & communication	Students will be able to : -identify the profile, role and responsibilities of the project manager; -unblock difficult situations in project management (risk management, change management, ...)
Chapter12	Change management	Students will be able to unblock difficult situations in project management (risk management, change management, ...)
Chapter13	Risk management	

4. Assessment:

Designation	Chapter(s)	Rating
Mini-project		
Practical work		
Test	Chapters 1-8	
Presentation		
Exam	All chapter	

5. Bibliographic references

- Blais R.A. and Toulouse J.M. (1990), « *Les motivations des entrepreneurs : une étude empirique de 2278 fondateurs d'entreprises dans 14 pays* », Revue internationale, vol.3 (3-4), p. 269-300.
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	MODULE DESCRIPTION Entreprise & Project Management Code : GM5.4	Departement : Computer Engineering
		Date : 15/10/2021
		Version : 02
		Semester : 5

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Annex 9

Exams regulations

IPSAS EXAMS REGULATION BOOK

Preface

The purpose of this document is to introduce the framework of regulatory provisions, the organization and validation of examinations within the Private Polytechnic Institute of Advanced Sciences of Sfax, here in after referred to as IPSAS. It applies to all IPSAS training courses. This document sets out the exam charter established in October 2018 and the general exam regulations.

1- PREPARATION AND ORGANIZATION OF EXAMINATIONS

1-1 Summons of student to pass exams:

Every student regularly registered with IPSAS and have paid his tuition fees is automatically registered for the exams.

The exam schedules are communicated to students by posting on the institution's notice boards and by email at least 07 days before the scheduled date to sit for the exams.

Every student who have accumulated more than three absences in a module is subject to the non-authorization to sit for the exam relating to this module in the main- session exam.

Instead, he will be able to sit for the exam in the re- sit exam session. The lists of eliminations by module are displayed at least 7 days before the scheduled exam start dates.

1-2 Exam schedules:

The exam calendars including the date, time and place of each exam are brought to the attention of students by publishing on closed panels reserved for this purpose, at least 10 days before the outset of the exams and should no longer be modified, except in cases of force majeure duly noted.

The publishing of the written and oral exam calendars constitutes an individual invitation to the exams except for students eliminated for various reasons.

1-3 Special conditions for students with disabilities:

Students recognized as having temporary or permanent disabilities, who have previously obtained specific authorization from the competent service, benefit from special conditions within the framework of the examinations.

These conditions are as follows:

- The one third (1/3) of the overtime organized by the service in charge of examinations, in compliance with regulatory texts;

- It is urgently needed to get applicable, a special examination room and educational assistance (a person having been authorized by the administration to help him in composing and writing in his place).

1-4 Exam subjects:

Each teacher has, alone and personally, the educational responsibility for the subject he delivers and its confidentiality until it is sent to the service responsible for the duplication. Indeed, he ensures the duplication in the strictest confidence with the printing service and ensures that a sufficient number of sealed envelopes are placed with the service in charge of examinations. Exceptionally, in case of impediment, he designates a replacement (necessarily a teacher) and gives his contact details in order to be reachable in case of emergency or need.

The subject must necessarily be proportional to the provided content and correspondent with the duration of the test.

The subject must recall the title and duration of the test and specify the scale of questions according to the test and the list of authorized documents or materials. In the absence of an intentional indication to the contrary, no document or material is authorized throughout the duration of the event.

The procedure for duplicating and submitting subjects to the service in charge of examinations is determined by each component according to its specialty, while respecting strict confidentiality.

The submission and printing of the subject must be made at least one week in advance, the date of the test or exam.

The teacher can propose an additional subject which will be adopted in the absence of confidentiality of the main subject as a substitute.

1-5 Material preparation for exams :

Administrative and / or personal services involved in the organization of exams:

- Prepare, in conjunction with teachers, the exam schedule.
- Convene students and supervisors .
- Plan and prepare the examination rooms and equipment necessary for the running of the tests.

- Receive the envelopes containing the examination papers and keep them in a safe and arrange them to be sent to the site (s) of the test.
- Prepare the enrollment lists and examination inspection reports.
- Distribute the envelopes containing the tests on the day of the exam.
- Implement the logistical means necessary for the smooth running of the exams (according to the capacities and resources of the institution).
- Implement the necessary and adapted provisions for students with disabilities and inform supervisors of the special conditions from which these students would benefit from.
- Provide students with:
 - The number of perfectly legible copies of the subject.
 - Anonymous copies.
 - Easily identifiable draft papers (color, and stamp)
- Implement the means guaranteeing the anonymity of the copies to ascertain that it is anonymous.
- Ensure that material not used at the end of a test is recovered and returned to the service in charge of the exams.
- Keep the copies as well as the jury observations after the deliberations.

1-6 Anonymity of copies :

Anonymity of copies is mandatory regardless of the medium used. If necessary, the competent pedagogical secretariat is empowered to hand over anonymity when entering grades which will be validated by the responsible lecturer throughout a well-defined platform.

2- Examination process and realization :

2-1 Conditions of access for candidates to the examination room :

The student must be present in front of the examination room at least 15 minutes before the outset of the examination. First to remember, access to the examination room is prohibited before the arrival of supervising teachers.

It must be remembered, if a candidate presents himself after opening the envelopes containing the subject, the supervisor responsible for the examination room may, exceptionally (when the delay is due to a case of force majeure) subject to an entry authorization issued by the

examination center, authorize him to compose provided that the delay does not exceed 15 minutes after the outset of the test. In particular, no additional time will be given to this candidate, the indication of the delay and its reasons will be entered in the examination report.

2-2 Student's rights and duties regarding the exam :

The student must:

- Be present in front of the examination room at least a quarter of an hour before the outset of the test.
- Do not disturb the tranquil running of the exams, including in the immediate environment of the examination room.
- Respect all of the supervisor's instructions and commands and do not disturb the smooth running of the exam, in particular the change of seat and to stop writing instructions by the end of the exam.
- Be provided with all the necessary documents for identification (the student card and the invitation to the exam are obligatory to bring with).
- Sign the entry and exit list.
- Sit in the seat reserved for him when a numbered assignment has been notified.
- Use the stamped exam papers and drafts made available by the administration.
- Each student is not allowed to possess any documents not expressly authorized for the test (course, manual, dictionary, etc.);
- Submit your copy at the time indicated for the end of the tests, even if it is a white copy, in which case do not forget to write your name.
- Be equipped with the school supplies authorized to sit for their exam and cannot exchange it between peers throughout the course of the exam.
- Not be in possession of any gadgets for storing and transmitting information such as electronic diary and mobile phone (even for clock use) which must be turned off and placed on the supervising teacher's table.
- Do not smoke in the examination room and it will under no circumstances be allowed to leave the examination room except in cases of absolute necessity.

2-3 Identification:

Another key to realize, to be admitted to the test, students must be in possession of their student cards and their invitation to the exams. In the hope that, they must be able to present an identity document with a photo (national identity card, passport, driving license).

When place numbers have been assigned, the student must first check his place number, by consulting the exhibited lists in the schooling data.

2-4 The instructions:

The student must under no circumstances be in possession of documents not expressly authorized for the examination.

Equally important, the student's personal belongings, including mobile phones and devices for storing and distributing information that must be turned off, must be left at the entrance to the examination room or at the place indicated by the supervisors.

2-5 Regulation of entry and exit to examination rooms:

Access to the examination rooms remains possible for any unpunctual student for a maximum of 30 minutes following the outset of the exams. After 30 minutes the late student will no longer have the right to enter the examination room and he would automatically be deprived to sit for the exam and maybe he would recapitulate it in the re-sit exam if not validated.

It is immediate that students make sure before entering the examination room that they take the necessary steps to remain in the examination room without leaving until after they have finished their composition work. Certainly, except for justified medical reasons or for urgent cases that student can leave the examination room to go to the toilet.

Equally important, no candidate may temporarily or definitively leave the examination room (even in the event that a white copy is handed over) before the elapse of 45 minutes from the outset of the examination.

Correspondingly, candidates who wish to temporarily leave the examination room will be allowed only for an emergency and those for one time only and must be accompanied, if

possible, by one of the supervisors. They must necessarily give their copies to the supervisor, who will give back copies to them on their return.

In any case, the student must not leave the examination room before having checked the identity and without having signed in front of his name for the delivery of a copy even if it is a unwritten copy (white copy: without wording). An unwritten copy must be identified by the student by writing his name and last name.

Once he left the examination room he is no longer authorized to go back to it once his copy has been delivered. Surely, the student must then even leave the environment of the examination rooms.

2-6 The monitoring mission:

The supervision of the examinations constitutes an educational act which constitutes part of the statutory obligations of the lecturers in the same way as the preparation of the subjects and the correction of the exams.

The lecturer responsible for the subject, even if he is not a proctor of his test, is required to be present at the examination room for assistance or to be reachable throughout the duration of the test. In the event of major impediment, he appoints a qualified representative and indicates to the service in charge of examinations the contact details allowing him to be reached.

The supervisors go before the start of the exams to the schooling service, which specifies their supervisory tasks and gives them all the documents necessary for maintaining of the exam.

Students have indeed the right to ask the supervisor to call on their course teachers for clarification whenever a crucial problem arises. By all means, the course teacher has the right to a single entry into the examination room and must clarify unclear points without, however, directing the student to the solution.

Supervisors will clearly be informed of the special examination conditions from which certain candidates benefit (1/3 additional composition time and / or any special provision in favor of students with disabilities).

Supervisors must be present at least 15 minutes before the outset of the exam and ensure that the material preparation of the examination room (places, copies, drafts ...) are properly organized and arranged in advance. They have full authority to determine the place of the students.

Add to this, supervisors verify obligatorily the identity of candidates. Only students who are concerned for the exams' call have the right to compose after their legal enrollment. With attention to, any candidate who cannot prove his identity will not be authorized to compose or deliver his copy.

Before the outset of the exam, the supervisors remind the candidates of the conditions under which they must compose.

Any candidate has sat to compose an exam must necessarily return a copy, even a blank one.

2-7 Exam report :

For each exam , an examination report is drawn up including the date, nature and times of the exam , the name and signature of the supervisors.

At the end of the exam, the candidate hands on his copy to the supervisor by signing on the attendance list. By the same token, the responsible supervisor completes the examination report specifying:

- The number of students who attended the exam and notified as present, the number of absent ones, the identity of those present not appearing on the call list and authorized to dial subject to effective registration for the exam.
- The number of copies which were submitted.
- The observations or incidents observed during the test.

The responsible supervisor takes into charge for retrieving the copies, the attendance list, the exam report and their submission to the pedagogical secretariat concerned.

3- EXAM FRAUD

Any fraudster will be subject to the provisions of the already set regulations. And then, the finding of fraud can be made during or outside the exams. As a preventive measure, active and continuous surveillance constitutes an effective means of deterrence.

Any fraud committed during an examination may lead to a disciplinary sanction for the culprit, which may go as far as a definitive ban on taking any registration and undergoing any examination leading to a diploma or title issued by IPSAS.

In the event of fraud or attempted fraud, the responsible supervisor for the examination room must:

- Take all necessary measures to put an end to the fraud without interrupting the student's participation in the test (except in special cases: in the presence of substitution of person or disturbances affecting the course of the test, expulsion from the examination room may be spoken by the responsible supervisor)
- Seize immediately the document (s) or material used to subsequently establish the reality of the facts.
- Draw up a report about the fraud's type or way (precise and detailed report).
- Report the fraud to the attention of the Examinations Coordinator, the Secretary General and the Director of the Institution who may submit it to the disciplinary section of the Institution's Disciplinary Board.

In the most frequent cases where the candidate is not excluded from the examination room, the jury will deliberate on his grades and results under the same conditions as for any other ordinary candidate. Equally important, no certificate of achievement or transcript may be handed to him before the scientific Council delivers its sanction and punishment.

The disciplinary decision may touch the annul disputed test, the subject, the teaching unit, the semester or even the academic year if the trickery is of great significance.

Note: Any blatant distinguishing marks appearing on the student's copy will be considered an attempt at fraud and will be reported to the exams department.

4- CORRECTIONS, DELIBERATIONS AND COMMUNICATION OF RESULTS

4-1 The correction:

For the purpose to guarantee equity between the students a sufficient correction period which does not exceed 10 days is left to the correctors, taking into account the type of examination and the number of copies to be corrected.

Copies are corrected markedly under the authority of the teacher responsible for the teaching of the unit being examined. Specifically, in case of multiple correctors, the person in charge ensures the unity of the correction and the compliance of the marks while respecting the

principle of egalitarianism between the students. Again, the issue of correction respects compulsorily the anonymity of the copies.

The deadlines and modalities for the transmission of marks are fixed in advance by each department.

The General secretary of IPSAS is charged of transmitting the information about: online platform of marks, deadlines, regulations and dates of deliberations for each department where attendance is obligatory for all the tutors concerned by each department by forwarding an informative e-mail for all the responsible teachers who would ultimately respond to his instructions and commands promptly.

4-2 The Jury's Deliberation:

The jury is made up of teachers concerned by the teaching units evaluated. It includes the teachers of the Teaching Units and the qualified personalities who have contributed to the teachings. The composition of the juries as well as the name of the President of the jury are displayed before the start of deliberations. Participation in juries constitutes for the teaching staff an educational act included in the service. Therefore, attendance at deliberations is an obligation for lecturers. The jury deliberates sovereignly on the basis of all the results obtained by the student, in compliance with the procedures for checking knowledge.

It is highly recommended that students bring to the attention of the exam coordinator and / or director of the establishment, within 48 hours of the end of the exams, any information or event likely to have had an impact on the progress of their studies or exams results.

The juries remain sovereign in their decisions.

The various elements (copies, reports, briefs, etc.) used for the ratings must be made available to the jury during the deliberation as well as the attendance lists.

The jury ensures that the anonymity of copies is quietly respected and that anonymity is lifted and that the entry of marks and the validation of teaching units are checked.

The President of the jury ensures the regularity of the deliberation (presence of half of the members). At the end of the deliberation, the present members of the jury sign the minute the document where results are already displayed.

4-3 Communication of results:

At the end of the jury's deliberation, no further modification can be made to the meeting minutes except in the event of a material error in the postponement or calculation duly noted by the Chairman of the jury. In this case, the latter must immediately inform the other members of the jury. The marks and the “admitted” or “adjourned” results are communicated to the students by posting and the application of IPSAS intended to communicate with students.

4-4 Consultation of copies or works:

Students have the right, on their request and within 3 days of the results being displayed, to the communication of their copies and / or to an interview with the teacher (or teachers) responsible for teaching.

The teachers responsible for the examinations must organize a consultation session for the copies which will be clearly indicated by posting.

4-5 Issuance of certificates and diplomas:

The issuance of transcripts, certificates of achievement and diplomas can only be made to the concerned student, on presentation of an official identity document (national identity card, passport) or to a representative provided with a power of attorney given for this purpose, his own official identity document, and a photocopy of both sides of an identity document of the student giving the power of attorney.

The diploma is issued after deliberation by the jury.

5- General notes:

5-1 For lecturers :

The convening of teachers for exam supervision sessions includes the following instructions:

"In the event of a planned absence, you are requested to notify the Head of the Education Department in good time and inform him of the name of the colleague who will substitute you.

On the one hand, in order to optimize the course of exams:

- An "exam papers office" has been set up to accommodate supervising teachers.
- You are kindly requested to report to the exams office 15 minutes before the scheduled time for the exam.
- The exam papers will be given to you on your arrival by one of the members of the Examinations Committee who will indicate to you the examination room where the surveillance will take place.
- Any incident occurring during the exams must be reported to the members of the Examinations Committee present and will appear in the examination report.

On the other hand, the following instructions are worth remembering and must be scrupulously applied:

Before the start of the event:

- In the event of the absence of one or more students at the time scheduled for the exam, respect the regulatory 10 minutes granted to latecomers before opening the envelopes containing the exam papers.
- No student is allowed to enter the examination room after opening the envelopes containing the examinations, without being authorized by the examination committee.
- Remind students before the outset of the test of the need to respect the place number assigned to them.
- Remind students before the outset of the test of the regulatory points, concerning penalties in the event of fraud.

5-2 For students:

The general examination regulations are made known to all students and are posted on the boards and in front of all examination rooms. It comprises 12 articles :

- Article 1: Students must comply with the provisions of these regulations as well as the measures and decisions taken by the teacher responsible for the examination room.
- Article 2: Each student must, upon entering the examination room, bring his student card and / or his national identity card and his individual summons.

Exams Regulations

- Article 3: The candidate must deposit at the entrance to the examination room all documents and objects such as handbags and suitcase and especially duly closed cell phones.
- Article 4: The candidate is not authorized to carry any document with him.
- Article 5: The candidate must equip himself with everything necessary to face the exam.
- Article 6: The candidate is required to sign the enrollment list at the beginning and at the end of the examination session. The second signature must take place after the examination copy has been handed over directly to the teacher in charge of the examination room.
- Article 7: No student will be admitted to the examination room after the start of the test if he is not authorized by the examination committee.
- Article 8: No student will be allowed to leave the examination room before the end of the first half hour of each session and during the last quarter of an hour of said session.
- Article 9: No student is allowed to temporarily leave the examination room for any reason. In the event of force majeure, he must be accompanied by an administrative officer, in this case the liaison officer placed in front of the examination rooms.
- Article 10: Any fraud or attempted fraud exposes its perpetrator (s) to regulatory sanctions, the following acts are considered as such: possession of an unauthorized document, discussion or exchange of objects with another student whatever either the pattern, the throwing of documents, scrap paper or other on the ground or elsewhere.
- Article 11: When a student commits fraud or attempted fraud or any breach of the discipline of exams, he may be excluded from the examination room by the teacher in charge.
- Article 12: The use of the mobile phone during the examination session is considered an act of fraud which results in the immediate exclusion of the candidate.
- Important: Students must take the tests in their examination room and at their assigned place. Otherwise, they will be considered absent and will be assigned a grade of zero.

6- Conditions for success and passage from one level to another:

6-1 For licenses and bachelor degree:

Exams Regulations

During the deliberation of the main session, is declared admitted, any student with an overall average of at least 10/20 and having validated a minimum of 45 credits.

Any student who has not met these two conditions is declared adjourned. The adjourned student has the right to take the tests of all modules in which he or she has not obtained the general average of the subject.

6-2 For preparatory cycles:

During the deliberation of the main session, is declared admitted, any student with an overall average of at least 10/20.

Students who have been postponed will retake the exams for the subjects they have not passed.

The bar is set at a minimum average of 09/20.

6-3 For engineering cycles programs:

Examination regulation for engineering programs is summarized on the table below:

Main Session	OverallAverage	Average of the groups of modules
Passed	$\geq 10/20$	$\geq 08/20$
Control Session .Situation (1)	$\geq 10/20$	1G.M. or more have an average of less than 08/20. In this situation, the student can only take the exams of the non-validated subjects of this (these) group(s) of modules.
Control session .Situation (2)	$\leq 10/20$	The student can sit for the exams of all non-validated subjects.
Control session		
Admitted	$\geq 10/20$	$\geq 08/20$
Redemption (1)	$9.5 \geq \text{Average} < 10$	$\geq 08/20$
Redemption (2)	$\geq 10/20$	A single group of modules averaging between 7.5 and 7.99
Admittedwithcredit	$\geq 10/20$	Only one group of modules averaging between 7 and 7.49

6-4 Redundancy and Granted Credits:

Any repeating student, whether he or she is an IPSAS student or from another institution, retains his or her validated credits. In other words, he retains the grades for subjects with an average of 10/20 or higher. They must attend classes in non-validated subjects and pass all tests (Continuous Assessment and Examination)

6-5 Average calculation:

Private Polytechnic Institute of Advanced Sciences of Sfax (IPSAS)

Direction of Studies on 02/09/2020

Calculation of Averages, for the Engineering Specialties :

- Main Session

o Subject Mixed system (Continuous assessment (DCC)+Examination (E) : Average = $((0.5 \times DCC) + (1 \times E)) / 1.5$

o Subject Mixed system (Continuous assessment + Practical work (PW) + Examination (E) : Average = $((0.5 \times DCC) + (0.5 \times PW) + (1 \times E)) / 2$

o Workshop or Mini Project (PW, practical work) : Average = score of PW

- Control Session

o Subject Mixed regime (DCC+E) : Average = $((0.5 \times DS) + (1 \times \text{Superior score (E of main or control session)})) / 1.5$

o Subject Mixed regime (DCC+PW+E) : Average = $((0.5 \times DCC) + (0.5 \times TP) + (1 \times \text{Superior score (E of main or control session)})) / 2$

o Workshop or Mini Project (TP) : Average = Score PW

Calculation of Averages, Preparatory Cycle :

- Main Session

o Subject Mixed system (Continuous assessment +E) : Average = $((0.5 \times DCC) + (1 \times E)) / 1.5$

o Subject Mixed system (Continuous assessment + Practical work + Examination) : Average = $((0.5 \times DCC) + (0.5 \times TP) + (1 \times \text{Examen})) / 2$

- **Control Session**

oSubject Mixed regime (DCC+Exam) :Average = $((0.5 \times DS) + (1 \times \text{superior score (E of main or control session)}) / 1.5$

oSubject Mixed regime (DCC+TP+Exam) : Average = $\frac{((0.5 \times DCC) + (0.5 \times TP) + (1 \times \text{superior score (E of main or control session)})}{2}$

Overall average: OV

OV = $\sum ((\text{Each module average} \times \text{correspondent module coefficient})) / (\sum \text{Coefficients})$

11. The student`s chart

CHARTER
of the IPSAS students

Article 1: Purpose

The CHARTER presents the internal regulations for the students of IPSAS. It determines the fundamental rules that are strictly obligatory to be respected by each student during his/her administrative membership of this university institution. It presents a personal contract of the student with the IPSAS Administration, which aims at the good progress of the education and mutual respect between all

Article 2: Commitment of the student:

I, the undersigned,

CIN (Passport) Tel:

E-mail :

Student in the following course: A.U.:

(to be specified)

I undertake and confirm by signing this CHARTER that :

2.1. I accept and will comply fully and correctly with all the rules described in this CHARTER during the period of my administrative membership of the ULS (IPSAS),

2.2 In case of non-compliance or violation of my commitments described in this CHARTER I will suffer all the administrative, financial and legal consequences provided for.

Article 3: Registration of students:

Training at IPSAS is not free of charge and enrolment is compulsory within the stipulated deadlines. The tuition fees are fixed by the Administration and are payable in instalments as follows: the first instalment is required at registration, the second instalment must be paid before the end of December and the third instalment is to be paid at the latest before the end of April during the academic year.

Article 4: Organisation of teaching

4.1 Teaching

Teaching at IPSAS is carried out according to the study plans approved by the Tunisian Ministry of Higher Education and specific for each speciality. The organisation of the curricula and the annual calendar are ensured by the IPSAS Administration. An academic year is divided into two semesters, each of which lasts 15 weeks of teaching plus one week reserved for examinations.

Students are required to attend all courses (lectures, practical work, seminars and company visits). It is controlled by the teachers and the Administration. When absences in a unit or element exceed 20% of the module's hourly volume, the student concerned is not allowed to attend the main examination session.

Attendance at all examinations (tests, assignments, examinations, viva voce, etc.) is compulsory. Any absence from a test will result in a zero mark.

It should be noted that medical certificates do not necessarily constitute a justification for absences.

Students are obliged to keep themselves informed through the IPSAS websites (www.uls-ens.net or www.ipsas-ens.net) about all announcements concerning the organisation of studies, timetables, assignments and exams, internships and cultural and social life. For students in their final year of study, the course includes the preparation of a professional final year project.

Article 5: Internships

During their university education at IPSAS, each student must complete two internships:

- a) An internship in the 1st year (working internship) lasting one month, the host structure of which may be a company, an association or
- b) An internship in the 2nd year (technician internship) lasting one month, which must be carried out in a company.

At the end of each internship, the student must present an internship diary and a report which are evaluated by a jury. The host organisation gives an assessment of the trainee at the end of the placement.

If a traineeship is declared inconclusive by the jury, a replacement traineeship must be carried out and evaluated under the same conditions.

Article 6: Final projects

Upon successful completion of the final year exams, each student must prepare a 5-month Final Year Project (FWP).

The PFE is defended before a Jury appointed by IPSAS.

Students are allowed to defend the FDP in the following cases:

- * all validated GM,
- * all internships validated,
- * compliance with all conditions required by the IPSAS Administration (payment of tuition fees, etc.)

- * submission of the necessary documents (dissertation, technical file, postcard, CD, written authorisation for the defence,) within the deadlines set by the IPSAS Administration.

Note: All documents presented by students for the PFE defence must be checked and signed by the academic supervisor.

Article 7: Students' rights :

The student registered at IPSAS and signatory of this CHARTER has the right to :

- a) All information from the IPSAS Administration that concerns him/her,
- b) Access to classrooms and practical training rooms according to the posted timetable,
- c) Access to rooms authorised for preparation during revision periods.
- d) Pedagogical consultations with the teachers,
- e) For any problem concerning courses or practical work, the student must contact the Coordinator of the speciality,
- f) Participation in IPSAS clubs according to the rules of the desired club,
- g) Participation in the sports and cultural life of IPSAS students,
- h) Participation in applied industrial research teams within IPSAS for the development of industrial projects
- i) Participation in the different training courses and/or events provided for in the Conventions between IPSAS and its national and international partners.

Article 8: Obligations of the student :

The student, registered at IPSAS, undertakes to respect the following rules:

- a) Attendance during the course and practical sessions:

Late arrivals at the beginning of the sessions are to be avoided. In case of repeated lateness, the IPSAS Disciplinary Board will take action. Absences are counted and are taken into account for the continuous assessment grade,

- b) Telephone calls and cigarette breaks are strictly forbidden during class sessions and exams.
- c) Entrance and exit from the rooms are signalled by a bell that must be respected.
- d) The duration of breaks must be respected and teachers will be asked not to accept latecomers,
- e) The student is obliged to have for each session of class, practical work, homework or exam
- f) The student is obliged to have the material required by the teacher (course notes, calculators, etc.). In case of non-compliance with these obligations the teacher has the right to take appropriate measures.
- g) The use of unauthorised equipment and documents by students during tests is forbidden,
- h) The student's participation in the course, his/her attendance, the execution of personal work required by the teacher, are required by the teacher are taken into account in the marking of the continuous assessment.
- i) Attempts to cheat in any test will be severely punished.

Article 9: Appearance before the Disciplinary Board:

The IPSAS Disciplinary Board is chaired by the Director of the institution. A student is summoned to appear before the IPSAS Disciplinary Board in the following cases

a) Having been the subject of a report of disrespect towards a teacher or an agent of the Administration,

b) After an attempt to cheat during the tests (exam, homework or continuous assessment).

This situation leads to the exclusion of the student from the examination room. A mark of zero is automatically awarded and the student's file is submitted to the Disciplinary Board.

The student is called to appear before the Discipline Council in writing and must be informed of the facts of which he or she is accused. The student has the right to defend himself.

The Discipline Council deliberates on one of the following sanctions:

- Warning,

- Ban on taking examinations for one or two sessions,
- Exclusion from the institution for a maximum period of one academic year,
- Permanent exclusion from the institution.

Note: In the last two cases, the student is not entitled to a refund of tuition fees.

Article 10: Validity of the Charter

10.1. This CHARTER is valid after its signature by the Director of IPSAS and the student, until the student's final departure.

10.2. The CHARTER is made in two signed copies: one for the IPSAS Administration one for the IPSAS Administration and one for the student.

Done in Sfax, on

Student: Director of IPSAS:

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