study Program

Civil Engineering

2023-2024

MANUAL STUDY PLAN

&

SHEETS MODULE

Civil Engineer Program

In the Civil Engineering department of EPI-Polytechnique, the objective is to train engineers capable of designing, analyzing, calculating, carrying out, assessing and managing works In THE sectors of construction.

The GC Engineer is an engineer specialized in the design and implementation of means, the management of people in the act of building. He assumes responsibility for screw of there community And of the company In a artwork tour towards humans

- Construction of buildings for residential use, businesses, buildings industrial, of offices or shows
- Construction of communication and land use infrastructure (roads, bridges, tunnels, logistics centers, dams, power plants) or backup of the environment (management of the waters, storage of waste)

The engineer can intervene in any stage of the construction operation, from the study of ground up to the reception of the work :

- study of ground, calculation of the foundations
- design of the work (calculation, methods, study of price)
- conduct of the works
- control technical

There training proposed by EPI-Polytechnique East adapted in permanence to needs of the companies by integrating the evolution of techniques and methods in the engineering sector civil.

Contents

Civil Engineering
Study Plan

civil engineering : Common Core : S1

Code	Subject	Coef	Credit	Course/week	Practical/week
FR-ABC	French	1,5	2	1,5	0
ENG-ABC	English	1,5	2	1,5	0
GC 3.1.01	Mathematics for engineers	3	3	3	0
GC 3.1.02	Probability and statistics	1,5	2	1,5	0
GC 3.1.03	MMC	3	3	3	0
GC 3.1.04	Algorithm and data structure	1,5	3	0	1,5
GC 3.1.05	material resistance RDM	3	4	3	0
GC 3.1.06	Topography	3	3	1,5	1,5
GC 3.1.07	General construction processes	3	3	3	0
GC 3.1.08	Fluid mechanics	1,5	3	1,5	0
GC 3.1.09	Geology	1,5	2	1,5	0
	Total	24	**30**		

civil engineering : Common Core : S2

Code	Subject	Coef	Credit	Course/week	Practical/week
FR-ABC	French	1,5	2	1,5	0
ENG-ABC	English	1,5	2	1,5	0
GC 3.2.01	Numerical analysis	1,5	2	1,5	0
GC 3.2.02	material resistance RDM : TP	1,5	2	0	1,5
GC 3.2.03	Operational research	1,5	2	1,5	0
GC 3.2.04	Reinforced concrete 1	3	4	3	0
GC 3.2.05	Calculation of structures 1	3	3	3	0
GC 3.2.06	Building materials	3	3	1,5	1,5
GC 3.2.07	Soil mechanics 1	3	4	3	0
GC 3.2.08	General hydraulics	1,5	2	1,5	0
GC 3.2.09	DAO : civil engineering	1,5	2	0	1,5
GC 3.2.10	Building electricity	1,5	2	1,5	0
	Total	24	**30**		

civil engineering : Common Core : S3

Code	Subject	Coef	Credit	Course/week	Practical/week
FR-ABC	French	1,5	2	1,5	0
ENG-ABC	English	1,5	2	1,5	0
GC 4.1.01	Roads1	3	3	3	0
GC 4.1.02	Reinforced concrete 2	3	4	3	0
GC 4.1.03	Calculation of structures 2	3	4	3	0
GC 4.1.04	Metal construction	3	4	3	0
GC 4.1.05	Thermal - Acoustic	1,5	3	1,5	0
GC 4.1.06	Soil mechanics 2	3	3	1,5	1,5
GC 4.1.07	Hydrology and urban hydraulics	3	3	3	0
GC 4.1.08	Urbanism	1,5	2	1,5	0
	Total	24	**30**		

civil engineering : Common Core : S4

Code	Subject	Coef	Credit	Course/week	Practical/week
FR-ABC	French	1,5	2	1,5	0
ENG-ABC	English	1,5	2	1,5	0
GC 4.2.01	Finite elements	1,5	2	1,5	0
GC 4.2.02	Planning and organization of the work	1,5	2	1,5	0
GC 4.2.03	Prestressed concrete	3	4	3	0
GC 4.2.04	Diagnosis and repair of structures	1,5	2	1,5	0
GC 4.2.05	civil engineering Softwares: Piste-Covadis	2,25	2	0	2,25
GC 4.2.06	civil engineering Software : Arche-Robot	2,25	2	0	2,25
GC 4.2.07	VRD	1,5	2	0	1,5
GC 4.2.08	Hydraulic structures	1,5	2	1,5	0
GC 4.2.09	Special structures	1,5	2	1,5	0
GC 4.2.10	Public Procurement	1,5	2	1,5	0
TV-401	MOS Certification	1,5	2	0	1,5
TV-402	PFA	1,5	2	1,5	0
	Total	24	**30**		

civil engineering Major:Roads and Bridges: S5

Code	Subject	Coef	Credit	Course/week	Practical/week
TV-501	human resources management GRH	1,5	2	0	1,5
TV-502	Law of work	1,5	2	1,5	0
TV-503	ESB Certification	1,5	2	1,5	0
GC PC 5.1.01	Engineering structures	3	3	3	0
GC PC 5.1.02	Bridge design and construction	3	3	3	0
GC PC 5.1.03	Roads 2	3	4	3	0
GC PC 5.1.04	Design & Calculation of Road Projects	1,5	2	0	1,5
GC PC 5.1.05	Risk management	1,5	2	1,5	0
GC PC 5.1.06	Quantity survey and price estimation	1,5	2	1,5	0
GC PC 5.1.07	Dynamics of structures	1,5	2	1,5	0
GC PC 5.1.08	Plates and Covers	1,5	2	1,5	0
GC PC 5.1.09	civil engineering Software : Revit + Primavera	3	4	0	3
	Total	24	**30**		

civil engineering Major:Buildings & Energys: S5

Code	Subject	Coef	Credit	Course/week	Practical/week
TV-501	human resources management GRH	1,5	2	0	1,5
TV-502	Law of work	1,5	2	1,5	0
TV-503	ESB Certification	1,5	2	1,5	0
GC BE 5.1.01	Design and calculation of building projects	3	3	3	0
GC BE 5.1.02	Energy study of buildings	3	3	3	0
GC BE 5.1.03	Specific CG structures	3	4	3	0
GC BE 5.1.04	Green Buildings	1,5	2	1,5	0
GC BE 5.1.05	Risk management	1,5	2	1,5	0
GC BE 5.1.06	Quantity survey and price estimation	1,5	2	1,5	0
GC BE 5.1.07	Dynamics of structures	1,5	2	1,5	0
GC BE 5.1.08	Plates and Covers	1,5	2	1,5	0
GC BE 5.1.09	civil engineering Software : Revit + Primavera	3	4	0	3
	Total	24	**30**		

S6 : Professional Semester

Codes	Teachings	Coef	Credit	Course/week	work/week
Pro- 5 2 01	Introductory course	10	3	/	/
Pro- 5 2 02	Course development		3	/	/
Pro- 5 2 03	PFE		24	/	/
		24	**30**	**18**	**6**

Content sheets

COMMON CORE

Course Specification

Mathematics for engineers

1. General

Coded	GELM 3 103	Level/Semester	*1/S1*	Coefficient	*3*	Credits	*3*
Course	*Engineer*					Volume. H. (CI)	*42*
Responsible	*Walid ABID*					Volume. H. (TP)	
Module	Mathematics for engineers					Version	*09/2023*

Course description (Course objective):
This course allows students to gain advanced knowledge of mathematics and develop skills to solve engineering problems using mathematical techniques.

Prerequisites:	*Keywords :*
L1 and L2 mathematics courses *Mathematical tools at a BAC+2 level*	-Functions with a real variable (limit and continuity). - Derivation and primitive. - Integral calculation. -Differential equations.

Specific objectives of the course (OBJ $_i$):
At the end of this course, students will: **OBJ 1:** Be able to calculate Fourier transforms of non-periodic functions. **OBJ 2:** Understand the notion of the convolution product. **OBJ 3:** Understand the concepts of Laplace transforms and inverse Laplace transforms. Be able to solve a differential equation using Laplace transforms. **OBJ 4:** Know how to decompose a periodic signal into a Fourier sum.

Necessary material :

2- Content elements (Course)

Week(s)	Chapters/Content Items	No. HR	Goals
1-2	Chapter 1: Laplace Transformation - General - Properties - Convolution	6h	Introduction to the Laplace transform and its use to solve linear Ordinary Differential Equations (ODE) of order n
3-4	-Practical methods for calculating the image and an original -Application: Use the Laplace transform to solve a differential equation	6h	
5-6	TD-Series 1	*6h*	
7-8	Chapter 2: Fourier Transformation -General -Terms	*6h*	In this chapter, to simplify, we will introduce the notion of Fourier transform on R rather than on R^d. This short chapter is an interesting application of the previous integration course, in the sense that many results are used (dominated convergence theorem, continuity and differentiability theorems for parameter integrals, convolution product, density of step functions in L 1 ...).
9-10	-Properties -Convolution	*6h*	
11-12	- Inversion - Plancherel and Parseva formulas	*6h*	

	TD=Series 2		
13-14	Detailed series of exercises throughout the course	*6h*	Evaluate the overall level of students and rectify gaps

3- Content elements (Practical work)

Week(s)	Activities/Content Items	No. HR	Goals

4- Evaluation methods & Marks Distribution

Type of assessment	Yes No	Tx Weighting
CC - Continuous assessment (Test/Quiz, Presentation, Report, etc.)	☐ *Yes* ■ *No*	
DS - Supervised Duty	■ *Yes* ☐ *No*	*40%*
EE - Written test (Final exam)	■ *Yes* ☐ *No*	*60%*
EP - Practical test (TP- TP exam / MP- Mini project)	☐ *Yes* ■ *No*	

- *Material 100% TP : Average = 20% CC + 80% EP*
- ***100% CI material : Average = 40% DS + 60% EE***
- *CI+TP material : Average = 20% DS + 20% EP + 60% EE*

5- Evaluation criteria

- *Authorized documents* : ☐ *Yes* ■ *No*
- *Authorized search engine* : ☐ *Yes* x *No*
- *Criterion 1: Understanding of the content (4 points)*
- *Criterion 2: Application of knowledge (10 points)*
- *Criterion 3: Critical analysis (4 points)*
- *Criterion 4: Clarity and organization (2 points)*

6- Web references (useful links):

- Mathematics for engineers. Authors: Yves Leroyer and Patrice Tesson - Edition Dunod

7- Working environment (Facilities necessary for learning)

Probability and Statistics

1. General

Coded	**GCIV 3 102**	Level/Semester	*1/S1*	Coefficient	*1.5*	Credits	*2*
Course	*Engineer*					Volume H. (CI)	*21h*
Responsible	*Ben Haj Mbarek mohamed Hedi*					volume. H. (TP)	*0*
Module	*Probability and Statistics*					Version	*09/2023*

Course description (Course objective):
study of the laws governing random events, including the collection, analysis, interpretation, and display of numerical data.

Prerequisites:	*Keywords :*
Basic algebra	- *Probability* - *Statistics* - random experience

Specific objectives of the course (OBJ $_i$):
Upon completion of this module, the student will be able to: OBJ 1: random variable study. OBJ 2: Variance and standard deviation calculation.

Necessary material :
NONE

2- Content elements (Course)

Week(s)	Chapters/Content Items	No. HR	Goals
1-3	Chapter 1: INTRODUCTION TO CALCULATION OF PROBABILITIES 1. Basic concepts 1.1 Notions of random experience and fundamental set 1.2 Concept of event 1.2.1 Relationships between events 1.2.2 Complete event system 2. Probable space and probability 2.1 Axioms of probability 2.2 Properties 3. Conditional probability 3.1 Definition 3.2 Formula for total probabilities 4. Independence of events 5. Bayes formula	*4.5*	*At the end of this chapter, the student will be able to:* knowledge of the conditional probability and Independence of events
4-6	CHAPTER 2: COUNTING METHODS AND PROBABILISTIC DRAWING SCHEMES 1. Enumeration method: combinatorial analysis 1.1 The multiplication rule 1.2 Permutations 1.3 Arrangements 1.4 Combinations 2. Probabilistic drawing schemes: urn models 2.1 General 2.2 Urn models	*4.5*	combinatorial analysis , Permutations , Arrangements , Combinations and Urn models
7-10	CHAPTER 3: RANDOM VARIABLES 1. General and distribution function 2. Discrete random variables 2.1 Definition of a random variable and distribution function 2.2 Moments of a discrete random variable 2.2.1 Mathematical expectation 2.2.2 Variance and standard deviation 3. Continuous real random variables 3.1 Definition of a real continuous random variable 3.2 Density function of a continuous random	*6*	*able to calculate the* Mathematical expectation, variance and standard deviation

	variable 3.3 Moments of a discrete random variable 3.3.1 Mathematical expectation 3.3.2 Variance and standard deviation 3.4 Quantile of a continuous random variable 4. The moment generating function 5. Transformation of random variables		
11-14	CHAPTER 4: USUAL LAWS 1. Discreet laws 1.1 Bernoulli's law 1.2 The Binomial law 1.3 Poisson's law 2. Continuous laws 2.1 The Uniform Law continues 2.2 The exponential law 2.3 The Normal law and the reduced centered normal law 2.4 Laws derived from the normal law	*6*	*Knowledge of different usual laws*

3- Content elements (Practical work)

Week(s)	Activities/Content Items	No. HR	Goals

4- Evaluation methods & Marks Distribution

Type of assessment	Yes No	Tx Weighting
CC - Continuous assessment (Test/Quiz, Presentation, Report, etc.)	☐ *Yes* ■ *No*	
DS - Supervised Duty	■ *Yes* ☐ *No*	*40%*
EE - Written test (Final exam)	■ *Yes* ☐ *No*	*60%*
EP - Practical test (TP- TP exam / MP- Mini project)	☐ *Yes* ■ *No*	

- *Material 100% TP : Average = 20% CC + 80% EP*
- ***100% CI material : Average = 40% DS + 60% EE***
- *CI+TP material : Average = 20% DS + 20% EP + 60% EE*

5- Evaluation criteria

- *Authorized documents* : ☐ *Yes* ■ *No*
- *Authorized search engine* : ☐ *Yes* x *No*
- *Criterion 1: Understanding of the content (4 points)*
- *Criterion 2: Application of knowledge (10 points)*
- *Criterion 3: Critical analysis (4 points)*
- *Criterion 4: Clarity and organization (2 points)*

6- Web references (useful links):

https://math.univ-lyon1.fr/irem/IMG/pdf/PolyTunis_A_Perrut.pdf

- Bernard Courtebras , *At the school of probability* , Press univ. Franche-Comté, 2006, 282 p.
- Bernard Courtebras, *Mathematizing chance,* Vuibert, 2008
- Virginie Delsart and Nicolas Vaneecloo , *Statistical methods of economics and management* , Presses Univ. Septentrion, 2010, 317 p.

7- Working environment (Facilities necessary for learning)

NONE

Course Specification

MMC

1. General

Coded	**GCIV 3 103**	Level/Semester	*1/S1*	Coefficient	3	Credits	3
Course	Civil engineering					Volume. H. (CI)	42
Responsible	Moez SELMI					Volume. H. (TP)	*0*
Module	MMC					Version	*12/2023*

Course description (Course objective):
Knowledge of the basic notions of continuum mechanics.

Prerequisites:	*Keywords :*
Engineering mathematics, numerical analysis	*Lagrangian description,* Eulerian description, deformation tensor, stress tensor, *generalized Hooke's law*

Specific objectives of the course (OBJ $_i$):
OBJ 1 : Understand and succeed in describing the state of stress and strain in a continuous medium
OBJ 2 : Apply the fundamental relation of dynamics for a continuous medium
OBJ 3 : Apply generalized Hooke's law for homogeneous isotropic materials

Necessary material :
…

2- Content elements (Course)

Week(s)	Chapters/Content Items	No. HR	Goals
1-2	**<u>Chap1</u> : Upgrading in mathematics:** 1. Linear Algebra 2. Differential calculus. Partial differential equations 3. Integral Calculation 5. Scalar and vector operators 6. Elements of matrix calculation 7. Diagonalization of a matrix, eigenvalues, eigenvectors 8. Different operators (gradient, divergence, rotational, Laplacian).	*6h*	*Master tensor calculation*

3	**Chap2 : Kinematics of continuous media** 1. Lagrangian description (trajectory, speed, acceleration) 2. Eulerian description (particle derivative, conversation equation of mass).	*3h*	*Determine the displacement gradient tensor*
4-6	**Chap3 : Constraints** 1. Volume forces, surface forces 2. Fundamental relationship of Dynamics (Torsor, constraint) 3. Stress tensor (directions and principal stresses, symmetry, Mohr circles)	*9h*	*Determine the stress tensor of a homogeneous isotropic material*
7-10	**Chap4: Deformation** 1. Strain rate tensor 2. Study of instantaneous local deformation 3. Expansion rate	*12 h*	*Determine the strain tensor of a homogeneous isotropic material*
11-14	Chap7 : **Linear behavioral laws** 1. General 2. Law of homogeneous isotropic linear behavior (Elasticity)	*12 h*	*Solve a mechanical problem in linear elasticity*

3- Content elements (Practical work)

Week(s)	Activities/Content Items	No. HR	Goals
…	…	…	…
…	…	…	…

4- Evaluation methods & Marks Distribution

Type of assessment	Yes No	Tx Weighting
CC - Continuous assessment (Test/Quiz, Presentation, Report, etc.)	☐ *Yes* ■ *No*	
DS - Supervised Duty	■ *Yes* ☐ *No*	*40%*
EE - Written test (Final exam)	■ *Yes* ☐ *No*	*60%*
EP - Practical test (TP- TP exam / MP- Mini project)	☐ *Yes* X *No*	

- *Material 100% TP : Average = 20% CC + 80% EP*
- ***100% CI material : Average = 40% DS + 60% EE***
- *CI+TP material : Average = 20% DS + 20% EP + 60% EE*

5- Evaluation criteria

- *Authorized documents* : ■ *Yes* ☐ *No*
- *Authorized search engine* : ☐ *Yes* ☐ *No*
- *Criterion 1: Understanding of the content (4 points)*
- *Criterion 2: Application of knowledge (10 points)*
- *Criterion 3: Critical analysis (4 points)*
- *Criterion 4: Clarity and organization (2 points)*

6- Web references (useful links):

1- P. Germain "Introduction to the mechanics of continuous media" 1995

2- G. Duvet "Mechanics of continuous media" 1990

3- J. Obala "Exercises and problems in mechanics of continuous media" 1988

4- H Dumontet "Exercises in mechanics of continuous media" 1994

7- Working environment (Facilities necessary for learning)

- *NONE*

Course Specification

ASD algorithm and data structure

1. General

Coded	**GCIV 3 104**	Level/Semester	*1/S1*	Coefficient	1.5	Credits	3
Course	Civil engineering					Volume. H. (CI)	0
Responsible	Taoufik Lahmar					Volume. H. (TP)	21
Module	ASD algorithm and data structure					Version	*09/2023*

Course description (Course objective):
This course see has develop at the house of the learner THE c ap a c it es adequ a t es For solve a problem is structured according to there logic a l g o r it h m i c.

Prerequisites:	*Keywords :*
None .	Algorithm , Structures control , Painting , Matrix , Chain , Fun c ti o n, P r o c ed u r e

Specific objectives of the course (OBJ $_i$):	
OBJ 1 :	*OBJ 1: Acquire prior knowledge of algorithms.*
OBJ 2 :	*OBJ 2: Write Simple Algorithms: Simple actions and alternative structures*
OBJ 3 :	*OBJ 3: Write algorithms made up of processing iteratives (Loops).*
OBJ 4 :	*OBJ 4: Master the Painting, Matrix and Character Chain types*

Necessary material :
- Support : Summary classes , T D

2- Content elements (Practical work)

Week(s)	Chapters/Content Items	No. HR	Goals
1-2	P r e a l a b l e s has h i c a l g o r i t h i c . A c ti o n s s i m p l es : Reading , Writing And Af f e c t a	*3*	*Write a simple*

	ti on		*algorithm*
3-4	S tr u c t u r e s A l t e r n a t i v e s : THE s ché m as If And According to	*3*	*Write an algorithm containing simple control*
5-6	S tr u c t u r e s REPETITIVES (LOOPS) : Repeat , So much that And For ,	*3*	*Algorithm containing repetitive controls*
7-8	Types Table , Matrix and string of characters ,	*3*	*Algorithm with tables*
9-10	Functions And THE P r o c e d u r e s ,	*3*	*subdivide a problem into sub-problems*
11-12	A l g o rit h m es of Tri	*3*	*Sort an array*
13-14	*Practical exam, mini-project defense, …*	*3*	*Summative evaluation*

3- Evaluation methods & Marks Distribution

Type of assessment	Yes No	Tx Weighting
CC - Continuous assessment (Test/Quiz, Presentation, Report, etc.)	x *Yes* ☐*No*	*20%*
DS - Supervised Duty	☐*Yes* ☐ *No*	
EE - Written test (Final exam)	☐*Yes* ☐ *No*	
EP - Practical test (TP- TP exam / MP- Mini project)	x *Yes* ☐ *No*	*80%*

- ***Material 100% TP : Average = 20% CC + 80% EP***
- *100% CI material : Average = 40% DS + 60% EE*
- *CI+TP material : Average = 20% DS + 20% EP + 60% EE*

4- Evaluation criteria

- *Authorized documents* : ☐ *Yes* ☒*No*
- *Authorized search engine* : ☐ *Yes* ☒*No*
- *Criterion 1: Understanding of the content (4 points)*
- *Criterion 2: Application of knowledge (10 points)*
- *Criterion 3: Critical analysis (4 points)*
- *Criterion 4: Clarity and organization (2 points)*

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5- Web references (useful links):

- S. R OHAU T : A l g o r i t h m i c And Techniques fundamental of p r o g r a mm a ti on, E d i t i on E n i 200 7 .
- L IGN ELET P. , A l gorit h m i c . Methods And models . Paris : But we , 1985.

6- Working environment (Facilities necessary for learning)

- *Matlab, Python*
- *…*

Course Specification

RDM

1. General

Coded	**GCIV 3 105**	Level/Semester	*1/S1*	Coefficient	3	Credits	4
Course	Civil engineering					Volume. H. (CI)	42
Responsible	Kais Ghenia					Volume. H. (TP)	*0*
Module	RDM					Version	*09/2023*

Course description (Course objective):
Complete the study of the efforts internal And of the deformations of the solid. Study of the beams

Prerequisites:	*Keywords :*
Mathematics – General Mechanics	Reactions of supports - Internal forces - Diagrams - Moment of inertia.

Specific objectives of the course (OBJ $_i$):
• Know how to write balance equations and calculate support reactions. • Calculate the internal forces and draw the corresponding diagrams. • Determine the geometric characteristics of plane sections. • Normal stresses and tangential stresses • Deformed beams and deflection check.

Necessary material :
…

2- Content elements (Course)

Week(s)	Chapters/Content Items	No. HR	Goals
1-2	Chap1 : Mechanical reminders (Course + tutorial)	6h	Master the calculation of

			support reactions
3-5	Chap2 : Elementary theory of RDM (Course + tutorial)	9 a.m.	Know the assumptions of RDM Determine the internal forces
6-8	Chap3 : Geometric characteristics of plane sections (Course + tutorial)	9h	Know how to calculate all the geometric characteristics of the usual sections
9-10	Chap4: Simple traction – Simple compression	6h	State of constraint State of deformation Strength conditions
11-12	Chap5 : Simple bending	6h	Normal stress Tangential stress Deformed beam
13-14	Synthesis problems	6h	General revision

3- Content elements (Practical work)

Week(s)	Activities/Content Items	No. HR	Goals
…	…	…	…
…	…	…	…

4- Evaluation methods & Marks Distribution

Type of assessment	Yes No	Tx Weighting
CC - Continuous assessment (Test/Quiz, Presentation, Report, etc.)	☐ *Yes* ■ *No*	
DS - Supervised Duty	■ *Yes* ☐ *No*	
EE - Written test (Final exam)	■ *Yes* ☐ *No*	
EP - Practical test (TP- TP exam / MP- Mini project)	☐ *Yes* X *No*	

- *Material 100% TP : Average = 20% CC + 80% EP*
- ***100% CI material : Average = 40% DS + 60% EE***
- *CI+TP material : Average = 20% DS + 20% EP + 60% EE*

5- Evaluation criteria

- *Authorized documents* : ■ *Yes* ☐ *No*
- *Authorized search engine* : ☐ *Yes* ☐ *No*

- *Criterion 1: Understanding of the content (4 points)*
- *Criterion 2: Application of knowledge (10 points)*
- *Criterion 3: Critical analysis (4 points)*
- *Criterion 4: Clarity and organization (2 points)*

6- Web references (useful links):

1- Resistance of the materials authors : mr. kerguignas, g. caignaert edition : bordas 1977

2- Guide of calculation in mechanical authors : d. splendor, r. greedy editing : hatchet 1996

3- Resistance of the materials authors : has. watchtower, L. geminard editing : dunod 1994

7- Working environment (Facilities necessary for learning)

- *NONE*

Course Specification

Topography

1. General

Coded	**GCIV 3 106**	Level/Semester	*1/S1*	Coefficient	3	Credits	3
Course	Civil engineering					Volume. H. (CI)	21h
Responsible	Kais Ghenia					Volume. H. (TP)	21h.
Module	Topography					Version	09/2023

Course description (Course objective):
Complete the study of the efforts internal And of the deformations of the solid. Study of the beams

Prerequisites:	*Keywords :*
Mathematics	Survey – layout – theodolite – tripod – angles – distances – leveling

Specific objectives of the course (OBJ $_i$):
• Know the surveying procedures • Planimetric calculation methods • Leveling • Calculation of areas.

Necessary material :
NONE

2- Content elements (Course)

Week(s)	Chapters/Content Items	No. HR	Goals
1-2	Chap1 : General elements	3h	Solving triangles
3-5	Chap2 : Measurements of angles (Course + tutorial)	4:30	Horizontal angles – Vertical

		a.m.	angles
6-8	Chap3 : Planimetric survey procedures and determination of rectangular coordinates (Course + tutorial)	4:30 a.m.	Calculation of the coordinates of the points of a polygonal path
9-10	Chapter4: Leveling	3h	Know how to complete a leveling table.
11-12	Chap5 : Calculation of areas	3h	Coordinate Methods
13-14	Synthesis problems	3h	General revision

3- Content elements (Practical work)

Week(s)	Activities/Content Items	No. h	Goals
1	Knowledge of instruments + Set-up	3h	…
2	Implementation	3h	…
3	Measuring horizontal angles	3h	
4	Measuring the altitude of an inaccessible point (vertical angles)	3h	
5	Determination of planimetric coordinates	3h	
6	Ordinary leveling	3h	
7	Assessment	3h	

4- Evaluation methods & Marks Distribution

Type of assessment	Yes No	Tx Weighting
CC - Continuous assessment (Test/Quiz, Presentation, Report, etc.)	☐ *Yes* ■ *No*	
DS - Supervised Duty	■ *Yes* ☐ *No*	
EE - Written test (Final exam)	■ *Yes* ☐ *No*	
EP - Practical test (TP- TP exam / MP- Mini project)	■ *Yes* ☐ *No*	

- *Material 100% TP : Average = 20% CC + 80% EP*
- *100% CI material : Average = 40% DS + 60% EE*
- ***CI+TP material : Average = 20% DS + 20% EP + 60% EE***

5- Evaluation criteria

- *Authorized documents :* ■ *Yes* ☐ *No*
- *Authorized search engine :* ☐ *Yes* ☐ *No*
- *Criterion 1: Understanding of the content (4 points)*
- *Criterion 2: Application of knowledge (10 points)*
- *Criterion 3: Critical analysis (4 points)*

- *Criterion 4: Clarity and organization (2 points)*

6- Web references (useful links):

Destrac J.M. –Lefaivre D. –Maldent Y. –Vila S. : Mémotech Genius Civil (Ed. Caseila)

7- Working environment (Facilities necessary for learning)

- *NONE*

Course Specification

General Construction Processes: PGC

1. General

Coded	**GCIV 3 107**	Level/Semester	1/S1	Coefficient	3	Credits	3
Course	Civil Engineering					Volume. H. (CI)	42
Responsible	Nawfel BOUFAIED					Volume. H. (TP)	0
Module	General Construction Processes: PGC					Version	09/2023

Course description (Course objective):
- Identify the execution processes for the elements of a civil engineering work; - Select the means and methods to implement; - Develop and develop services, technical and operational intervention procedures; - Discover industrial civil constructions; - Learn the practice of execution and construction of constructions.

Prerequisites:	*Keywords :*
Knowledge of school curriculum, mathematics and IT.	Structural work, secondary work, infrastructure, superstructure, engineering work, earthworks, shielding, superficial foundation, deep foundation, etc.

Specific objectives of the course (OBJ $_i$):
The objective of this course is to give students the means to: ***OBJ 1 :*** Discover civil constructions (Buildings and Public Works) ***OBJ 2 :*** Be able to identify the extent of the earthworks. ***OBJ 3 :*** Choose the appropriate gear. ***OBJ 4 :*** Master earthwork volume calculations. ***OBJ 5 :*** Managing is organizing the equipment on a construction site. **OBJ 6 :** Choosing the foundation system

OBJ 7 : Discover the different techniques for executing structural elements. **OBJ 8 :** Be able to identify finishing work.

Necessary material :
Computer, video projector

2- Content elements (Course)

Week(s)	Chapters/Content Items	No. HR	Goals
1	Presentation of the construction sector and civil engineering works	*3h*	General information on the field of civil engineering (statistics, sectors of activity, approvals, etc.)
2	Techniques for executing infrastructure elements	*3h*	*Know execution techniques*
3-4	General information on earthworks.	*6h*	*Earthworks, calculation of: theoretical volume, expanded volume, cycle duration, duration of earthworks, etc.*
5-6	Earthworks in soft ground.	*6h*	*Implementation; Mechanical earthmoving equipment, shielding (molded walls, Berliner walls, etc.) of excavations, drying*

			and drawing down of the water table.
7-9	Floors and foundations	*9*	*Execution techniques: Superficial foundation, semi-deep foundation and deep foundation.*
10	Techniques for executing superstructure elements (frames)	*3h*	*Superstructures and execution techniques*
11	Posts, beams	*3h*	*Learn post and beam construction techniques*
12	Floors and slabs	*3h*	*Method of execution of floors and slabs*
13-14	Finishing work: Coating – masonry – waterproofing – sound and thermal insulation…	*6h*	*Method of carrying out finishing work*

3- Evaluation methods & Marks Distribution

Type of assessment	Yes No	Tx Weighting
CC - Continuous assessment (Test/Quiz, Presentation, Report, etc.)	☐ *Yes* ☐ *No*	
DS - Supervised Duty	■ *Yes* ☐ *No*	*40%*
EE - Written test (Final exam)	■ *Yes* ☐ *No*	*60%*
EP - Practical test (TP- TP exam / MP- Mini project)	☐ *Yes* ■ *No*	

- *Material 100% TP : Average = 20% CC + 80% EP*
- ***100% CI material : Average = 40% DS + 60% EE***
- *CI+TP material : Average = 20% DS + 20% EP + 60% EE*

4- Evaluation criteria

- *Authorized documents* : ☐ *Yes* ■ *No*
- *Authorized search engine* : ☐ *Yes* ■ *No*
- *Criterion 1: Clarity of answers (1 points)*
- *Criterion 2: Clear description of phenomena or situations (Variable… points)*
- *Criterion 3: Proposal of solutions, techniques for construction situations (Variable. points)*
- *Criterion 4: Clear calculation, correct drawing to scale (Variable… points)*

5- Web references (useful links):

General construction processes Volume 1: Formwork and concreting (Christian BOITEAU, Jacques MATHIVAT)

Building, renovating and fitting out a house: All construction techniques in pictures (2nd edition) Alain Bouteveille , Ursula Bouteveille
Building design elements Regulatory and normative requirements (From Bureau Veritas)
The Monitor (Guide to good practices)

6- Working environment (Facilities necessary for learning)

- *Video projector*

Course Specification

Fluid mechanics

1. General

Coded	**GCIV 3 108**	Level/Semester	*1/S1*	Coefficient	*1.5*	Credits	*3*
Course	*Civil Engineering*					Volume. H. (CI)	*21*
Responsible	*Marwen BEN REFIFA*					Volume. H. (TP)	
Module	*Fluid mechanics*					Version	*09/2023*

Course description (Course objective):
This Fluid Mechanics course is designed for engineering students to improve their understanding of fundamental principles and practical applications in the field of fluids. Participants will explore fluid dynamics concepts, basic equations, viscosity, pressure, fluid flow, and industrial applications. This 21-hour interactive course will provide students with a solid foundation for solving real-world problems in fluid mechanics.

Prerequisites:	*Keywords :*
General mechanics, kinematics, Mathematics	*Fluid, Bernoulli, Euler,…*

Specific objectives of the course (OBJ $_i$):
OBJ 1 : Understand the basic principles of fluid mechanics **OBJ 2 :** Apply the equations for conservation of mass and momentum **OBJ 3 :** Analyze the different types of flow and pressure losses **OBJ 4 :** Understand the importance of viscosity and pressure in fluids **OBJ 5 :** Apply concepts learned to practical cases and case studies .

Necessary material :
Board, Pens, Calculator

2- Content elements (Course)

Week(s)	Chapters/Content Items	No. HR	Goals
1-2	*Chapter I: Basic concepts in fluid mechanics*	*3 hours*	*Before diving deeper into the fundamentals of fluid mechanics, it is essential to understand a few key concepts that will serve as a foundation for our exploration.*
3-4	*Chapter II Fluid Properties and Fluid Behavior*	*3 hours*	*Understand the properties of fluids that influence their behavior when at rest. Understanding these properties is essential for analyzing and predicting fluid movement in various situations.*
5-6	*Chapter III: Fundamental laws of fluid mechanics*	*3 hours*	*Present The fundamental laws of fluid mechanics are essential to understanding the behavior of fluids in motion. They are based on physical and mathematical principles that make it possible to analyze and predict the movement of fluids in various situations.*
7-8	*Chapter IV: Law of conservation of mass*	*3 hours*	*This law is expressed by the continuity equation. The objective is to determine the variation of the flow speed as a function of the cross section of the conduit.*
9-10	*Chapter V: Law of conservation of momentum*	*3 hours*	*Analyze the forces that affect the movement of a fluid and predict its behavior.*
11-12	*Chapter VI:: Law of conservation of the quantity of mechanical energy*	*3 hours*	*Understand Bernoulli's Theorem and establish the energy balance of a moving fluid*
13-14	*Chapter VII: Analysis of a fluid flow in a pipe*	*3 hours*	*Perform a comprehensive fluid flow study*

3- Content elements (Practical work)

Week(s)	Activities/Content Elements	No. HR	Goals

…	…	…	…
…	…	…	…
12	*Practical exam, mini-project defense, …*	…	…

4- Evaluation methods & Marks Distribution

Type of assessment	Yes No	Tx Weighting
CC - Continuous assessment (Test/Quiz, Presentation, Report, etc.)	☐ *Yes* ☐ *No*	
DS - Supervised Duty	x *Yes* ☐ *No*	*40%*
EE - Written test (Final exam)	x *Yes* ☐ *No*	*60%*
EP - Practical test (TP- TP exam / MP- Mini project)	☐ *Yes* ☐ *No*	

- *Material 100% TP : Average = 20% CC + 80% EP*
- ***100% CI material : Average = 40% DS + 60% EE***
- *CI+TP material : Average = 20% DS + 20% EP + 60% EE*

5- Evaluation criteria

- *Authorized documents* : x *No*
- *Authorized search engine* : ☐ *Yes* x *No*
- *Criterion 1: clear approach (5 points)*
- *Criterion 2: clear response elements (5 points)*
- *Criterion 3: Good command of calculations and units (5 points)*
- *Criterion 4: excellence and rethinking (5 points)*

6- Web references (useful links):

- *"Fluid mechanics [archive]", on ac-nancy-metz.fr (accessed October 3, 2010)*
- *Bruhat, G., Mechanics, 6th edition, Masson, 1967*
- *(en) Clancy, LJ, Aerodynamics, Section 3.11, Pitman Publishing, London, 1975*
- *(en) Van Wylen, GJ, and Sonntag, RE, Fundamentals of Classical Thermodynamics, Section 5.9, John Wiley and Sons Inc., New York, 1965*

7- Working environment (Facilities necessary for learning)

NONE

Course Specification

Geology

1. General

Coded	**GCIV 3 109**	Level/Semester	1/S1	Coefficient	1.5	Credits	2
Course	Civil Engineering					Volume. H. (CI)	21h.
Responsible	Nawfel BOUFAIED					Volume. H. (TP)	0
Module	Geology					Version	09/2023

Course description (Course objective):
Know the structure of the earth, the different types of rocks and the phenomena that lead to the transformation of rocks

Prerequisites:	*Keywords :*
Natural Sciences	*Layers, geodynamics*

Specific objectives of the course (OBJ $_i$):
OBJ 1 : *The vertical distribution of layers* ***OBJ 2 :*** *Processes that affect the earth's surface (external geodynamics)* ***OBJ 3 :*** *Study sedimentology (the different sedimentation environments)* ***OBJ 4 :*** *Know the different aspects that affect the ground and their applications in the Civil Engineering field*

Necessary material :
…Video projector and a table

2- Content elements (Course)

Week(s)	Chapters/Content Items	No. HR	Goals

1-2	*Know the constituents of the earth according to depth.*	*3h*	*Know the vertical layers of soils and their histories*
3-4	*Study all the processes that affect the earth's surface (external geodynamics)*	*3h*	*Hydrogeological processes and their effects*
5-6	*Study sedimentology (the different sedimentation environments)*	*3h*	*The phenomenon of sedimentation and the nature of soils*
7-8	*Concept of stratigraphy*	*3h*	*The layers of the soil, their stability, resistance,…*
9-10	*Know internal geodynamics (earthquakes and volcanoes and the tectonic concept)*	*3h*	*Breaks in soil layers and the effect of earthquakes*
11-12	*The different types of rocks and their formation methods*	*3h*	*Introduction to materials, rocks,…*
13-14	*Application of geology in the field of civil engineering*	*3h*	*Applications Summary*

3- Content elements (Practical work)

Week(s)	Activities/Content Elements	No. HR	Goals
…	…	…	…
…	…	…	…

4- Evaluation methods & Marks Distribution

Type of assessment	Yes No	Tx Weighting
CC - Continuous assessment (Test/Quiz, Presentation, Report, etc.)	☐ *Yes* ☐ *No*	

DS - Supervised Duty	☒ *Yes* ☐ *No*	*40%*
EE - Written test (Final exam)	☒ *Yes* ☐ *No*	*60%*
EP - Practical test (TP- TP exam / MP- Mini project)	☐ *Yes* ☐ *No*	

- *Material 100% TP : Average = 20% CC + 80% EP*
- ***100% CI material : Average = 40% DS + 60% EE***
- *CI+TP material : Average = 20% DS + 20% EP + 60% EE*

5- Evaluation criteria

- *Authorized documents : ☐ Yes ☒ No*
- *Authorized search engine : ☐ Yes ☒ No*
- *Criterion 1: Understanding of the content (4 points)*
- *Criterion 2: Application of knowledge (10 points)*
- *Criterion 3: Critical analysis (4 points)*
- *Criterion 4: Clarity and organization (2 points)*

6- Web references (useful links):

- *https://www.btp-cours.com/cours-de-geologie-de-lingenieur/ …*
- René Maury, Maurice Renard and Yves Lagabrielle, *Visual memo of geology: The essentials in cards and colors* , Dunod, 2013 , 256 p.
- Foucault & Raoult 2010] Alain Foucault and Jean-François Raoult , *Dictionary of geology: geophysics, Prehistory, paleontology, petrography, mineralogy* , Paris, Dunod , 2010 (reprint 1984, 1988, 1995, 2000, 2005) , 7th ed. (1 st ed. 1980), 388 p. (ISBN 978-2-10-054778-4

7- Working environment (Facilities necessary for learning)

- *NONE*

Course Specification

Numerical analysis

1. General

Coded	**GCIV 3 201**	Level/Semester	1/S1	Coefficient	1.5	Credits	2
Course	Civil Engineering					Volume. H. (CI)	21h.
Responsible	Walid ABID					Volume. H. (TP)	0
Module	Numerical analysis					Version	09/2023

Course description (Course objective):
This course allows students to gain advanced knowledge of mathematics and develop skills to solve engineering problems using mathematical techniques.

Prerequisites:	*Keywords :*
L1 and L2 mathematics courses *Mathematical tools at a BAC+2 level*	*- Dies* *-Determinant of a matrix* *-Functions with a real variable*

Specific objectives of the course (OBJ $_i$):
OBJ 1: Numerically solve a system of linear equations. **OBJ 2:** Solve nonlinear equations numerically.

Necessary material :
NONE

2- Content elements (Course)

Week(s)	Chapters/Content Items	No. HR	Goals
1-7	*Chapter 1: Solving a system of linear equations using direct and iterative methods* *.-Introduction :* ** Definition of a system of equations.* ** Existence and uniqueness of the solution.* ** Resolution by the Cramer method.-* *-The exact methods:* ** Gauss's pivot* ** LU decomposition* ** comparison of the two methods (calculation cost).* *- Iterative Methods:* ** General principle* ** Jacobi's method:* ** The Gauss-Seidel method* ** Comparison of the two methods*	*10:30 a.m.*	*At the end of this chapter, the student will be able to:* *1-Show the existence and uniqueness of a solution of a system of linear equations.* *2-Apply LU decomposition to decompose a matrix.* *3-Describe and Apply the Gauss and LU method to solve a system of linear equations.* *4-Describe and Apply the Jacobi and Gauss-Seidel method to solve a system of linear equations.* *5-Cite the convergence conditions of the Jacobi and Gauss-Seidel methods*
8-14	*Chapter 2: Solving non-linear equations* *-Application examples* *-Existence and uniqueness* *-The dichotomy method:* **Definition* **The dichotomy algorithm* **Estimated number of iterations* **Order of convergence* **Application*	*10:30 a.m.*	*At the end of this chapter, the student will be able to:* *1-Define the Dichotomy method.* *2-Calculate the number of iterations necessary to solve* *a non-linear equation by the dichotomy method with a given precision.* *3-Define Newton's method.* *4-Define the convergence conditions of Newton's*

	-Newton's Method: **Definition* **Convergence condition (Choice of x_0)* ** Newton's algorithm* **Order of convergence* **Application* *- Comparison between the two methods.*		*method.* *5-Discuss the choice of the initial solution of Newton's method.* *6-Compare the Dichotomy method and Newton's method*

3- Content elements (Practical work)

Week(s)	Activities/Content Elements	No. HR	Goals

4- Evaluation methods & Marks Distribution

Type of assessment	Yes No	Tx Weighting
CC - Continuous assessment (Test/Quiz, Presentation, Report, etc.)	☐ *Yes* ■ *No*	
DS - Supervised Duty	■ *Yes* ☐ *No*	*40%*
EE - Written test (Final exam)	■ *Yes* ☐ *No*	*60%*
EP - Practical test (TP- TP exam / MP- Mini project)	☐ *Yes* ■ *No*	

- *Material 100% TP : Average = 20% CC + 80% EP*
- ***100% CI material : Average = 40% DS + 60% EE***
- *CI+TP material : Average = 20% DS + 20% EP + 60% EE*

5- Evaluation criteria

- *Authorized documents* : ☐ *Yes* ■ *No*
- *Authorized search engine* : ☐ *Yes* ☐ *No*
- *Criterion 1: Understanding of the content (4 points)*
- *Criterion 2: Application of knowledge (10 points)*
- *Criterion 3: Critical analysis (4 points)*
- *Criterion 4: Clarity and organization (2 points)*

6- Web references (useful links):

- *Grégoire Allaire "Numerical analysis and optimization: An introduction to mathematical modeling and simulation*

7- Working environment (Facilities necessary for learning)

NONE

Course Specification

Practical Work on Material Resistance: TP-RDM

1. General

Coded	**GCIV 3 202**	Level/Semester	2	Coefficient	1.5	Credits	2
Course	Civil Engineering					Volume. H. (CI)	0
Responsible	Kais Ghenia					Volume. H. (TP)	21h.
Module	Practical Work on Material Resistance: TP-RDM					Version	10/2023

Course description (Course objective):
Carrying out practical work to verify and complete the knowledge provided in the RDM theoretical course

Prerequisites:	*Keywords :*
RDM theoretical course	*Deflection, Stresses, Deformations, Elastic limit, Modulus of elasticity, Critical force, coefficient of friction*

Specific objectives of the course (OBJ $_i$):
OBJ 1: *Know how to carry out a manipulation by following the instructions in the booklet.*
OBJ 2: *Observe physical phenomena and exploit practical results.*
OBJ 3: *Write a report.*

Necessary material :
Video projector – Computers.

2- Content elements (Practical work)

Week(s)	Chapters/Content Items	No. HR	Goals
1	*TP1: Study of buckling of beams.*	*3H*	*- Observe the shape of the deformation of a buckling beam* *- Know the effect of support conditions on the buckling phenomenon* *- Determine experimentally and theoretically the critical buckling load of a beam*
2	*TP2: Study of the bending of beams by measuring displacements.*	*3H*	*- Highlight the Maximum Effort-Deflection relationship* *- Deduce the influence of the span and rigidity of a beam on its deflection.* *- Experimentally determine the longitudinal elastic modulus of a material.*
3	*TP3: Study of the bending of beams by measuring deformation.*	*3H*	*- Highlight small deformations* *- Determine the distribution of normal stresses in a section of a beam subjected to simple bending* *- Experimentally determine the*

			longitudinal elastic modulus of a material.
4	*TP4: Study of Friction on an Aluminum plane.*	*3H*	*- Highlight the parameters on which friction depends* *- Experimentally determine the coefficient of static friction of various materials in contact with Aluminum*
5	*TP5: Study of the bending of an isostatic beam using RDM 6 software.*	*3H*	*- Handle the RDM 6 software* *- Determine manually and automatically the variation of stresses, stresses and deflection in an isostatic beam* *- Size the beam for different materials.*
6	*TP6: Study of the bending of a gantry using RDM 6 software.*	*3H*	*- Handle the RDM 6 software for more complex structural cases* *- Automatically determine the variation of stresses, constraints and deflection at all points* *- Size the*

			constituent elements for different materials and different shapes of profiles.
7	*Practical Final Exam*	*3H*	*Be able to carry out any requested manipulation*

4- Evaluation methods & Marks Distribution

Type of assessment	Yes No	Tx Weighting
CC - Continuous assessment (Test/Quiz, Presentation, Report, etc.)	x *Yes* ☐ *No*	*20%*
DS - Supervised Duty	☐ *Yes* ☐ *No*	
EE - Written test (Final exam)	☐ *Yes* ☐ *No*	
EP - Practical test (TP- TP exam / MP- Mini project)	x *Yes* ☐ *No*	*80%*

- ***Material 100% TP : Average = 20% CC + 80% EP***

5- Evaluation criteria

- *Authorized documents : ☐ Yes x No*
- *Authorized search engine : ☐ Yes* x *No*
- *Criterion 1: Understanding of the content (4 points)*
- *Criterion 2: Application of knowledge (10 points)*
- *Criterion 3: Critical analysis (4 points)*
- *Criterion 4: Clarity and organization (2 points)*

6- Web references (useful links):

- Jean-Claude DOUBRERE, Resistance of Materials, EYROLLES, 2013.
- Pierre LATTEUR, Calculating a structure from theory to example, ACADEMIA, 2012.

Course Specification

Operational research

1. General

Coded	**GCIV 3 203**	Level/Semester	1/S2	Coefficient	1.5	Credits	2
Course	Civil Engineering					Volume. H. (CI)	21h.
Responsible	Walid ABID					Volume. H. (TP)	0
Module	Operational research					Version	10/2023

Course description (Course objective):
This course allows students to acquire the basic knowledge necessary to formalize and analyze the complex decision problems that arise in companies.

Prerequisites:	*Keywords :*
Linear Algebra and Matrix Calculus	*- Linear programming* *-Graph theory* - Simplex algorithm

Specific objectives of the course (OBJ $_i$):
Upon completion of this module, the student will be able to: **OBJ 1:** Master business problem-solving algorithms. **OBJ 2:** Master graph theory.

2- Content elements (Course)

Week(s)	Chapters/Content Items	No. HR	Goals
1-7	*Chapter 1:* Linear Programming -Problem formulation -Method and graphic interpretation	*10:30 a.m.*	Optimization of a linear

	-Simplex algorithm -Detail of the algorithm		function
8-14	*Chapter 2:* Graph theory	*10:30 a.m.*	

3- Content elements (Practical work)

Week(s)	Activities/Content Items	No. HR	Goals

4- Evaluation methods & Marks Distribution

Type of assessment	Yes No	Tx Weighting
CC - Continuous assessment (Test/Quiz, Presentation, Report, etc.)	☐ *Yes* ■ *No*	
DS - Supervised Duty	■ *Yes* ☐ *No*	*40%*
EE - Written test (Final exam)	■ *Yes* ☐ *No*	*60%*
EP - Practical test (TP- TP exam / MP- Mini project)	☐ *Yes* ■ *No*	

- *Material 100% TP : Average = 20% CC + 80% EP*
- *100% CI material : Average = 40% DS + 60% EE*
- *CI+TP material : Average = 20% DS + 20% EP + 60% EE*

5- Evaluation criteria

- *Authorized documents* : ☐ *Yes* ■ *No*
- *Authorized search engine* : ☐ *Yes* ☐ *No*
- *Criterion 1: Understanding of the content (4 points)*
- *Criterion 2: Application of knowledge (10 points)*
- *Criterion 3: Critical analysis (4 points)*
- *Criterion 4: Clarity and organization (2 points)*

6- Web references (useful links):

Fabian Bastin. Operational Research Models. Department of Computer Science and Operations Research University of Montreal

Course Specification

Reinforced concrete 1

1. General

Coded	**GCIV 3 204**	Level/Semester	1/S2	Coefficient	3	Credits	4
Course	Civil Engineering					Volume. H. (CI)	42h
Responsible	Sami ANTIT					Volume. H. (TP)	0
Module	Reinforced concrete 1					Version	09/2023

Course description (Course objective):
General information on Eurocodes and mastery of BA calculation of sections subject to simple loads

Prerequisites:	*Keywords :*
RDM - Building materials	*Eurocode – Reinforced concrete – Sizing*

Specific objectives of the course (OBJ $_i$):
OBJ 1 : Know the basic principles of structural design according to Eurocodes 0 and 1 ***OBJ 2 :*** Concepts of reinforced concrete calculation according to EC2

Necessary material :
…

2- Content elements (Course)

Week(s)	Chapters/Content Items	No. HR	Goals
1-3	**Chapter I : Calculation bases and actions on structures (Eurocodes 0 and 1)** 1 General 2 Calculation bases 3 Actions on structures	*9h*	*Ensuring the safety and stability of structures to resist external loads*

4-6	**Chapter II : Material behavior, durability and safety** 1 Concrete 2 Structural steel 3 Durability of concrete	*9h*	*Understanding how materials deform which allows us to design durable and safe structures*
7-11	**Chapter III : Simple bending at ULS** 1 General 2 Deformation diagrams of steel and concrete 3 Stress diagrams 4 Bending at ULS – Rules of the three pivots 5 Bending at ULS – Equilibrium equations 6 Bending at ULS – Reinforcement section A(cm²) 7 Diagrams and programming spreadsheets 8 Applications	*3 h*	*Sizing of elements deflected at ULS (beams)*
12-14	**Chapter V : Columns in simple compression at the ULS** 1 Position of the problem 2 Min and max sections 3 Sizing of posts – Simplified method (H.Thonier) 4 Constructive provisions and transverse reinforcement 5 Diagramming and programming spreadsheets 6 Applications	*9h*	*Sizing of compressed elements at ULS (columns)*

3- Content elements (Practical work)

Week(s)	Activities/Content Items	No. HR	Goals
…	…	…	…
…	…	…	…

4- Evaluation methods & Marks Distribution

Type of assessment	Yes No	Tx Weighting
CC - Continuous assessment (Test/Quiz, Presentation, Report, etc.)	☐ *Yes* ☐ *No*	

DS - Supervised Duty	X *Yes*	☐ *No*	*40%*
EE - Written test (Final exam)	X *Yes*	☐ *No*	*60%*
EP - Practical test (TP- TP exam / MP- Mini project)	☐ *Yes*	☐ *No*	

- *Material 100% TP : Average = 20% CC + 80% EP*
- ***100% CI material : Average = 40% DS + 60% EE***
- *CI+TP material : Average = 20% DS + 20% EP + 60% EE*

5- Evaluation criteria

- *Authorized documents : ☐ Yes ☐x No*
- *Authorized search engine : ☐ Yes ☐ xNo*
- *Criterion 1: Understanding of the content (4 points)*
- *Criterion 2: Application of knowledge (10 points)*
- *Criterion 3: Critical analysis (4 points)*
- *Criterion 4: Clarity and organization (2 points)*

6- Web references (useful links):

1 - JA Calgaro, Bases for calculating structures according to Eurocode 0, Edition Le Moniteur

2- H.Thonier, Design and calculation of building structures (Volume 7,) Presse des Ponts 2010 (2nd edition)

3 - D.Ricotier, Sizing of concrete structures according to Eurocode 2, Edition le Moniteur 2012

4 - J.Roux, Mastery of Eurocode 2, Edition Eyrolles 2009

7- Working environment (Facilities necessary for learning)

- *NONE*

Course Specification

Calculation of structures 1

1. General

Coded	**GCIV 3 205**	Level/Semester	*1/S2*	Coefficient	3	Credits	3
Course	Civil engineering					Volume. H. (CI)	42h
Responsible	Kais GHenia					Volume. H. (TP)	*0*
Module	Calculation of structures 1					Version	*12/2023*

Course description (Course objective):
Deepen the knowledge seen in RDM and introduction to practical methods for sizing certain structural elements

Prerequisites:	*Keywords :*
Mathematics – RDM	Normal stresses – tangential stresses – Resistance conditions – Sizing – Buckling – plane triangular systems

Specific objectives of the course (OBJ $_i$):
• Calculate the normal and tangential stresses – draw the diagrams – carry out the checks • Control the buckling phenomenon (case of posts) • Calculate plane triangular systems (knot method and section method) • Composite requests.

Necessary material :
NONE

2- Content elements (Course)

Week(s)	Chapters/Content Items	No.	Goals
1-4	Chap1 : Verification of sections with respect to normal stress and tangential stress - deflection verification (Course + tutorial)	12 h	Introduction to section sizing
5-6	Chap2 : Buckling (Course + TD)	6h	Force to criticize Euler
7-9	Chap3 : Plane triangular systems (simple lattices) (Course + tutorial)	9h	Solving Methods
10-12	Chap4: Compound Flexion	9h	State of constraint State of deformation Strength conditions Introduction to the principle of prestressed concrete
13-14	Synthesis problems	6h	General revision

3- Content elements (Practical work)

Week(s)	Activities/Content Items	No. HR	Goals
…	…	…	…
…	…	…	…

4- Evaluation methods & Marks Distribution

Type of assessment	Yes No	Tx Weighting
CC - Continuous assessment (Test/Quiz, Presentation, Report, etc.)	☐ *Yes* ■ *No*	
DS - Supervised Duty	■ *Yes* ☐ *No*	
EE - Written test (Final exam)	■ *Yes* ☐ *No*	
EP - Practical test (TP- TP exam / MP- Mini project)	☐ *Yes* X *No*	

- *Material 100% TP : Average = 20% CC + 80% EP*
- ***100% CI material : Average = 40% DS + 60% EE***
- *CI+TP material : Average = 20% DS + 20% EP + 60% EE*

5- Evaluation criteria

- *Authorized documents* : ■ *Yes* ☐ *No*

- *Authorized search engine : ☐ Yes ☐ No*
- *Criterion 1: Understanding of the content (4 points)*
- *Criterion 2: Application of knowledge (10 points)*
- *Criterion 3: Critical analysis (4 points)*
- *Criterion 4: Clarity and organization (2 points)*

6- Web references (useful links):

1- Resistance of the materials authors : mr. kerguignas, g. caignaert edition : bordas 1977

2- Guide of calculation in mechanical authors : d. splendor, r. greedy editing : hatchet 1996

3- Resistance of the materials authors : has. watchtower, L. geminard editing : dunod 1994

Course Specification

Construction materials

1. General

Coded	**GCIV 3 206**	Level/Semester	1/S2	Coefficient	3	Credits	3
Course	Civil engineering					Volume. H. (CI)	21h.
Responsible	Atef BEN OTHMEN					Volume. H. (TP)	21h.
Module	Construction materials					Version	09/2023

The first objective of this course consists of defining the physical and mechanical characteristics of aggregates and mineral binders.

The current normative texts which establish the quality control procedures for these materials are described and will be applied in practical work sessions.

The second objective concerns the specification of the workability characteristics of mortars and concretes in the fresh state and their mechanical characteristics in the hardened state.

These characteristics will be analyzed in the laboratory by carrying out appropriate experimental tests.

The latest development of this course focuses on the study of the formulation of hydraulic concrete using the Dreux Gorisse method and that of Baron – Olivier.

At the end of this course, two chapters will be devoted, on the one hand, to the classification of adjuvants and their use in concrete and, on the other hand, to the definition and classification of black products used in road construction.

Prerequisites:	*Keywords :*
	Material , concrete, mortar, resistance, workability

Specific objectives of the course (OBJ $_i$):
OBJ 4 : *Be* able to choose good quality aggregates and appropriate hydraulic binders.
OBJ 5 : *Determine* the characteristics of mortars and concretes in the fresh and hardened states.
OBJ 6 : *Master* the *formulation* of hydraulic concrete.

Necessary material :
Course handout

2- Content elements (Course)

Week(s)	Chapters/Content Items	No. HR	Goals
1	*Chapter* 1: Physical and mechanical *characteristics* of construction materials	*1.5*	- Physical properties - Phase diagram of porous materials - thermal properties
2	. Continued Chapter 1	*1.5*	- Acoustic *properties* - Mechanical *properties* - Application *exercises*
3-4	Chapter 2: Rocks and aggregates	*3*	- Different categories of rocks - Source of aggregates - The properties of aggregates - Particle size analysis - Sand Equivalent Test - Methylene blue test - Los Angeles Trial - Micro-Deval test.
5	TD 1: Aggregates	*1.5*	
6-7	Chapter 3: Mineral binders	*3*	- Cement - Cement manufacturing - Characteristics of cement powder - Characteristics of cement paste - Cement Setting Test - Mechanical resistance test - Classification of cements

			- Lime - The plaster
8	Chapter 4: Mortars and concretes	*1.5*	- *The* dead - *Characteristics* and requirements - *Dosage of mor* thirds - Mortar tests - Socket test - Compressive strength test - Use of mortars
9	*Follow* Chapter 4	*1.5*	- *Concrete* - Characteristics of concrete - Compressive strength - Tensile strength - Concrete formulation elements
10 - 11	*Chapter* 5: Formulation of hydraulic concretes	*3*	- *Water dosage and* predictable air content - Link *dosage* - Optimal granularity of the granular skeleton - Dosing of aggregates - Correction of the wording - Application exercise
12	TD 2: Formulation of hydraulic concrete	*1.5*	
13	Chapter *6: admixtures* for concrete	*1.5*	- *Definition* of adjuvants - *Plasticizers* - Thinners - Air trainers - Setting accelerators - Setting retarders - Water repellents - Anti-freezes and anti-freezes - Treatment products
14	Chapter 7: Black Products	*1.5*	- *Use* of black products

			- *Bitumens* - The characteristics of pure bitumens - Quality, standards and specifications of bitumens - Classification of bitumens

3- Content elements (Practical work)

Week(s)	Activities/Content Items	No. HR	Goals
1	*Determination* of aggregate densities	*1.5*	- *Determine* the apparent and specific density of a sand - *Determine* the apparent density of a rock
2	*Granulometric analysis* of sand	*1.5*	- *Analyze the* particle size distribution of sand - *Draw up the granulometric* curve - Calculation of the fineness modulus and the uniformity coefficient - Judging the quality of sand
3	Sand *Equivalent Test*	*1.5*	- *Determine* the percentage of fines in the sand - *Apply the EN 933 – 8 standard to* determine the value of the visual sand equivalent ESV

4	Methylene blue test	*1.5*	- *Defining* the clay of the sand - *Measure the methylene blue value* of sand VB
5	Mechanical resistance *tests of aggregates*	*1.5*	- Testing the impact resistance of a gravel test Los Angeles - Testing the friability of sand using the Micro - Deval
6	*Consistency test* of cement paste	*1.5*	- *Determine* the standardized consistency of a normal cement paste using the Vicat test
7	*Socket test*	*1.5*	- *Apply the NF EN 196 -3 standard to determine* the start-of-setting time and the end-of-setting time of a cement.
8	Mortar *formulation*	*1.5*	- *Formulation of a normal mortar and preparation of test specimens (4* 4 *16)*
9	*Abrams cone test*	*1.5*	*Study* the different consistency classes of concrete using the Abrams cone slump test.
10 - 11	*Formulation* of concrete	*3*	*Application* of the Dreux Gorisse method for the formulation of

			concrete.
12	Concrete *compression test*	*1.5*	*Determine the compressive strength of cylindrical specimens (16 * 32) through the application of Standard NFP 18 – 408.*
13	Splitting tensile *test*	*1.5*	*Determine the tensile strength of cylindrical specimens using the Brazilian test (Standard NFP 18 - 408)*
14	*Practical exam*	*3h*	*Summative evaluation*

4- Evaluation methods & Marks Distribution

Type of assessment	Yes No	Tx Weighting
CC - Continuous assessment (Test/Quiz, Presentation, Report, etc.)	☐ *Yes* ☐ *No*	
DS - Supervised Duty	☐ *Yes* ☐ *No*	*20%*
EE - Written test (Final exam)	☐ *Yes* ☐ *No*	*60%*
EP - Practical test (TP- TP exam / MP- Mini project)	☐ *Yes* ☐ *No*	*20%*

- *Material 100% TP : Average = 20% CC + 80% EP*
- *100% CI material : Average = 40% DS + 60% EE*
- ***CI+TP material : Average = 20% DS + 20% EP + 60% EE***

5- Evaluation criteria

- *Authorized documents* : ☐ *Yes* ☐ *No*
- *Authorized search engine* : ☐ *Yes* ☐ *No*
- *Criterion 1: Understanding of the content (4 points)*

- *Criterion 2: Application of knowledge (10 points)*
- *Criterion 3: Critical analysis (4 points)*
- *Criterion 4: Clarity and organization (2 points)*

6- Web references (useful links):

- Materials for Construction and Civil Engineering, Gonçalves, M. Clara, Margarido, Fernanda; Springer International Publishing, March 2015; DOI 10.1007/978-3-319-08236-3
- https://www.constructionplacements.com/civil-engineering-materials/#google_vignette
- https://books.google.tn/books/about/Construction_Materials_for_Civil_Enginee.html?id=GCpOmKQWrkUC&redir_esc=y

7- Working environment (Facilities necessary for learning)

- *None*

Course Specification

Soil mechanics 1

1. General

Coded	**GCIV 3 207**	Level/Semester	1/S2	Coefficient	3	Credits	4
Course	Civil Engineering					Volume. H. (CI)	42h
Responsible	Hatem Karoui					Volume. H. (TP)	
Module	Soil mechanics 1					Version	09/2023

Course description (Course objective):
Study the physical, mechanical and hydraulic properties of foundation soils for engineering works civil in order to classify them and understand their behavior.

Prerequisites:	*Keywords :*
Mathematics, General Mechanics, RDM, Construction Materials	*Consolidation, soil hydraulics*

Specific objectives of the course (OBJ $_i$):
OBJ 1 : *General information on rocks and soil*
OBJ 2 : *Physical properties and identification and classification of soils*
OBJ 3 : *Soil hydraulics: Water flow in the ground*
OBJ 4 : *Consolidation settlement and constraints*

2- Content elements (Course)

Week(s)	Chapters/Content Items	No. HR	Goals
1	*General information on rocks and soils*	*3H*	*Soil families*
2-4	*Chapter 1: Physical properties and identification and classification of soils*	*9h*	*Soil classification*
5-7	*Chapter 2: Soil hydraulics*	*9h*	*Soil permeability*

8-10	*Chapter 3: Stresses in the ground*	*9h*	*Normal and tangential stress*
11-14	*Chapter 4: Consolidation, settlement and duration of consolidation*	*12H*	*The oedometric test and consolidation time*

3- Content elements (Practical work)

Week(s)	Activities/Content Elements	No. HR	Goals
…	…	…	…
…	…	…	…

4- Evaluation methods & Marks Distribution

Type of assessment	Yes No	Tx Weighting
CC - Continuous assessment (Test/Quiz, Presentation, Report, etc.)	☐ *Yes* ☐ *No*	
DS - Supervised Duty	x *Yes* ☐ *No*	*40%*
EE - Written test (Final exam)	x *Yes* ☐ *No*	*60%*
EP - Practical test (TP- TP exam / MP- Mini project)	☐ *Yes* ☐ *No*	

- *Material 100% TP : Average = 20% CC + 80% EP*
- ***100% CI material : Average = 40% DS + 60% EE***
- *CI+TP material : Average = 20% DS + 20% EP + 60% EE*

5- Evaluation criteria

- *Authorized documents* : ■ *Yes No*
- *Authorized search engine* : ☐ *Yes* x *No*
- *Criterion 1: Understanding of the content (4 points)*
- *Criterion 2: Application of knowledge (10 points)*
- *Criterion 3: Critical analysis (4 points)*
- *Criterion 4: Clarity and organization (2 points)*

6- Web references (useful links):

- Notions of soil mechanics: Bouassida. M., Klai, M., Marzougui, A.
- Elements of soil mechanics: François Schlosser:

7- Working environment (Facilities necessary for learning)

- *None*

Course Specification

General hydraulics

1. General

Coded	**GCIV 3 208**	Level/Semester	*1/S2*	Coefficient	*1.5*	Credits	*2*
Course	*Civil Engineering*					Volume. H. (CI)	*21*
Responsible	*Marwen BEN REFIFA*					Volume. H. (TP)	
Module	*General hydraulics*					Version	*09/2023*

Course description (Course objective):
This course on general hydraulics aims to strengthen the knowledge and skills of civil engineering students in the field of hydraulics. Participants will learn the fundamentals of fluid flow, pressure calculations, pressure losses, and practical applications of hydraulics in civil engineering projects.

Prerequisites:	*Keywords :*
General mechanics, kinematics, Mathematics	*Civil engineering, Hydraulics, Fluids, Pressure losses, Pressure calculations*

Specific objectives of the course (OBJ $_i$):	
OBJ 1 :	Understand the fundamentals of fluid flow
OBJ 2 :	Master pressure calculations in hydraulics
OBJ 3 :	Analyze pressure losses in pipes
OBJ 4 :	Apply hydraulics concepts to civil engineering projects
OBJ 5 :	Solve complex general hydraulics problems

Necessary material :
Board, Pens, Calculator

2- Content elements (Course)

Week(s)	Chapters/Content Items	No. HR	Goals
1-2	*Chapter I: Introduction to fluid flow*	*3 hours*	*explore the fundamentals of fluid flow and associated pressure calculations.*
3-4	*Chapter II Fluid Properties and Fluid Behavior*	*3 hours*	*Understand the properties of fluids that influence their behavior when at rest. Understanding these properties is essential for analyzing and predicting fluid movement in various situations.*
5-6-7-8	*Chapter III: Pressure calculations Fundamental relationship of hydrostatics*	*6 hours*	*Understanding how to calculate pressure in a hydraulic system is essential to ensure its proper operation and safety.*
9-10	*Chapter IV: Pascal's Theorem*	*3 hours*	*This law is expressed by the pressure variation equation. The objective is to determine the variation of pressure in all points of a hydraulic system.*
11-12	*Chapter V: Push Torsor*	*3 hours*	*Analyze the forces that influence the walls of hydraulic structures and calculate the associated torque*
13-14	*Chapter VI:: Calculation of pressure in a hydraulic system*	*3 hours*	*OBJ 5: Solve complex general hydraulics problems*

3- Content elements (Practical work)

Week(s)	Activities/Content Elements	No. HR	Goals
…	…	…	…
…	…	…	…
…	*Practical exam, mini-project defense, …*	…	…

4- Evaluation methods & Marks Distribution

Type of assessment	Yes No	Tx Weighting

CC - Continuous assessment (Test/Quiz, Presentation, Report, etc.)	☐ *Yes* ☐ *No*	
DS - Supervised Duty	x *Yes* ☐ *No*	*40%*
EE - Written test (Final exam)	x *Yes* ☐ *No*	*60%*
EP - Practical test (TP- TP exam / MP- Mini project)	☐ *Yes* ☐ *No*	

- *Material 100% TP : Average = 20% CC + 80% EP*
- *100% CI material : Average = 40% DS + 60% EE*
- *CI+TP material : Average = 20% DS + 20% EP + 60% EE*

5- Evaluation criteria

- *Authorized documents* : x *No*
- *Authorized search engine* : ☐ *Yes* x *No*
- *Criterion 1: clear approach (5 points)*
- *Criterion 2: clear response elements (5 points)*
- *Criterion 3: Good command of calculations and units (5 points)*
- *Criterion 4: excellence and rethinking (5 points)*

6- Web references (useful links):

- *"Fluid mechanics [archive]", on ac-nancy-metz.fr (accessed October 3, 2010)*
- *Bruhat, G., Mechanics, 6th edition, Masson, 1967 livier Thual, Waves and fluids: multimedia educational articles, Toulouse, Cépaduès, 2005, 197 p. (ISBN 2-85428-655-3)*
- *Hendrik C. Kuhlmann and Hans-Josef Rath (Eds.), Free Surface Flows, Springer-Verlag, 1998, 331 p. (ISBN 978-3-7091-2598-4)*

7- Working environment (Facilities necessary for learning)

NONE

Course Specification

DAO: Civil engineering

1. General

Coded	**GCIV 3 209**	Level/Semester	1/S2	Coefficient	1.5	Credits	2
Course	Civil Engineering					Volume. H. (CI)	0
Responsible	Nawfel SASSI					Volume. H. (TP)	21h.
Module	DAO: Civil engineering					Version	09/2023

Course description (Course objective):
- The student must know the usefulness of the dedicated software for computer - assisted drawing Auto-cad, revit… (speed, simplicity…) ; - The student must be able to master the A u t o - cad tool in 2D to achieve of the drawings genius c i v il ; - The student must be able to import and export files in several formats (dwg, dxf, etc.) to computer-aided CAD design software (Robot, Arche, Piste, Covadis, etc.); - Setting up the printing of plans to scale.

Prerequisites:	*Keywords :*
Technical drawing standards: lines, drawing paper formats and printing plans, the principle of orthogonal projection, sections, facades, plans (architectural, structure, details, etc.).	Scale , dimensions , layers , hatching , mod e s hooks , dwg , dxf …

Specific objectives of the course (OBJ $_i$):
OBJ 1 : The student must be able to master the A u t o - cad tool in 2D / 3D to achieve of the drawings genius c i v il ; ***OBJ 2 :*** The student must also be able to import and export files in several formats (dwg, dxf, etc.) to computer-aided design software CAD (Robot) **OBJ 3 :** Setting up the printing of plans on scale.

Necessary material :

Computer, video projector, Autodesk Auto-cad 2023 software.

2- Content elements (Practical work)

Week(s)	Activities/Content Elements	No. HR	Goals
1-4	Overview of the standard drawing environment: The student must handle them orders of ba rr es where does he come from follow : - Drawing , Editing , Dimensions , Text , Layers , Hatching . All in know the modifications required of the settings of : - Style of t e x t e. - Style of quoting . - Importation and exportation of the images - Impression . - modes of attachments .	*6*	Computer-assisted drawing of technical plans
5-8	- Application For of the p l an subdivision , foundation , formwork , ironwork and details ; - Application for drawing building electricity lots, fluid (simple examples); - Application for drawing in plan, longitudinal profile, cross types of roads;	*6*	Computer-assisted drawing of technical plans
9-12	- Application for drawing elements of simple bridges; - Import settings and exportation of files to CAD software; Setting up the printing of plans to scale.	*6*	Computer-assisted drawing of technical plans
13-14	*Practical exam, mini-project defense, …*	*3*	*Summative evaluation*

3- Evaluation methods & Marks Distribution

Type of assessment	Yes No	Tx Weighting
CC - Continuous assessment (Test/Quiz, Presentation, Report, etc.)	☐ *Yes* ■ *No*	
DS - Supervised Duty	☐ *Yes* ■ *No*	
EE - Written test (Final exam)	☐ *Yes* ■ *No*	
EP - Practical test (TP- TP exam / MP- Mini project)	■ *Yes* ☐ *No*	

- ***Material 100% TP : Average = 20% CC + 80% EP***
- *100% CI material : Average = 40% DS + 60% EE*
- *CI+TP material : Average = 20% DS + 20% EP + 60% EE*

4- Evaluation criteria

- *Authorized documents :* ■ *Yes* ☐ *No*
- *Authorized search engine :* ■ *Yes* ☐ *No*

- *Criterion 1: Clarity of answers (1 points)*
- *Criterion 2: Clear description of phenomena or situations (Variable… points)*
- *Criterion 3: Proposal of solutions, techniques for modeling situations (Variable. points)*
- *Criterion 4: Clear calculation, correct drawing to scale (Variable… points)*

5- Web references (useful links):

- Acquire the fundamentals of Autodesk AUTOCAD
- https://www.autodesk.fr/

6- Working environment (Facilities necessary for learning)

- *Video projector, computer laboratory, Auto-cad 2023*

Course Specification

Building Electricity

1. General

Coded	**GCIV 3 210**	Level/Semester	1/S2	Coefficient	1.5	Credits	2
Course	Civil engineering					Volume. H. (CI)	21h.
Responsible	Imen KORTAS					Volume. H. (TP)	0
Module	Building Electricity					Version	09/2023

Course description (Course objective):
This course is intended for 3rd year civil engineering classes , it presents the sizing of electrical installations and the study of domestic lighting schemes.

Prerequisites:	*Keywords :*
Knowledge of some basic notions of domestic electrical equipment.	*Lighting, electrical consumption, architectural diagram, developed diagram, single-line diagram, etc.*

Specific objectives of the course (OBJ $_i$):
1. Knowledge and choice of electrical protection devices. 2. Establish the energy balance of a domestic installation. 3. Draw the different electrical diagrams while respecting given specifications.

2- Content elements (Course)

Week(s)	Chapters/Content Items	No. HR	Goals
1-2	Chapter 1: The basic elements of a domestic electrical installation.	*3h*	Know the basic elements of an

			electrical installation and their roles.
3-4	Chapter 2: Standards and symbols	*3h*	Become familiar with national and international electrical standards
5-6-7-8	Chapter 3: Lighting, power socket and signaling assemblies	*6h*	Establish the different lighting schemes.
9-11	Chapter 4: LV electrical equipment & personal safety	*4:30 a.m.*	Choice of electrical equipment according to the type of protection requested.
12-14	Chapter 5: neutral regime	*4:30 a.m.*	Know the neutral regimes and calculate the fault current in each regime.

- Evaluation methods & Grade distribution

Type of assessment	Yes No	Tx Weighting
CC - Continuous assessment (Test/Quiz, Presentation, Report, etc.)	☐ *Yes* ☐ *No*	
DS - Supervised Duty	■ *Yes* ☐ *No*	*40%*
EE - Written test (Final exam)	■ *Yes* ☐ *No*	*60%*
EP - Practical test (TP- TP exam / MP- Mini project)	☐ *Yes* ■ *No*	

- *Material 100% TP : Average = 20% CC + 80% EP*
- ***100% CI material : Average = 40% DS + 60% EE***
- *CI+TP material : Average = 20% DS + 20% EP + 60% EE*

5- Evaluation criteria

- *Authorized documents* : ☐ *Yes* ■ *No*
- *Criterion 1: Understanding of the content (4 points)*
- *Criterion 2: Application of knowledge (10 points)*
- *Criterion 3: Critical analysis (4 points)*
- *Criterion 4: Clarity and organization (2 points)*

5- Web references (useful links):

- *M. González-Torres, L. Pérez-Lombard, Juan F. Coronel, Ismael R. Maestre, Da Yan,A review on buildings energy information: Trends, end-uses, fuels and drivers, Energy Reports, Volume 8,2022,Pages 626-637,ISSN 2352-4847,https://doi.org/10.1016/j.egyr.2021.11.280.*
- *https://www.archtoolbox.com/electrical-system-in-buildings/*

6- Working environment (Facilities necessary for learning)

- *Video projector, electrical laboratory*

Course Specification

Roads 1

1. General

Coded	**GCIV 4 101**	Level/Semester	2/S3	Coefficient	3	Credits	3
Course	Civil Engineering					Volume. H. (CI)	42h
Responsible	Mohamed Boudabous					Volume. H. (TP)	0
Module	Roads 1					Version	09/2023

Course description (Course objective):
Geometric design of roads and layout of intersections based on traffic surveys.

Prerequisites:	*Keywords :*
Topography, mathematics	*Road traffic, geometric layout, crossroads*

Specific objectives of the course (OBJ $_i$):
OBJ 1 : *Road classification* ***OBJ 2 :*** *Traffic study* ***OBJ 3 :*** *Geometric drawing and technical guides* ***OBJ 4 :*** *Development of intersections*

Necessary material :
NONE

2- Content elements (Course)

Week(s)	Chapters/Content Items	No. HR	Goals
1-2	*Introduction to road design: definitions, generalities, Tunisian road network, road network in developed countries, classified roads, highways*	*6H*	*Importance of road infNonetructure in development*

3-4	*Chapter 1: study of road traffic* *The objectives of traffic studies* *Vocabulary: transit traffic, tMJA*	*6H*	*The role of traffic surveys in road and intersection planning*
5-6	*Traffic flow, level of service, traffic projection, Directed work*	*6H*	*Traffic projection and planning of road projects*
7-8	*Geometric layout, technical guides (ARP, VSA ICTAAL) reference speed, plan layout, circular and progressive connections*	*6H*	*The Basics of Geometric Road Design*
9-10	*Visibility, stopping distance, longitudinal profile, cross profile*	*6H*	*The different elements of geometric design*
11-12	*Design of intersections, types of intersections (at grade, unevenness), design parameters,*	*6H*	*Layout of intersections*
13-14	*Capacity calculation of roundabouts and review*	*6H*	*The level of service at intersections*

3- Content elements (Practical work)

Week(s)	Activities/Content Items	No. HR	Goals
…	…	…	…
…	…	…	…

4- Evaluation methods & Marks Distribution

Type of assessment	Yes No	Tx Weighting
CC - Continuous assessment (Test/Quiz, Presentation, Report, etc.)	☐ *Yes* ☐ *No*	
DS - Supervised Duty	x *Yes* ☐ *No*	*40%*
EE - Written test (Final exam)	x *Yes* ☐ *No*	*60%*
EP - Practical test (TP- TP exam / MP- Mini project)	☐ *Yes* ☐ *No*	

- *Material 100% TP : Average = 20% CC + 80% EP*
- ***100% CI material : Average = 40% DS + 60% EE***
- *CI+TP material : Average = 20% DS + 20% EP + 60% EE*

5- Evaluation criteria

- *Authorized documents : ☐ Yes x No*
- *Authorized search engine : ☐ Yes x No*
- *Criterion 1: Understanding of the content (4 points)*
- *Criterion 2: Application of knowledge (10 points)*
- *Criterion 3: Critical analysis (4 points)*
- *Criterion 4: Clarity and organization (2 points)*

6- Web references (useful links):

Jamel NEJI, The road project, 2005

SETRA, Development of interurban intersections, 1998

SETRA, Development of main roads, 1994

INRETS, introduction to traffic engineering, 2000

7- Working environment (Facilities necessary for learning)

None

Course Specification

Reinforced concrete 2

1. General

Coded	**GCIV 4 102**	Level/Semester	2/S3	Coefficient	3	Credits	4
Course	Civil engineering					Volume. H. (CI)	42h
Responsible	Sami Antit					Volume. H. (TP)	0
Module	Reinforced concrete 2					Version	09/2023

Course description (Course objective):
Calculation with Eurocode 2 and mastery of the dimensioning of RC elements

Prerequisites:	*Keywords :*
RDM- Structural calculation – BA1	*Eurocode2 – Reinforced concrete – Sizing*

Specific objectives of the course (OBJ $_i$):
- ***OBJ 1 :*** Concepts of reinforced concrete calculation according to EC2 ***OBJ 2 :*** Design and calculate simple civil engineering structures

Necessary material :
…

2- Content elements (Course)

Week(s)	Chapters/Content Items	No. HR	Goals
1-3	**Chapter I : Calculation of foundation footings** 1 General 2 Homothetic footings 3 Sizing of footings with equal overhangs 4 Rolling soles (H.Thonier)	*9h*	*Sizing and reinforcement of the soles*

	4 Diagramming and programming spreadsheets 5 Applications		
4 -6	**Chapter II : Shear force checks** 1 General 2 General verification procedure 3 Diagramming and programming spreadsheets	*9h*	*Determination and distribution of transverse steels*
7-10	**Chapter III : Continuous beams** 1 General 2 RDM reminders 3 Combinations of actions 4 Calculations of moments at supports – Redistribution of moments 5 Span moment calculations 6 Diagrams and programming spreadsheets 7 Applications	*12 h*	*Complete BA calculation of continuous beams*
11-14	**Chapter IV : Verifications at the ELS** 1 General 2 General verification procedure 3 Diagramming and programming spreadsheets 4 Applications	*12 h*	*Checking crack openings*

3- Content elements (Practical work)

Week(s)	Activities/Content Items	No. HR	Goals
…	…	…	…
…	…	…	…

4- Evaluation methods & Marks Distribution

Type of assessment	Yes No	Tx Weighting
CC - Continuous assessment (Test/Quiz, Presentation, Report, etc.)	☐ *Yes* ☐ *No*	
DS - Supervised Duty	■ *Yes* ☐ *No*	*40%*

EE - Written test (Final exam)	■ *Yes* ☐ *No*	*60%*
EP - Practical test (TP- TP exam / MP- Mini project)	☐ *Yes* ☐ *No*	

- *Material 100% TP : Average = 20% CC + 80% EP*
- ***100% CI material : Average = 40% DS + 60% EE***
- *CI+TP material : Average = 20% DS + 20% EP + 60% EE*

5- Evaluation criteria

- *Authorized documents : ☐ Yes ☐ **X** No*
- *Authorized search engine : ☐ Yes ☐ **x** No*
- *Criterion 1: Understanding of the content (4 points)*
- *Criterion 2: Application of knowledge (10 points)*
- *Criterion 3: Critical analysis (4 points)*
- *Criterion 4: Clarity and organization (2 points)*

6- Web references (useful links):

1 - JA Calgaro, Bases for calculating structures according to Eurocode 0, Edition Le Moniteur

2- H.Thonier, Design and calculation of building structures (Volume 7,) Presse des Ponts 2010 (2nd edition)

3 - D.Ricotier, Sizing of concrete structures according to Eurocode 2, Edition le Moniteur 2012

4 - J.Roux, Mastery of Eurocode 2, Edition Eyrolles 2009

7- Working environment (Facilities necessary for learning)

- *NONE*

Course Specification

Calculation of structures 2

1. General

Coded	**GCIV 4 103**	Level/Semester	2/S3	Coefficient	3	Credits	4
Course	Civil engineering					Volume. H. (CI)	42h
Responsible	Foued Khdimallah					Volume. H. (TP)	
Module	Calculation of structures 2					Version	09/2023

Course description (Course objective):
Analyze hyperstatic structures, study stresses and determine deformations.

Prerequisites:	*Keywords :*
RDM, structural calculation 1	*Beam, slab,…*

Specific objectives of the course (OBJ $_i$):
OBJ 1: study deformations in isostatic structures by Navier Bress method and energy method.
OBJ 2 : Calculation of continuous beams using the 3 moments method
OBJ 3 : Study of hyperstatic frames using force method
OBJ 4 : Study of lines of influence

Necessary material :
…

2- Content elements (Course)

Week(s)	Chapters/Content Items	No. HR	Goals
1	***Chapter 0: RDM reminders***	*3*	*Calculating internal efforts* *Calculation of normal and*

			tangential stresses
2-4	***Chapter 1: deformation of structures***	*9*	*Calculation of deformation and deflection verification*
5-8	***Chapter 2: 3 moments method***	*12*	*Calculation of continuous beams*
9-12	***Chapter 3: force method***	*12*	*Study of hyperstatic frames using force method*
13-14	***Chapter 4: line of influence***	*6*	*Study of influence lines (case of rolling loads)*

3- Content elements (Practical work)

Week(s)	Activities/Content Items	No. HR	Goals
…	…	…	…
…	…	…	…

4- Evaluation methods & Marks Distribution

Type of assessment	Yes No	Tx Weighting
CC - Continuous assessment (Test/Quiz, Presentation, Report, etc.)	☐ *Yes* ☐ *No*	
DS - Supervised Duty	x *Yes* ☐ *No*	*40%*
EE - Written test (Final exam)	x *Yes* ☐ *No*	*60%*
EP - Practical test (TP- TP exam / MP- Mini project)	☐ *Yes* ☐ *No*	

- *Material 100% TP : Average = 20% CC + 80% EP*
- *100% CI material : Average = 40% DS + 60% EE*
- *CI+TP material : Average = 20% DS + 20% EP + 60% EE*

5- Evaluation criteria

- *Authorized documents : ☐ Yes ☐ No*
- *Authorized search engine : ☐ Yes ☐ No*
- *Criterion 1: Understanding of the content (4 points)*
- *Criterion 2: Application of knowledge (10 points)*
- *Criterion 3: Critical analysis (4 points)*
- *Criterion 4: Clarity and organization (2 points)*

6- Web references (useful links):

Resistance of the materials authors : mr. kerguignas, g. caignaert edition : bordas 1977

2- Guide of calculation in mechanical authors : d. splendor, r. greedy editing : hatchet 1996

3- Resistance of the materials authors : has. watchtower, L. geminard editing : dunod 1994

7- Working environment (Facilities necessary for learning)

- *Title, Version, URL*

Course Specification

Metallic construction

1. General

Coded	**GCIV 4 104**	Level/Semester	2/S3	Coefficient	3	Credits	4
Course	Civil Engineering					Volume. H. (CI)	42 hours
Responsible	Hatem Karoui					Volume. H. (TP)	
Module	Metallic construction					Version	12/2023

Course description (Course objective):
Analyze and dimension the elements of a metal structure according to the regulations in force.

Prerequisites:	*Keywords :*
Building materials 1 and 2; RDM, Structural calculation	*Assembly, Profiles, Purlins, crosspiece*

Specific objectives of the course (OBJ $_i$):
OBJ 1 : *Study of the action of wind on metal constructions* ***OBJ 2 :*** *Sizing of metal parts* ***OBJ 3 :*** *Design and sizing of elements assembled by bolts and welding.*

2- Content elements (Course)

Week(s)	Chapters/Content Items	No. HR	Goals
1-2	*General information on metal construction, steel and steel products, constraints and geometric characteristics and combination of loads*	*6H*	*Steel in the field of Civil Engineering*
3-4	*Chapter 1: Study of the effect of snow and wind on metal constructions.*	*6H*	*Determine the wind pressure on a construction.*
5-7	*Calculation of bolted and welded joints*	*9h*	*Sizing of parts*

			assembled by bolts
8-11	*Sizing of metal parts in simple bending and classification of cross sections.*	*12H*	*The basics of metal profile design*
12-14	*Elastic instability phenomena (theoretical aspect and regulatory aspect), Simple buckling and with bending*	*9h*	*Study of parts subject to buckling*

3- Content elements (Practical work)

Week(s)	Activities/Content Items	No. HR	Goals
…	…	…	…
…	…	…	…

4- Evaluation methods & Marks Distribution

Type of assessment	Yes No	Tx Weighting
CC - Continuous assessment (Test/Quiz, Presentation, Report, etc.)	☐ *Yes* ☐ *No*	
DS - Supervised Duty	x *Yes* ☐ *No*	*40%*
EE - Written test (Final exam)	x *Yes* ☐ *No*	*60%*
EP - Practical test (TP- TP exam / MP- Mini project)	☐ *Yes* ☐ *No*	

- *Material 100% TP : Average = 20% CC + 80% EP*
- *100% CI material : Average = 40% DS + 60% EE*
- *CI+TP material : Average = 20% DS + 20% EP + 60% EE*

5- Evaluation criteria

- *Authorized documents* : ■ *Yes No*
- *Authorized search engine* : ☐ *Yes* x *No*
- *Criterion 1: Understanding of the content (4 points)*
- *Criterion 2: Application of knowledge (10 points)*
- *Criterion 3: Critical analysis (4 points)*
- *Criterion 4: Clarity and organization (2 points)*

6- Web references (useful links):

Metal construction manual: Extract from Eurocode 0,1 and 3: Jean Pierre Muzeau

Metal construction with the Eurocodes: Jean Pierre Muzeau
Metal construction: Fundamental notions and sizing methods

Course Specification

Thermal and acoustic

1. General

Coded	**GCIV 4 105**	Level/Semester	2/S3	Coefficient	1.5	Credits	3
Course	Civil Engineering					Volume. H. (CI)	21h.
Responsible	Nawfel Sassi					Volume. H. (TP)	
Module	Thermal and acoustic					Version	09/2023

Course description (Course objective):
Applications of basic heat transfer elements to the study of heat transfer from heating and air conditioning equipment in buildings. *Applications of architectural acoustic studies to airborne noise.*

Prerequisites:	*Keywords :*
Physical	*Thermal: Conductivity, Thermal resistance, Thermal transmission coefficient, Thermal power, Cooling power;* *Acoustics: Sound level, Frequency, Celerity, Reverberation time, Attenuation index, Standardized insulation.*

Specific objectives of the course (OBJ $_i$):
OBJ 1: *Know the fundamental notions of thermal and the different transfer modes.* ***OBJ 2:*** *Provide the elements necessary for the thermal design of building envelopes.* ***OBJ 3:*** *Know the fundamental characteristics of sound and the basic notions of architectural acoustics.* ***OBJ 4:*** *Carry out a study of acoustic comfort and sound insulation with respect to airborne noise in buildings.*

Necessary material :

Video projector

2- Content elements (Course)

Week(s)	Chapters/Content Items	No. HR	Goals
1-2	*Part 1: Acoustics* *Chapter 1: Basic notions of Acoustics* *- Sound: Definition, phases of noise, characteristics.* *- Sound levels: dB, power level, pressure level, intensity level.* *- Modes of noise transmission.*	*3H*	*Apply the concepts of sound waves to buildings.*
3-4	*Chapter2: Acoustic Correction* *- Principle* *- Absorption area of a room and reverberation time* *-Main absorption processes.* *- Regulation*	*3H*	*Know the procedures necessary to correct sound inside a building.*
5-6	*Chapter 3: Acoustic Insulation (Airborne Noise)* *- Principle* *- Standardized indices: Weakening Index, Raw Isolation and Standardized Isolation.* *- Mass law.* *- Regulation*	*3H*	*Carry out a study on the insulation of the walls of a building against airborne noise.*
7	*Guarded duty*	*1.5H*	*Carry out an acoustic study part*
8-9	*Part2: Thermal* *Chapter 1: Fundamentals* *- The different forms of energy: sensible heat, latent heat, quantity of heat, heat flux density, calorific value.* *- Concepts of thermal comfort: the main individual and environmental parameters and traditional and modern*	*3H*	*Provide the elements necessary for distribution and regulation of heat networks.*

	protection against heat. *- Apps.*		
10-11-12-13	*Chapter2: Thermal transfer modes* *- Conduction: Fourrier's law, thermal conductivity.* *- Convection: inside and outside.* *- Radiation: black bodies, gray bodies, exchange.* *- Losses through a wall: simultaneity of the three modes.* *- Apps.*	*6H*	*Provide the necessary elements for the thermal study of* *walls of a building.*
14	*evaluation*	*1.5H*	*Carry out a thermal and acoustic study of a premises.*

4- Evaluation methods & Marks Distribution

Type of assessment	Yes No	Tx Weighting
CC - Continuous assessment (Test/Quiz, Presentation, Report, etc.)	☐ *Yes* ☐ *No*	
DS - Supervised Duty	x *Yes* ☐ *No*	*40%*
EE - Written test (Final exam)	x *Yes* ☐ *No*	*60%*
EP - Practical test (TP- TP exam / MP- Mini project)	☐ *Yes* ☐ *No*	

- ***100% CI material : Average = 40% DS + 60% EE***

5- Evaluation criteria

- *Authorized documents : ☐ Yes x No*
- *Authorized search engine : ☐ Yes x No*
- *Criterion 1: Understanding of the content (4 points)*
- *Criterion 2: Application of knowledge (10 points)*
- *Criterion 3: Critical analysis (4 points)*
- *Criterion 4: Clarity and organization (2 points)*

6- Web references (useful links):

- De Vriendt, Gaétan Morin, Air Conditioning: Humid Air Calculations, Parisian Editions 1994.

- Trades Guide, Air conditioning, Editions NATHAN.

- Trades Guide, Insulation and waterproofing, Editions NATHAN.

-Loïc HAMAYON, Pierre and Marie CURIE, Succeeding in the acoustics of a building, Editions Le Moniteur.

Course Specification

Soil mechanics 2

1. General

Coded	**GCIV 4 106**	Level/Semester	2/S3	Coefficient	3	Credits	3
Course	CIVIL ENGINEERING					Volume. H. (CI)	21h.
Responsible	Hatem Karoui					Volume. H. (TP)	21h.
Module	Soil mechanics 2					Version	09/2023

Course description (Course objective):
Master road geotechnics *Check the stability of foundations and retaining structures*

Prerequisites:	*Keywords :*
Mathematics, General Mechanics, RDM, Construction Materials	*Shear Strength, Foundation*

Specific objectives of the course (OBJ $_i$):
OBJ 1 : *Shear resistance of soils* ***OBJ 2 :*** *The stability of retaining structures* ***OBJ 3 :*** *The bearing capacity of superficial and deep foundations*

2- Content elements (Course)

Week(s)	Chapters/Content Items	No. HR	Goals
1-3	*Chapter 1: Shear resistance of soils: laboratory tests*	*4:30 a.m.*	*Triaxial and box shear tests*
4-7	*Chapter 2: Retaining works: Wall wall and sheet pile curtains*	*6h*	*The stability of the structures*
8-11	*Chapter 3: The bearing capacity of surface foundations through laboratory and in-situ tests*	*6h*	*Allowable soil stress*

1 2-14	*Chapter 4: Deep Foundations*	*4:30 a.m.*	*Bearing capacity of piles*

3- Content elements (Practical work)

Week(s)	Activities/Content Items	No. HR	Goals
1	*Aterberg boundaries*	*3h*	*Determine the liquidity limit, plasticity limit and plasticity index of the soil*
2	*Proctor Trial*	*3h*	*Determine the optimal water content and density of the soil*
3	*Particle size analysis by sedimentometry*	*3h*	*Draw the particle size curve of a fine soil*
4	*Oedometric test*	*6h*	*Draw the settlement curve and the soil consolidation curve. Determine the soil consolidation and swelling index*
5	*Methylene blue analysis*	*3h*	*Determine the blue value of a fine soil*
6	*Practical exam, mini-project defense, …*	*3h*	*Summative evaluation*

4- Evaluation methods & Marks Distribution

Type of assessment	Yes No	Tx Weighting
CC - Continuous assessment (Test/Quiz, Presentation, Report, etc.)	☐ *Yes* ☐ *No*	
DS - Supervised Duty	X *Yes* ☐ *No*	*20%*
EE - Written test (Final exam)	X *Yes* ☐ *No*	*60%*
EP - Practical test (TP- TP exam / MP- Mini project)	☐ *Yes* ☐ *No*	*20%*

- *Material 100% TP : Average = 20% CC + 80% EP*

- *100% CI material : Average = 40% DS + 60% EE*
- ***CI+TP material : Average = 20% DS + 20% EP + 60% EE***

5- Evaluation criteria

- *Authorized documents : x Yes ☐ No*
- *Authorized search engine : ☐ Yes x No*
- *Criterion 1: Understanding of the content (4 points)*
- *Criterion 2: Application of knowledge (10 points)*
- *Criterion 3: Critical analysis (4 points)*
- *Criterion 4: Clarity and organization (2 points)*

6- Web references (useful links):

Notions of soil mechanics: Bouassida. M., Klai, M., Marzougui, A.

Elements of soil mechanics: François Schlosser:

7- Working environment (Facilities necessary for learning)

- *Soil mechanics laboratory*
- *Video projector*

Course Specification

Hydrology and urban hydraulics

1. General

Coded	**GCIV 4 107**	Level/Semester	2/S3	Coefficient	3	Credits	3
Course	Civil engineering					Volume. H. (CI)	42h
Responsible	Foued Khdimallah					Volume. H. (TP)	
Module	Hydrology and urban hydraulics					Version	09/2023

Course description (Course objective):
Study of the characteristics of watersheds, calculation of flow rates and study of drinking water supply networks

Prerequisites:	*Keywords :*
General hydraulics and fluid mechanics	***Watershed, flood flow, networks, reservoirs…***

Specific objectives of the course (OBJ $_i$):
OBJ 1 : definition and characteristics of watersheds
OBJ 2 : Calculation of BV flow rates by methods: rational, Franco Rodier, specific and local methods. Sizing of crossing works.
OBJ 3 : Sizing drinking water supply networks (branched and mesh)

Necessary material :
…

2- Content elements (Course)

Week(s)	Chapters/Content Items	No. HR	Goals
1	***Chapter 0: general hydrology***	*6*	*OBJ 1*
2-3	***Chapter 1: characteristics of watersheds***	*9*	*OBJ 1*

4-6	***Chapter 2: calculation of flow rates and sizing of hydraulic structures***	*9*	*OBJ 2*
7-9	***Chapter 3: drinking water supply: branched network***	*9*	*OBJ 3*
10-12	***Chapter 4: drinking water supply: mesh network***	*9*	*OBJ 3*

3- Content elements (Practical work)

Week(s)	Activities/Content Items	No. HR	Goals
…	…	…	…
…	…	…	…

4- Evaluation methods & Marks Distribution

Type of assessment	Yes No	Tx Weighting
CC - Continuous assessment (Test/Quiz, Presentation, Report, etc.)	☐ *Yes* ☐ *No*	
DS - Supervised Duty	x *Yes* ☐ *No*	*40%*
EE - Written test (Final exam)	x *Yes* ☐ *No*	*60%*
EP - Practical test (TP- TP exam / MP- Mini project)	☐ *Yes* ☐ *No*	

- *Material 100% TP : Average = 20% CC + 80% EP*
- *100% CI material : Average = 40% DS + 60% EE*
- *CI+TP material : Average = 20% DS + 20% EP + 60% EE*

5- Evaluation criteria

- *Authorized documents : ☐ Yes ☐ No*
- *Authorized search engine : ☐ Yes ☐ No*
- *Criterion 1: Understanding of the content (4 points)*
- *Criterion 2: Application of knowledge (10 points)*
- *Criterion 3: Critical analysis (4 points)*
- *Criterion 4: Clarity and organization (2 points)*

6- Web references (useful links):

- Alain Giret, *Fluvial hydrology* , Paris, Éditions Ellipses , 2007 (ISBN 978-2-7298-3226-1)

- *Hydrological Processes* , (ISSN 1099-1085) (electronic) 0885-6087 (paper), John Wiley & Sons
- *Hydrology Research* , (ISSN 0029-1277) , IWA Publishing (formerly *Nordic Hydrology*)

7- Working environment (Facilities necessary for learning)

Google Mapper, ARCGIS

Course Specification

Urban planning

1. General

Coded	**GCIV 4 108**	Level/Semester	2/S2	Coefficient	1.5	Credits	2
Course	Civil engineering					Volume. H. (CI)	21h.
Responsible	Nawfel Boufaied					Volume. H. (TP)	
Module	Urban planning					Version	09/2023

Course description (Course objective):
Know the regulations, basic principles and legislation relating to development plans

Prerequisites:	*Keywords :*
PGC	*Development plan – Subdivision – Building permit*

Specific objectives of the course (OBJ $_i$):
OBJ 1 : *Know the general objectives of town planning: social, economic, and environmental.*
OBJ 2 : *Know urban planning and regulations*
OBJ 3 : *Functional analysis of the city*
OBJ 4 : *Know the different development plans (SNAT, SDA, PAU,PAD)*
OBJ 5 : *The subdivision*
OBJ 6 : *The building permit*
OBJ 7 : *Apply an example of a specification (COS, PIF, H max, etc.)*

Necessary material :
…

2- Content elements (Course)

Week(s)	Chapters/Content Items	No. HR	Goals
1-2	*Chapter 1: General*	*3h*	*The objectives of town planning*
3-4	*Chapter 2: Planning and regulation*	*3h*	*Know the regulations in force*
5-6	*Chapter 3: Development master plans*	*3h*	*Know the SDAs*
7-8	*Chapter 4: The urban development plan*	*3h*	*PAU / PAD*
9-11	*Chapter 5: The subdivision*	*4:30*	*Definition and work*
12-14	*Chapter 6: The building permit*	*4:30*	*Definition and constituent elements.* *Case study*

3- Content elements (Practical work)

Week(s)	Activities/Content Items	No. HR	Goals
…	…	…	…
…	…	…	…

4- Evaluation methods & Marks Distribution

Type of assessment	Yes No	Tx Weighting
CC - Continuous assessment (Test/Quiz, Presentation, Report, etc.)	☐ *Yes* ☐ *No*	
DS - Supervised Duty	☐ *Yes* ☐ *No*	*40%*
EE - Written test (Final exam)	☐ *Yes* ☐ *No*	*60%*
EP - Practical test (TP- TP exam / MP- Mini project)	☐ *Yes* ☐ *No*	

- *Material 100% TP : Average = 20% CC + 80% EP*
- ***100% CI material : Average = 40% DS + 60% EE***
- *CI+TP material : Average = 20% DS + 20% EP + 60% EE*

5- Evaluation criteria

- *Authorized documents* : ☐ *Yes* ☐ *No*
- *Authorized search engine* : ☐ *Yes* ☐ *No*
- *Criterion 1: Understanding of the content (4 points)*
- *Criterion 2: Application of knowledge (10 points)*
- *Criterion 3: Critical analysis (4 points)*
- *Criterion 4: Clarity and organization (2 points)*

6- Web references (useful links):

- *International Journal of Urban Planning*
- *Merlin Pierre, Urban planning, PUF-QSJ? Paris, 2007*
- *Merlin PIerre, Urban planning techniques, PUF-QSJ? Paris, 1995*

7- Working environment (Facilities necessary for learning)

NONE

Course Specification

Finished elements

1. General

Coded	**GCIV 4 201**	Level/Semester	2/S4	Coefficient	1.5	Credits	2
Course	CIVIL ENGINEERING					Volume. H. (CI)	21h.
Responsible	Kais Ghenia					Volume. H. (TP)	
Module	Finished elements					Version	09/2023

Course description (Course objective):
Numerical method used in structural analysis

Prerequisites:	*Keywords :*
Engineering mathematics – Numerical analysis -RDM	*Simulation – shape function – discretization*

Specific objectives of the course (OBJ $_i$):
OBJ 1 : *Generalities, basic notions and horizons of the finite element method*
OBJ 2 : *Know how to use this method to solve structural problems*

2- Content elements (Course)

Week(s)	Chapters/Content Items	No. HR	Goals
1-2	*Chapter 1: Finite element method – General philosophy*	*6h*	
3-4	*Chapter 2: Principle of approximation.*	*9h*	*Calculation of shape functions*
4-5	*Chapter 3: Formulation of finite elements*	*6h*	*Solving structural calculation problems*

3- Content elements (Practical work)

Week(s)	Activities/Content Elements	No. HR	Goals
…	…	…	…
…	…	…	…

4- Evaluation methods & Marks Distribution

Type of assessment	Yes No	Tx Weighting
CC - Continuous assessment (Test/Quiz, Presentation, Report, etc.)	☐ *Yes* ☐ *No*	
DS - Supervised Duty	x *Yes* ☐ *No*	*40%*
EE - Written test (Final exam)	x *Yes* ☐ *No*	*60%*
EP - Practical test (TP- TP exam / MP- Mini project)	☐ *Yes* ☐ *No*	

- *Material 100% TP : Average = 20% CC + 80% EP*
- ***100% CI material : Average = 40% DS + 60% EE***
- *CI+TP material : Average = 20% DS + 20% EP + 60% EE*

5- Evaluation criteria

- *Authorized documents* : ■ *Yes No*
- *Authorized search engine* : ☐ *Yes* x *No*
- *Criterion 1: Understanding of the content (4 points)*
- *Criterion 2: Application of knowledge (10 points)*
- *Criterion 3: Critical analysis (4 points)*
- *Criterion 4: Clarity and organization (2 points)*

6- Web references (useful links):

1-Finite element methods: Application in structural mechanics by Jean Louis Baltoz

2-Calculation of structures by finite elements by René Cottereau

7- Working environment (Facilities necessary for learning)

- *NONE*

Course Specification

Planning and Organization of work

1. General

Coded	**GCIV 4 202**	Level/Semester	2/S4	Coefficient	1.5	Credits	2
Course	CIVIL ENGINEERING					Volume. H. (CI)	21h.
Responsible	Kais Ghenia					Volume. H. (TP)	
Module	Planning and Organization of work					Version	09/2023

Course description (Course objective):
Present the basic concepts relating to construction project management

Prerequisites:	*Keywords :*
PGC – Operational research	Speakers – Organization – installation-planning

Specific objectives of the course (OBJ $_i$):
OBJ 1 : *General information and basic concepts on construction project management*
OBJ 2 : *Present the stakeholders in the act of building*
OBJ 3 : *Present project planning methods*

2- Content elements (Course)

Week(s)	Chapters/Content Items	No.	Goals
1-2	*Chapter 1: The participants in the act of building*	*3H*	*role(s) and organizational chart*
3-4	*Chapter 2: The stages of developing and executing a project*	*3H*	*Constituent documents for public and private markets*
5-8	*Chapter 3: Site preparation*	*6H*	*Site installation plan*

9-14	*Chapter 4: Project planning*	*9h*	*Railway planning* *Gantt planning* *PERT planning*

3- Content elements (Practical work)

Week(s)	Activities/Content Elements	No. HR	Goals
…	…	…	…
…	…	…	…

4- Evaluation methods & Marks Distribution

Type of assessment	Yes No	Tx Weighting
CC - Continuous assessment (Test/Quiz, Presentation, Report, etc.)	☐ *Yes* ☐ *No*	
DS - Supervised Duty	x *Yes* ☐ *No*	*40%*
EE - Written test (Final exam)	x *Yes* ☐ *No*	*60%*
EP - Practical test (TP- TP exam / MP- Mini project)	☐ *Yes* ☐ *No*	

- *Material 100% TP : Average = 20% CC + 80% EP*
- ***100% CI material : Average = 40% DS + 60% EE***
- *CI+TP material : Average = 20% DS + 20% EP + 60% EE*

5- Evaluation criteria

- *Authorized documents : ☐ Yes X No*
- *Authorized search engine : ☐ Yes X No*
- *Criterion 1: Understanding of the content (4 points)*
- *Criterion 2: Application of knowledge (10 points)*
- *Criterion 3: Critical analysis (4 points)*
- *Criterion 4: Clarity and organization (2 points)*

6- Web references (useful links):

Prestressed Concrete in Limit States (BPEL): Henry Thonier
Prestressed concrete according to Eurocodes: Patrick Le Delliou

7- Working environment (Facilities necessary for learning)

NONE

Course Specification

Prestressed concrete

1. General

Coded	**GCIV 4 203**	Level/Semester	2/S4	Coefficient	3	Credits	4
Course	CIVIL ENGINEERING					Volume. H. (CI)	42h
Responsible	Hatem KAroui					Volume. H. (TP)	
Module	Prestressed concrete					Version	12/2023

Course description (Course objective):
Analyze and dimension the elements of a prestressed concrete structure

Prerequisites:	*Keywords :*
Building materials 1 and 2; RDM, Structural Design and Concrete	*Tension losses, prestressing*

Specific objectives of the course (OBJ $_i$):
OBJ 1 : *General information and concepts on the materials used in prestressed concrete*
OBJ 2 : *Study of the loss of prestress by post tension and pre tension*
OBJ 3 : *Sizing study of isostatic ELS beams in prestressed concrete*

2- Content elements (Course)

Week(s)	Chapters/Content Items	No. HR	Goals
1-2	*Materials for prestressed concrete and strength limit constraints.*	*6H*	*The characteristics of the materials used*
3-4	*Chapter 1: Study of the loss of prestress by post tension.*	*6H*	*Estimation of prestressing losses*
4-5	*Chapter 2: Sizing of an isostatic prestressed concrete beam with class I and ELS*	*6H*	*Sizing of Class I isostatic beams*

6-7	*Chapter 3: Sizing isostatic beams to class II and ELS.*	*6H*	*Sizing of Class II isostatic beams*
8-9	*Chapter 4: Sizing isostatic beams to class III and ELS.*	*6H*	*Sizing of Class II isostatic beams*
10-11	*Shear force and resistance*	*6H*	*Study of elements subjected to shear force*
13-14	*Hyperstatic beams*	*6H*	*Design and sizing*

3- Content elements (Practical work)

Week(s)	Activities/Content Elements	No. HR	Goals
…	…	…	…
…	…	…	…

4- Evaluation methods & Marks Distribution

Type of assessment	Yes No	Tx Weighting
CC - Continuous assessment (Test/Quiz, Presentation, Report, etc.)	☐ *Yes* ☐ *No*	
DS - Supervised Duty	x *Yes* ☐ *No*	*40%*
EE - Written test (Final exam)	x *Yes* ☐ *No*	*60%*
EP - Practical test (TP- TP exam / MP- Mini project)	☐ *Yes* ☐ *No*	

- *Material 100% TP : Average = 20% CC + 80% EP*
- ***100% CI material : Average = 40% DS + 60% EE***
- *CI+TP material : Average = 20% DS + 20% EP + 60% EE*

5- Evaluation criteria

- *Authorized documents* : ■ *Yes No*
- *Authorized search engine* : ☐ *Yes* x *No*
- *Criterion 1: Understanding of the content (4 points)*
- *Criterion 2: Application of knowledge (10 points)*
- *Criterion 3: Critical analysis (4 points)*

- *Criterion 4: Clarity and organization (2 points)*

6- Web references (useful links):

Prestressed Concrete in Limit States (BPEL): Henry Thonier

Prestressed concrete according to Eurocodes: Patrick Le Delliou

7- Working environment (Facilities necessary for learning)

- *Title, Version, URL*

Course Specification

Diagnosis and repair of works

1. General

Coded	**GCIV 4 204**	Level/Semester	2/S4	Coefficient	1.5	Credits	2
Course	Civil engineering					Volume. H. (CI)	21h.
Responsible	Sami ANTIT					Volume. H. (TP)	
Module	Diagnosis and repair of works					Version	12/2023

Course description (Course objective):
Analysis of damage and disorders affecting civil engineering works: cause, manifestations, repair techniques, etc.

Prerequisites:	*Keywords :*
Foundations, structures, reinforced concrete, engineering structures, roads.	*Pathology, work*

Specific objectives of the course (OBJ $_i$):
OBJ 1 : diagnosis of structures: steps and methods
OBJ 2 : Diagnosis and repair of bridge equipment (waterproofing, guardrails, road seals, supports, etc.)
OBJ 3 : Pathology of foundations and reinforced concrete.

Necessary material :
NONE

2- Content elements (Course)

Week(s)	Chapters/Content Items	No. HR	Goals
1	***Chapter 1: introduction to pathology (terminology, pathology of works, interview)***	*1.5*	
2-4	***Chapter 2: Diagnosis and repair of bridge equipment***	*4.5*	

	(waterproofing, guardrail, road seal, support, etc.)		
5-7	***Chapter 3: instruments for monitoring structures (CND, CD)***	*4.5*	
8-11	***Chapter 4: pathology of reinforced concrete structures (cracks, corrosion of reinforcements, freezing and thawing, etc.)***	*6*	
12-14	***Chapter 5: repair and reinforcement of foundations (cause of damage, processes and techniques used)***	*4.5*	

3- Content elements (Practical work)

Week(s)	Activities/Content Elements	No. HR	Goals
…	…	…	…
…	…	…	…

4- Evaluation methods & Marks Distribution

Type of assessment	Yes No	Tx Weighting
CC - Continuous assessment (Test/Quiz, Presentation, Report, etc.)	☐ *Yes* ☐ *No*	
DS - Supervised Duty	x *Yes* ☐ *No*	*40%*
EE - Written test (Final exam)	x *Yes* ☐ *No*	*60%*
EP - Practical test (TP- TP exam / MP- Mini project)	☐ *Yes* ☐ *No*	

- *Material 100% TP : Average = 20% CC + 80% EP*
- *100% CI material : Average = 40% DS + 60% EE*
- *CI+TP material : Average = 20% DS + 20% EP + 60% EE*

5- Evaluation criteria

- *Authorized documents* : ☐ *Yes* X *No*
- *Authorized search engine* : ☐ *Yes* X *No*
- *Criterion 1: Understanding of the content (4 points)*
- *Criterion 2: Application of knowledge (10 points)*
- *Criterion 3: Critical analysis (4 points)*

- *Criterion 4: Clarity and organization (2 points)*

6- Web references (useful links):

- Regulations concerning the management of structures. Ministry of Equipment and Transport, General Directorate of Technical Services (Ed. PH Besem), 99p.
- GAGNE R., LINGER L. (2007) The durability of concrete, Second edition, Presses de l'École des Ponts et Chaussées, JP Olliver and A. Vichot Éditeurs, Chapter 10 – La 32 16 18 12 4 3 14 Design Materials Hand work Diagnosis Climatic conditions (during work) Unknown cause 27 durability of concrete in harsh winter environments, 70p.
- Technical Information Bulletin. Monitoring of freezing and thawing in roadways using temperature measuring stations. Directorate of the Roads Laboratory, 6 (8), August 2001.

7- Working environment (Facilities necessary for learning)

NONE

Course Specification

GC software: Track - Covadis

1. General

Coded	**GCIV 4 205**	Level/Semester	2/S4	Coefficient	2.25	Credits	2
Course	Civil engineering					Volume. H. (CI)	
Responsible	Foued Khdimallah					Volume. H. (TP)	31.5h
Module	GC software: Track - Covadis					Version	10/2023

Course description (Course objective):
Geometric study of the regional road MC46 using the track 5.06 tool ***Introduction to the Covadis 16 software (covadis2D, topometric calculation, covadis3D, Covadis VRD)***

Prerequisites:	*Keywords :*
Course: general topography, quantity surveying and price estimation, route 1 and route 2.	*…*

Specific objectives of the course (OBJ $_i$):
OBJ 1 : Master the track 5.06 software and become familiar with its modules through the complete geometric study of a real project. ***OBJ 2 : Master the covadis16 software and the application on several real cases (handling of topographical data, design of road and sanitation network projects, etc.)***

Necessary material :
Computer lab, software: Autocad, piste5.06, covadis16.

2- Content elements (Course)

Week(s)	Chapters/Content Items	No. HR	Goals
1-2			
2-3			

10-12			

3- Content elements (Practical work)

Week(s)	Activities/Content Elements	No. HR	Goals
1	***Project presentation and data analysis***	*1.5*	*OBJ 1*
2-3	***Choice of the plot on autocad then entry of the elements of the axis in plan on the module (.dap) of the track software***	*3*	*OBJ 1*
4	***Definition of the natural terrain on the module (.SEG) and drawing of the longitudinal profile on the module (.dpl) of the track software***	*3*	*OBJ 1*
5	***Drawing of standard cross sections on the module (.typ) and calculation of the track project.***	*3*	*OBJ 1*
6	***Outputs: plans, cubatures and price estimation***	*3*	*OBJ 1*
7	***TP1: getting started with the covadis16 software (covadis2D)***	*3*	*OBJ 2*
8	***TP2: topometric calculation***	*3*	*OBJ 2*
9	***TP3: management of MNT and calculation of cubature (covadis3D)***	*3*	*OBJ 2*
10-11	***TP4: road study (covadisVRD)***	*6*	*OBJ 2*
12	***TP5: design of a sanitation network (covadis VRD)***	*3*	*OBJ 2*

4- Evaluation methods & Marks Distribution

Type of assessment	Yes No	Tx Weighting
CC - Continuous assessment (Test/Quiz, Presentation, Report, etc.)	x *Yes* ☐ *No*	*20%*
DS - Supervised Duty	☐ *Yes* ☐ *No*	
EE - Written test (Final exam)	☐ *Yes* ☐ *No*	
EP - Practical test (TP- TP exam / MP- Mini project)	x *Yes* ☐ *No*	*80%*

- ***Material 100% TP : Average = 20% CC + 80% EP***
- *100% CI material : Average = 40% DS + 60% EE*
- *CI+TP material : Average = 20% DS + 20% EP + 60% EE*

5- Evaluation criteria

- *Authorized documents : ☐ Yes ☐ No*
- *Authorized search engine : ☐ Yes ☐ No*
- *Criterion 1: Understanding of the content (4 points)*
- *Criterion 2: Application of knowledge (10 points)*
- *Criterion 3: Critical analysis (4 points)*
- *Criterion 4: Clarity and organization (2 points)*

6- Web references (useful links):

TRACK user guide
Covadis user guide

7- Working environment (Facilities necessary for learning)

- *Track 5.6 (2021)*
- *Covadis 13*

Course Specification

GC Software: Arche - Robot

1. General

Coded	**GCIV 4 206**	Level/Semester	2/S4	Coefficient	2.25	Credits	2
Course	Civil Engineering					Volume. H. (CI)	
Responsible	Nawfel Sassi					Volume. H. (TP)	31.5h
Module	GC Software: Arche - Robot					Version	12/2023

Course description (Course objective):
Design of a Reinforced Concrete structure for a multi-storey building using direct entry and import-export between the different modules. ▪ Study the metal structures/buildings of a project and calculate the constraints of the work (structure, resistance, sizing, etc.) ▪ Study the feasibility of the project and propose technical solutions ▪ Study the design of the project (modeling on Robot) ▪ Create or modify diagrams and plans of works according to standards and changes in constraints

Prerequisites:	*Keywords :*
CAD RDM and Structural Calculation	*CAO: Global study and local study modules. Modeling, metallic structure, framework, limit deflection, admissible stress, deformation…*

Specific course objectives:
OBJ 1: *Know how to carry out Computer Aided Design.* ***OBJ 2:*** *Create a calculation note following an automatic calculation.* ***OBJ 3:*** *Provide construction reinforcement specifications.* ***OBJ 4 :*** Study metal structures on Autodesk Robot Structural Analysis Professional 2023 ***OBJ 5 :*** Study reinforced concrete structures (Building, FE plates and shells, Elements: column, beam, slab, etc.) on Autodesk Robot Structural Analysis Professional 2023

OBJ 6 : Use of the results (calculation notes, reinforcement diagram, plans, bending moment diagram , shear force diagram, stress/deformation, deflection, etc.)

OBJ 7 : The student must also be able to import and export files in several formats (dwg, dxf, etc.) to computer-aided design software CAD (Robot)

Setting up the printing of plans on scale.

Necessary material :
Computer, video projector, Autodesk Auto-cad software, Autodesk Robot Structural Analysis Professional 2023.

2- Content elements (Practical work)

Week(s)	Chapters/Content Items	No. HR	Goals
1-2-3	*- GRAITEC OMD: Presentation of the software and Work platform (OMD).* *- ARCH FRAME module:* **Presentation of the user interface (main screen, menus, icon palettes, etc.), list of commands and study process.* ** Applications: Design of a multi-storey building (by direct input and by import from AutoCAD)*	*9 A.M.*	*Practice specialty software requested by local and international BEs.*
4-5-6	*ARCHE REINFORCEMENT modules (Beam – Column – Footing – Slab – Plate- Wall):* **Presentation of the user interface (main screen, menus, icon palettes, etc.), list of commands and study process.* ** Applications: Direct entry of a few elements, import of RC elements from the Framework module (checks and sizing)*	*6H*	*Carry out a complete automatic study of Reinforced Concrete.*
7	*ARCHE evaluation*	*1h30*	*Be able to use the software's quick commands and successfully model*

			a structure

2- Content elements (Practical work)

Week(s)	Activities/Content Elements	No. HR	Goals
8-10	Study a metal structure on Autodesk Robot Structural Analysis (metal frame factory)	*6*	*Use the robot interface to model a planar gantry model structure* *Climatic load Wind* *Generate the 3D model* *Assembly* *Exploitation of results*
11-12	Study a reinforced concrete structure on Autodesk Robot Structural Analysis (Residential building)	*6*	*Import a DWG file to robot (building axes to model)* *Define bar profiles* *Modeling of structural elements* *Definition of load cases* *Set load* *Load combinations* *Calculation and exploitation of results*
13	Exploitation of results	*3*	*Modeling report*
14	*Practical exam, mini-project defense, …*	*3*	*Summative evaluation*

3- Evaluation methods & Marks Distribution

Type of assessment	Yes No	Tx Weighting
CC - Continuous assessment (Test/Quiz, Presentation, Report, etc.)	X *Yes* ☐*No*	*20%*
DS - Supervised Duty	☐ *Yes* ☐*No*	
EE - Written test (Final exam)	☐ *Yes* ☐*No*	
EP - Practical test (TP- TP exam / MP- Mini project)	X *Yes* ☐ *No*	*80%*

- ***Material 100% TP : Average = 20% CC + 80% EP***

4- Evaluation criteria

- *Authorized documents : X Yes ☐ No*
- *Authorized search engine : X Yes ☐ No*
- *Criterion 1: Understanding of the content (4 points)*
- *Criterion 2: Application of knowledge (10 points)*
- *Criterion 3: Critical analysis (4 points)*
- *Criterion 4: Clarity and organization (2 points)*

5- Web references (useful links):

Acquire the fundamentals of Autodesk robot structural analysis professional: training booklet volume 1 with the contribution of wek ingenierieconseils
- https://www.autodesk.fr/

6- Working environment (Facilities necessary for learning)

- *Video projector, computer laboratory, Autodesk Robot Structural Analysis Professional software, Auto-cad*

Course Specification

VRD

1. General

Coded	**GCIV 4 207**	Level/Semester	2/S4	Coefficient	1.5	Credits	2
Course	Civil engineering					Volume. H. (CI)	21h.
Responsible	Atef BEN OTHMEN					Volume. H. (TP)	
Module	VRD					Version	09/2023

Course description (Course objective):
General information on networks, standards and technologies for urban roads, calculation of sanitation networks.

Prerequisites:	*Keywords :*
General hydraulics, hydrology, roads	***Networks, guide,***

Specific objectives of the course (OBJ $_i$):
OBJ 1 : General provisions and techniques on networks (sanitation, drinking water, electricity, telecommunications, etc.).
OBJ 2 : Design and calculation of wastewater and rainwater sanitation networks.
OBJ 3 : Studies of urban roads and earthworks.

2- Content elements (Course)

Week(s)	Chapters/Content Items	No. HR	Goals
1-2	***Chapter 1: general information about networks***	*3*	*OBJ 1*
3-4	***Chapter 2: design and calculation of the wastewater treatment network.***	*3*	*OBJ 2*
5-8	***Chapter 3: sizing of the rainwater drainage network.***	*6*	*OBJ 2*
9-12	***Chapter 4: roads***	*6*	*OBJ 3*

13-14	***Chapter 5: earthworks (calculation of cubature and movement of land)***	*3*	*OBJ 3*

3- Content elements (Practical work)

Week(s)	Activities/Content Elements	No. HR	Goals
…	…	…	…
…	…	…	…
…			

4- Evaluation methods & Marks Distribution

Type of assessment	Yes No	Tx Weighting
CC - Continuous assessment (Test/Quiz, Presentation, Report, etc.)	☐ *Yes* ☐ *No*	
DS - Supervised Duty	X *Yes* ☐ *No*	
EE - Written test (Final exam)	X *Yes* ☐ *No*	
EP - Practical test (TP- TP exam / MP- Mini project)	☐ *Yes* ☐ *No*	

- *Material 100% TP : Average = 20% CC + 80% EP*
- ***100% CI material : Average = 40% DS + 60% EE***
- *CI+TP material : Average = 20% DS + 20% EP + 60% EE*

5- Evaluation criteria

- *Authorized documents : ☐ Yes ☐ No*
- *Authorized search engine : ☐ Yes ☐ No*
- *Criterion 1: Understanding of the content (4 points)*
- *Criterion 2: Application of knowledge (10 points)*
- *Criterion 3: Critical analysis (4 points)*
- *Criterion 4: Clarity and organization (2 points)*

6- Web references (useful links):

https://www.obat.fr/blog/vrd-voiries-reseaux-divers/

https://www.btp-cours.com/document-technique-et-reglementaire-vrd/

7- Working environment (Facilities necessary for learning)

- *NONE*

Course Specification

hydraulic structure

1. General

Coded	**GCIV 4 208**	Level/Semester	2/S4	Coefficient	1.5	Credits	2
Course	Civil engineering					Volume. H. (CI)	21h.
Responsible	Atef BEN OTHMEN					Volume. H. (TP)	
Module	hydraulic structure					Version	09/2023

Course description (Course objective):
The main objective of this course is to master the tools and calculation methods appropriate for the design of hydraulic structures. The first section of this course is reserved for dams where the essential parameters which govern the stability of dikes and foundations of embankment dams as well as the techniques for stabilizing ongoing landslides are defined. The second section of this course is devoted to the presentation of methods for sizing open-air hydraulic channels according to their cross section.

Prerequisites:	*Keywords :*
Hydrology, soil mechanics	*Dam, embankment,* stability, Renard, canal, cross section.

Specific objectives of the course (OBJ $_i$):
OBJ 1 : *Be* able to size the dikes of an embankment dam. ***OBJ 2 :*** *Know how to* study the stability of dam foundations. ***OBJ 3 :*** *Master* the *sizing* of open-air canals.

Necessary material :

Course handout

2- Content elements (Course)

Week(s)	Chapters/Content Items	No. HR	Goals
1	*Chapter* 1: *Dams*	*1.5*	- *Definition* of dams - *Geometry* of a dam - *Different* types of dams
2 - 3	Continued Chapter 1	*3*	- Earth *dams* - *Design* of embankment dams - *stability* of earth dams - *Study* by Fillinieus slice *method* - *Study* by analytical *method* - Stabilization techniques to stop a slide in progress
4-5	TD 1: *Study* of the stability of dikes of a dam - application case	*3*	
6	*Chapter* 2: Hydraulic load	*1.5*	- Basic assumptions - Hydraulic load - Hydraulic gradient - Fox phenomenon
7	Chapter 3: Drains and filters	*1.5*	- Roles of drains and filters - *Design* of drains and filters - *Particle size rule* for filters
8	TD 2: Design of a particle size filter for a dam	*1.5*	
9	*Chapter* 4: Sealing organs of a dam	*1.5*	- *Waterproofing* of the foundation - Horizontal waterproof mat - Diaphragm wall technique - Analysis of internal regressive erosion risks

10	TD 3: Analysis of the stability of the foundation of a dam	*1.5*	
11 - 12 -13	Chapter 5: Open Canals	*4.5*	- *Main calculation formulas* - *Essential problems* in the hydraulic calculation of canals - *Verification* at channel scour - *elements* of the channel cross section - *Channels with* trapezoidal section - Parabolic section *channels*
14	Tutorial 4: Sizing of open-air channels - Application exercises.	*1.5*	

3- Content elements (Practical work)

Week(s)	Activities/Content Elements	No. HR	Goals
…	…	…	…
…	…	…	…

4- Evaluation methods & Marks Distribution

Type of assessment	Yes No	Tx Weighting
CC - Continuous assessment (Test/Quiz, Presentation, Report, etc.)	☐ *Yes* ☐ *No*	
DS - Supervised Duty	■ *Yes* ☐ *No*	
EE - Written test (Final exam)	■ *Yes* ☐ *No*	
EP - Practical test (TP- TP exam / MP- Mini project)	☐ *Yes* ☐ *No*	

- *Material 100% TP : Average = 20% CC + 80% EP*
- ***100% CI material : Average = 40% DS + 60% EE***
- *CI+TP material : Average = 20% DS + 20% EP + 60% EE*

5- Evaluation criteria

- *Authorized documents : ☐ Yes ☐ x No*
- *Authorized search engine : ☐ Yes ☐ x No*
- *Criterion 1: Understanding of the content (4 points)*
- *Criterion 2: Application of knowledge (10 points)*
- *Criterion 3: Critical analysis (4 points)*
- *Criterion 4: Clarity and organization (2 points)*

6- Web references (useful links):

- Rios, Jorge L. Paes - *Études en modèles réduits du déversoir de l'usine de Tucuruí* - in Congrès International des Grands Barrages - ICOLD - San Francisco, 1986.
- L. Peyras, P. Royet, D. Boissier, A. Vergne, Diagnostic et analyse de risques liés au vieillissement des barrages-Développement de méthodes d'aide à l'expertise [archive], Ingénieries-EAT, 2004.

7- Working environment (Facilities necessary for learning)

- *RAS*

Course Specification

Special works

1. General

Coded	**GCIV 4 209**	Level/Semester	2/S4	Coefficient	1.5	Credits	2
Course	Civil engineering					Volume. H. (CI)	
Responsible	Sami ANTIT					Volume. H. (TP)	21h.
Module	Special works					Version	09/2023

Course description (Course objective):
Calculation and sizing of some particular works

Prerequisites:	*Keywords :*
RDM- Structural calculation – BA1– BA2	*Eurocode2 – Reinforced concrete – Sizing*

Specific objectives of the course (OBJ $_i$):
- ***OBJ 1 :*** Technology relating to some special works ***OBJ 2 :*** Design and calculate these structures according to current standards (Eurocodes, etc.)

Necessary material :
…

2- Content elements (Course)

Week(s)	Chapters/Content Items	No. HR	Goals
1-4	**Chapter I : Sizing of stairs** 1 General 3 Pre-sizing of stairs 4 BA calculation of stairs (H.Thonier) 4 Diagramming and programming spreadsheets 5 Applications	*6h*	*BA design and calculation of stairs*

5-9	**Chapter II : Calculation of retaining walls** 1 General 2 Stability of retaining walls 3 Diagramming and programming spreadsheets	*7:30 a.m.*	*Sizing – calculation and verification steps* *Case study*
10-14	**Chapter III: BA rafts** 1 General 2 Reminders RDM 3 General sizing procedure 4 Diagramming and programming spreadsheets 5Applications	*7:30 a.m.*	*Sizing – calculation and verification steps* *Case study*

3- Content elements (Practical work)

Week(s)	Activities/Content Elements	No. HR	Goals
…	…	…	…
…	…	…	…

4- Evaluation methods & Marks Distribution

Type of assessment	Yes No	Tx Weighting
CC - Continuous assessment (Test/Quiz, Presentation, Report, etc.)	☐ *Yes* ☐ *No*	
DS - Supervised Duty	■ *Yes* ☐ *No*	
EE - Written test (Final exam)	■ *Yes* ☐ *No*	
EP - Practical test (TP- TP exam / MP- Mini project)	☐ *Yes* ☐ *No*	

- *Material 100% TP : Average = 20% CC + 80% EP*
- ***100% CI material : Average = 40% DS + 60% EE***
- *CI+TP material : Average = 20% DS + 20% EP + 60% EE*

5- Evaluation criteria

- *Authorized documents* : ☐ *Yes* ☐ **X** *No*
- *Authorized search engine* : ☐ *Yes* ☐ ***x*** *No*
- *Criterion 1: Understanding of the content (4 points)*

- *Criterion 2: Application of knowledge (10 points)*
- *Criterion 3: Critical analysis (4 points)*
- *Criterion 4: Clarity and organization (2 points)*

6- Web references (useful links):

1 - JA Calgaro, Bases for calculating structures according to Eurocode 0, Edition Le Moniteur

2- H.Thonier, Design and calculation of building structures (Volume 7,) Presse des Ponts 2010 (2nd edition)

3 - D.Ricotier, Sizing of concrete structures according to Eurocode 2, Edition le Moniteur 2012

4 - J.Roux, Mastery of Eurocode 2, Edition Eyrolles 2009

7- Working environment (Facilities necessary for learning)

- *NONE*

Course Specification

Public markets

1. General

Coded	**GCIV 4 210**	Level/Semester	2/S4	Coefficient	1.5	Credits	2
Course	Civil engineering					Volume. H. (CI)	
Responsible	Walid CHRIAA					Volume. H. (TP)	21h.
Module	Public markets					Version	12/2023

Course description (Course objective):
Acquisition of knowledge, laws and rules which manage the Tunisian public market: the rules governing the award, execution and control of public contracts

Prerequisites:	*Keywords :*
Management, Management,	*Contract, award*

Specific objectives of the course (OBJ $_i$):
OBJ 1 : Public Market sources
OBJ 2 : Public procurement criteria
OBJ 3 : the principles of handover
OBJ 4 : the methods of handing over
OBJ 5 : the progress of the award procedures

Necessary material :
NONE

2- Content elements (Course)

Week(s)	Chapters/Content Items	No. HR	Goals
1-2	The definition of the Public Market Public procurement criteria Organic criterion Material criterion The formal criterion The financial criterion	*3 hours*	*OBJ 1+ OBJ 2*
3-4	Economic importance of public procurement	*3 hours*	*OBJ 1+ OBJ 2*
5-6	the principles of handover Competition Equality of candidates, equivalence of opportunities Non-discrimination between candidates Transparency of procedures	*3 hours*	*OBJ 3*
7-8	Freedom of access to public procurement Procedural integrity Rules of good governance Sustainable development requirements Good management of public funds The effectiveness of public procurement Following clear, detailed procedures The generalization of the communication of responses	*3 hours*	*OBJ 3*
9-10	methods of handing out PMs Open call for tenders Restricted call for tender The call for tender with competition Two-stage call for tenders	*3 hours*	*OBJ 4*
11-12	the progress of the award procedures The call for competition, Opening of offers, Evaluation of offers, The award of the contract, Publication of the award	*3 hours*	*OBJ 5*

13-14	*Study of practical cases and presentation of personal projects*	*3 hours*	*Evaluate students' level of learning with practical cases*

3- Content elements (Practical work)

Week(s)	Activities/Content Elements	No. HR	Goals
…	…	…	…
…	…	…	…
13-14			

4- Evaluation methods & Marks Distribution

Type of assessment	Yes No	Tx Weighting
CC - Continuous assessment (Test/Quiz, Presentation, Report, etc.)	☐ *Yes* ☐ *No*	
DS - Supervised Duty	X *Yes* ☐ *No*	*40%*
EE - Written test (Final exam)	x *Yes* ☐ *No*	*60%*
EP - Practical test (TP- TP exam / MP- Mini project)	☐ *Yes* ☐ *No*	

- *Material 100% TP : Average = 20% CC + 80% EP*
- ***100% CI material : Average = 40% DS + 60% EE***
- *CI+TP material : Average = 20% DS + 20% EP + 60% EE*

5- Evaluation criteria

- *Authorized documents* : x *No*
- *Authorized search engine* : ☐ *Yes* x *No*
- *Criterion 1: Clarity of ideas (5 points)*
- *Criterion 2: methodological approach (5 points)*
- *Criterion 3: innovation (5 points)*
- *Criterion 4: presentation and mastery (5 points)*

6- Web references (useful links):

tunisian-public-procurement-code

http://www.marchespublics.gov.tn/onmp/upload/documents/decret_consolide_mars_2010_fr.pdf

7- Working environment (Facilities necessary for learning)

civil engineering
Major:Roads and Bridges: S5

Course Specification

Artwork

1. General

Coded	**GC-PC 5 101**	Level/Semester	3/S5	Coefficient	3	Credits	3
Course	Bridges and roads					Volume. H. (CI)	42h
Responsible	Atef BEN OTHMEN					Volume. H. (TP)	
Module	Artwork					Version	12/2023

Course description (Course objective):
This course aims to design girder bridges with independent spans. It first presents a reminder of the lines of influence which will be used, in the following sections, for the dimensioning of the main beams of the bridge. Secondly, this course covers the rules for calculating and applying permanent and rolling loads for road bridges which will be illustrated by examples and applications. An important section of this course details the calculations of the stresses on the main beams in the longitudinal direction of the bridge with independent spans with the application of the Guyon Massonnet method. In the following sections, this course presents the principles of dimensioning support spacers and slabs. At the end of this course, the student will be able to understand the specificities of the design of the different structural elements of girder bridges in accordance with the rules of BAEL and Eurocode 1 Part 3.

Prerequisites:	*Keywords :*
Structural courses + reinforced concrete courses	*Bridge* , influence lines, rolling loads, main beams, spacers, slabs, Guyon-Massonnet, reinforcement.

Specific objectives of the course (OBJ $_i$):
OBJ 1 : *Study* the lines of influence ***OBJ 2 :*** *Master* the basic concepts in the calculation of permanent and rolling loads applied to a road bridge. ***OBJ 3 :*** *Be* able to dimension the main beams, braces and slabs of a girder bridge.

Necessary material :
Course handout

2- Content elements (Course)

Week(s)	Chapters/Content Items	No. HR	Goals
1	*Chapter* 1: *Lines of influence*	*3*	- *Determination* of the lines of influence of bending moments and shear forces in beams
2	Tutorial 1: Application exercises on the lines of influence of moments and shear forces.	*3*	
3-4	*Chapter* 2: *Regulations* for loads on bridges	*6*	. *Apply the rules for calculating* normal and special road loads . Master the calculation of loads applied to sidewalks . Calculate the loads on the embankment . Apply load combinations for BAEL
5	Tutorial *2: Application exercises: calculation of loads*	*3*	
6 -7	*Chapter* 3: *Calculation of main beams*	*6*	- *Apply the* G u yon Massonnet method for calculating CR T - *Calculate the stresses* due to permanent loads in the main beams - *Determine* the

			stresses due to the different rolling loads in the main beams - *Define the* calculation requirements for the model beam
8	Tutorial *3: Application exercises* on the calculation of CR T for a girder bridge.	*6*	
9-10	*Chapter* 4: *Study* of end spacers	*6*	- *Define the role of* support trusses in prefabricated girder bridges - *Determine* the actions applied to the support spacers depending on the number of jacks used during a jacking operation. - *Make an example of a* study *of a* support brace under the jacking effect.
11-12	*Chapter* 5: Calculation of slabs	*6*	- *Study* the diffusion of loads in the slab in the event of local bending - *Calculation of the slab in the case of a continuous slab* in the case of a rectangular slab resting on four articulated supports. - Calculate the

			bending moments due to an overall bending of a slab which plays the role of bracing. - Determine the stresses resulting from total bending of the slab - *Particularities* of reinforcement in the slab
13-14	*Chapter 6 : Some data on the calculation of supports*	*6*	- *Study* of shrink-wrapped elastomer bearings - *forces* acting on the supports of a bridge - *Distribution* of horizontal forces. - *Combinations for calculating piers and* abutments

3- Content elements (Practical work)

Week(s)	Activities/Content Elements	No. HR	Goals
…	…	…	…
…	…	…	…
	Practical exam, mini-project defense, …	*3h*	*Summative evaluation*

4- Evaluation methods & Marks Distribution

Type of assessment	Yes No	Tx Weighting
CC - Continuous assessment (Test/Quiz, Presentation, Report, etc.)	☐ *Yes* ☐ *No*	

DS - Supervised Duty	X *Yes* ☐ *No*	*40%*
EE - Written test (Final exam)	X *Yes* ☐ *No*	*60%*
EP - Practical test (TP- TP exam / MP- Mini project)	☐ *Yes* ☐ *No*	

- *Material 100% TP : Average = 20% CC + 80% EP*
- ***100% CI material : Average = 40% DS + 60% EE***
- *CI+TP material : Average = 20% DS + 20% EP + 60% EE*

5- Evaluation criteria

- *Authorized documents* : ☐ *Yes* ☐ *No*
- *Authorized search engine* : ☐ *Yes* ☐ *No*
- *Criterion 1: Understanding of the content (4 points)*
- *Criterion 2: Application of knowledge (10 points)*
- *Criterion 3: Critical analysis (4 points)*
- *Criterion 4: Clarity and organization (2 points)*

6- Web references (useful links):

- *Ben Ouezdou Mongi, "Art Works Course* , Volume 2: Sizing". (2018).
- AFNOR, Eurocode 1: Calculation bases and actions on structures, Part 3: Loads on bridges due to traffic (1997) .

Course Specification

Bridge design and construction

1. General

Coded	**GC-PC 5 102**	Level/Semester	3/S5	Coefficient	3	Credits	3
Course	Civil engineering					Volume. H. (CI)	42h
Responsible	Kais GHENIA					Volume. H. (TP)	
Module	Bridge design and construction					Version	12/2023

Course description (Course objective):
This course treaty of there design and the execution of bridges. It presents a classification of bridges in accordance with the standards based onon of the examples of bridges executed in Tunisia.

Specific objectives of the course (OBJ $_i$):
OBJ 1: *Classification of bridges according to constituent materials, functionality of the structure and mode of execution.* ***OBJ 2 :*** *To study there design and fashions of execution of the bridges has beams in reinforced concrete (TI-BA).* ***OBJ 3:*** *Study the design and execution methods of bridges with post-tensioned beams(VIPP).*

2- Content elements (Course)

Week(s)	Chapters/Content Items	No. HR	Goals
1-2	Chapter 1 : General information on works of art	6h	Pavement layers
3-4	Chapter 2 : Classification of bridges	6h	Behavior and physical and mechanical characteristics of road materials
5-6	Chapter 3 : The data needed for a bridge project	6h	Pavement design

			challenges
7-8	Chapter 4 : The design of BA and BP works	6h	Modeling and verification of the validity of pavement structures using software
9-10	Chapter 5 : Bridge equipment	6h	The causes of damage and repair solutions
11	Chapter 6 : Execution of foundations	3h	The causes of damage and repair solutions
12-13	Chapter 7 : Execution of girder bridge decks	6h	The different road monitoring tools
14	Chapter 8 : Execution of slab bridges and porticos	3h	Checking a reinforcing structure

4- Evaluation methods & Marks Distribution

Type of assessment	Yes No	Tx Weighting
CC - Continuous assessment (Test/Quiz, Presentation, Report, etc.)	☐ *Yes* ☐ *No*	
DS - Supervised Duty	■ *Yes* ☐ *No*	*40%*
EE - Written test (Final exam)	x *Yes* ☐ *No*	*60%*
EP - Practical test (TP- TP exam / MP- Mini project)	☐ *Yes* ☐ *No*	

- *Material 100% TP : Average = 20% CC + 80% EP*
- *100% CI material : Average = 40% DS + 60% EE*
- *CI+TP material : Average = 20% DS + 20% EP + 60% EE*

5- Evaluation criteria

- *Authorized documents* : ☐ *Yes* ☐ *No*
- *Authorized search engine* : ☐ *Yes* ☐ *No*

- *Criterion 1: Understanding of the content (4 points)*
- *Criterion 2: Application of knowledge (10 points)*
- *Criterion 3: Critical analysis (4 points)*
- *Criterion 4: Clarity and organization (2 points)*

6- Web references (useful links):

- *Ben Ouezdou Mongi, "Art Works Course* , Volume 2: Sizing". (2018).

Course Specification

Roads 2

1. General

Coded	**GC-PC 5 103**	Level/Semester	3/S5	Coefficient	3	Credits	4
Course	CIVIL ENGINEERING					Volume. H. (CI)	42h
Responsible	Mohamed BOUDABOUS					Volume. H. (TP)	
Module	Roads 2					Version	09/2023

Course description (Course objective):
Sizing of new pavements and maintenance and reinforcement of existing pavements

Prerequisites:	*Keywords :*
ROUTE1, construction materials, soil mechanics, MMC	*Road traffic, soil identification tests*

Specific objectives of the course (OBJ $_i$):
OBJ 1 : *Know the types of pavement*
OBJ 2 : *GTR classification of soils*
OBJ 3 : *Characteristics of road materials*
OBJ 4 : *Sizing of new pavement*
OBJ 5 : *Types and causes of pavement damage*
OBJ 6 : *Pavement reinforcement in place*

Necessary material :
PC

2- Content elements (Course)

Week(s)	Chapters/Content Items	No. HR	Goals

1	*Types of pavements*	*3*	*Pavement layers*
2-3	*Road materials: GNT, bituminous materials, materials treated with hydraulic binder, formulation of bituminous coatings, fatigue tests, complex module test, rutting test*	*6h*	*Behavior and physical and mechanical characteristics of road materials*
4-5	*Roadway design, rational method, Tunisian roadway design catalog*	*6H*	*Pavement design challenges*
6-7	*GTR Classification* *Pavement sizing empirical-rational method, handling of Alizé software,*	*6H*	*Modeling and verification of the validity of pavement structures using software*
8-10	*Road pathology: factors of disorder, main families of damage, maintenance solutions*	*9h*	*The causes of damage and repair solutions*
11-12-13	*Pavement diagnostics: data collection, deflection measurement, surface smoothness measurement, pavement coring*	*6H*	*The different road monitoring tools*
13-14	*Reinforcement of pavements: the different reinforcement methods, Sizing of the design structure using the catalog method and verification on the Alizé software*	*6H*	*Checking a reinforcing structure*

3- Content elements (Practical work)

Week(s)	Activities/Content Elements	No. HR	Goals
…	…	…	…
…	…	…	…
12	*Practical exam, mini-project defense, …*	*3h*	*Summative evaluation*

4- Evaluation methods & Marks Distribution

Type of assessment	Yes No	Tx Weighting
CC - Continuous assessment (Test/Quiz, Presentation, Report, etc.)	☐ *Yes* ☐ *No*	
DS - Supervised Duty	x *Yes* ☐ *No*	*60%*
EE - Written test (Final exam)	x *Yes* ☐ *No*	*60%*
EP - Practical test (TP- TP exam / MP- Mini project)	☐ *Yes* ☐ *No*	

- *Material 100% TP : Average = 20% CC + 80% EP*
- *100% CI material : Average = 40% DS + 60% EE*
- *CI+TP material : Average = 20% DS + 20% EP + 60% EE*

5- Evaluation criteria

- *Authorized documents* : ☐ *Yes* ☐ *No*
- *Authorized search engine* : ☐ *Yes* ☐ *No*
- *Criterion 1: Understanding of the content (4 points)*
- *Criterion 2: Application of knowledge (10 points)*
- *Criterion 3: Critical analysis (4 points)*
- *Criterion 4: Clarity and organization (2 points)*

6- Web references (useful links):

- *New pavement design and reinforcement catalogs, 1984*
- *SETRA-LCPC, design and sizing of road structures, 1994*
- *Di Benedetto H, Corté JF, bituminous road materials 2, 2004*
- *Jamel NEJI, The Road Project, 2005*
- *SETRA-LCPC, Creation of embankments and subgrades, Fasicule1 general principles, 2000*.

7- Working environment (Facilities necessary for learning)

- *Alizé LCPC*

Course Specification

Design and calculation of road projects

1. General

Coded	**GC-PC 5 104**	Level/Semester	3/S5	Coefficient	1.5	Credits	2
Course	Civil engineering					Volume. H. (CI)	
Responsible	Lassad TIZAOUI					Volume. H. (TP)	21h.
Module	Design and calculation of road projects					Version	12/2023

Course description (Course objective):
Complete study of a real project: regional road RR27 in the governorate of Nabeul

Prerequisites:	*Keywords :*
Courses: route 1 and route 2, hydrology, *Software: Autocad, track, Alize, Global mapper, Google Earth*	Design - Roads

Specific objectives of the course (OBJ $_i$):
OBJ 1 : Geometric study (plan layout, longitudinal profile, cross profiles)
OBJ 2 : Sizing of the roadway (traffic, geotechnical)
OBJ 3 : Hydrological and hydraulic study of watersheds
OBJ 4 : Cubature calculation and price estimation

Necessary material :
Computer lab, software: Autoca, track, Alize, Global mapper, Google Earth

2- Content elements (Course)

Week(s)	Chapters/Content Items	No. HR	Goals
1-2			

2-3			
10-12			

3- Content elements (Practical work)

Week(s)	Activities/Content Elements	No. HR	Goals
1	Project presentation and data analysis	*1h30*	*Project introduction*
2	Hydrological study: insertion of the route on global map and delimitation of watersheds	*1h30*	*OBJ 3*
3	Hydrological study: calculation of watershed flows (methods; rational, Franco-Rodier, specific, regional, FRIGUI)	*1h30*	*OBJ 3*
4	Hydraulic study: choice of hydraulic works	*1h30*	*OBJ 3*
5-6	Traffic study: traffic census, traffic calculation and projection, traffic class	*3*	*OBJ 2*
7	Geotechnical study: geotechnical study, LCPC classification, GTR classification	*1h30*	*OBJ 2*
8-9	Sizing of the road structure (ALIZE)	*3*	*OBJ 1*
10-14	Geometric study: choice of the layout on AutoCAD then entry of the elements on the track, definition of the natural terrain and drawing of the longitudinal profile, drawing of standard transverse profiles and project calculation; release of plans and price estimation	*7:30*	*OBJ 1+ OBJ 4*

4- Evaluation methods & Marks Distribution

Type of assessment	Yes No	Tx Weighting
CC - Continuous assessment (Test/Quiz, Presentation, Report, etc.)	x *Yes* ☐ *No*	*20%*
DS - Supervised Duty	☐ *Yes* ☐ *No*	
EE - Written test (Final exam)	☐ *Yes* ☐ *No*	
EP - Practical test (TP- TP exam / MP- Mini project)	x *Yes* ☐ *No*	*80%*

- *Material 100% TP : Average = 20% CC + 80% EP*
- *100% CI material : Average = 40% DS + 60% EE*
- *CI+TP material : Average = 20% DS + 20% EP + 60% EE*

5- Evaluation criteria

- *Authorized documents : ☐ Yes ☐ No*
- *Authorized search engine : ☐ Yes ☐ No*
- *Criterion 1: Understanding of the content (4 points)*
- *Criterion 2: Application of knowledge (10 points)*
- *Criterion 3: Critical analysis (4 points)*
- *Criterion 4: Clarity and organization (2 points)*

6- Web references (useful links):

- *https://www.infociments.fr/sites/default/files/article/fichier/routes-la-revue2-cahier-technique.pdf*
- *https://www.cerema.fr/system/files/documents/2017/12/1650w-rapport_synthese_fondamentaux_conception_routiere-1.pdf*

7- Working environment (Facilities necessary for learning)

- *Track, Microsoft Excel*

Course Specification

Risk management

1. General

Coded	**GC-PC 5 106**	Level/Semester	*3/S5*	Coefficient	*1.5*	Credits	*2*
Course	CIVIL ENGINEERING					Volume. H. (CI)	*21h.*
Responsible	Nawfel Boufaied					Volume. H. (TP)	
Module	*Risk management*					Version	*10/2023*

Course description (Course objective):
Analyze a work situation by giving the causes and solutions

Prerequisites:	*Keywords :*
Construction technologies	*Management, QHSE, Risks*

Specific objectives of the course (OBJ $_i$):
OBJ 1 : *Defining risks: accidental and chronic processes*
OBJ 2 : *Give the causes and solutions of risks in the construction sector*
OBJ 3 : *Present the risks linked to earthworks, machinery and falls from height*
OBJ 4 : *Classify security into integrated security, collective protection and individual protection*
OBJ 5 : *Present personal protective equipment*
OBJ 6 : *Develop the specific safety and health protection plan (PPSPS)*

Necessary material :
Video projector and board and a real example of a PPSP

2- Content elements (Course)

Week(s)	Chapters/Content Items	No. HR	Goals
1-4	*Chapter 1: Twinning*	*6h*	*Obj 1*
5-8	*Chapter 2: Risks in the construction sector*	*6h*	*Obj2 – Obj3*
9-11	*Chapter 3: Collective and individual protective equipment*	*4:30*	*Obj4 – Obj5*
12-14	*Chapter 4: Development of the PPSPS plan*	*4:30*	*Obj6*

3- Content elements (Practical work)

Week(s)	Activities/Content Elements	No. HR	Goals
…	…	…	…
…	…	…	…
12	*Practical exam, mini-project defense, …*	*3h*	*Summative evaluation*

4- Evaluation methods & Marks Distribution

Type of assessment	Yes No	Tx Weighting
CC - Continuous assessment (Test/Quiz, Presentation, Report, etc.)	☐ *Yes* ☐ *No*	
DS - Supervised Duty	☒ *Yes* ☐ *No*	*40%*
EE - Written test (Final exam)	☒ *Yes* ☐ *No*	*60%*
EP - Practical test (TP- TP exam / MP- Mini project)	☐ *Yes* ☐ *No*	

- *Material 100% TP : Average = 20% CC + 80% EP*
- ***100% CI material : Average = 40% DS + 60% EE***
- *CI+TP material : Average = 20% DS + 20% CC + 60% EE*

5- Evaluation criteria

- *Authorized documents* : ☐ *Yes* ☒ *No*
- *Authorized search engine* : ☐ *Yes* ☒ *No*
- *Criterion 1: Understanding of the content (4 points)*
- *Criterion 2: Application of knowledge (10 points)*
- *Criterion 3: Critical analysis (4 points)*
- *Criterion 4: Clarity and organization (2 points)*

6 - Web references (useful links):

- *Risk diagnosis: Identify, analyze and map vulnerabilities* . Sophie Gaultier-Gaillard, Jean-Paul Louisot. AFNOR Editions. 2007 . (ISBN 2124755757) .
- Riseo quarterly review (Risks: studies and observations) on www.riseo.fr
- "ISO Standard", *31000:2009 Risk management - Principles and guidelines* November 2009.
- "ISO/IEC Standard", 31010:2009 Risk management - Risk assessment techniques *November 2009.*
- *I., Zulqarnain. (2014). Risk Management in Civil Engineering Projects.*
- *Masovic, Snezana & Pecic, Nenad & Stošić, Saša & Hajdin, Rade & Tanasic, Nikola. (2023). Risk management in civil engineering. Gradjevinski materijali i konstrukcije. 66. 3-3. 10.5937/GRMK2300003M.*

- *I., Zulqarnain. (2014). Risk Management in Civil Engineering Projects.*
- *Masovic, Snezana & Pecic, Nenad & Stošić, Saša & Hajdin, Rade & Tanasic, Nikola. (2023). Risk management in civil engineering. Gradjevinski materijali i konstrukcije. 66. 3-3. 10.5937/GRMK2300003M.*

7- Working environment (Facilities necessary for learning)

None

Course Specification

Quantity measurement and price estimate

1. General

Coded	**GC-PC 5 105**	Level/Semester	3/S5	Coefficient	1.5	Credits	2
Course	CIVIL ENGINEERING					Volume. H. (CI)	21h.
Responsible	Laasad Tizaoui					Volume. H. (TP)	
Module	Quantity measurement and price estimate					Version	09/2023

Course description (Course objective):
Techniques for establishing a preliminary estimate and sub-details of prices for elementary works of a construction in order to develop the price schedule and the estimated estimate for the project.

Prerequisites:	*Keywords :*
Mathematics, Markets and regulations, PGC	*Preliminary Survey, Attachment, Dry Disbursements, Construction Costs, General Costs, Profits and Contingencies*

Specific objectives of the course (OBJ $_i$):
OBJ 1 : *Know how to use the information provided by the CCAP and the CCTP*
OBJ 2 : *Provide an execution file*
OBJ 3 : *Establish quantitative quotes*
OBJ 4 : *Establish sub-details of unit sales prices (all elementary works combined)*

Necessary material :
Video projector

2- Content elements (Course)

Week(s)	Chapters/Content Items	No. HR	Goals

1-2	*Chapter 1: Determination of quantities of elementary works* *1.1 Course:* *-Basic terminology* *- Main units of measurement by trade* *- Methods and rules for drafting quantitative quotes* *- Useful math formulas*	*3H*	*Methodology allowing the development of a clear, controllable and accurate quantitative estimate as quickly as possible*
3-4-5-6	*1.2 Study of different cases (development of different models of quantitative estimates):* *- Reinforced Concrete Structures* *- Metal constructions* *- VRD* *- Masonry…* *(The choice of subject depends on the Manager: Building or Bridges and Roads)*	*6H*	*Handle working documents and accurately calculate the quantities of the constituent elements of a work*
7	*Guarded duty*	*1.5H*	*Successfully complete a Survey task*
8-9	*Chapter 2: Estimation of the value of a work* *2.1 Course:* *-Basic terminology* *- Notions related to the term price* *- Sub-Details of the Dry Disbursement of supplies* *- Sub-Details of Dry Disbursement of productive labor* *- Sub-Details of the Dry Disbursement of the assignable material* *- Additional Costs (Construction Costs, Costs* *General, Special Charges)* *- Settlement coefficient*	*3H*	*Methodology for developing sub-price details*

	- Sub-Details of the Dry Disbursement of an Elementary Work *- Determination of the Unit Sales Price*		
10-11-12-13	*1.2 Study of different cases (development of different price sub-details):* *- Excavations and earthworks* *- Reinforced Concrete Elements in Foundations and Superstructure.* *- Masonry* *- Roads…* *(The choice of subject depends on the Building or Bridges and Roads Manager)*	*6H*	*- Handle working documents and accurately calculate forecast unit sales prices for elementary works* *- Know the margins of current disbursements*
14	*Summary assessment and review*	*1.5H*	*Estimate the total selling price of an elementary work*

3- Content elements (Practical work)

Week(s)	Activities/Content Elements	No. HR	Goals
…	…	…	…
…	…	…	…

4- Evaluation methods & Marks Distribution

Type of assessment	Yes No	Tx Weighting
CC - Continuous assessment (Test/Quiz, Presentation, Report, etc.)	☐ *Yes* ☐ *No*	
DS - Supervised Duty	x *Yes* ☐ *No*	*40%*
EE - Written test (Final exam)	x *Yes* ☐ *No*	*60%*
EP - Practical test (TP- TP exam / MP- Mini project)	☐ *Yes* ☐ *No*	

- ***100% CI material : Average = 40% DS + 60% EE***

5- Evaluation criteria

- *Authorized documents : ☐ Yes x No*
- *Authorized search engine : ☐ Yes x No*
- *Criterion 1: Understanding of the content (4 points)*
- *Criterion 2: Application of knowledge (10 points)*
- *Criterion 3: Critical analysis (4 points)*
- *Criterion 4: Clarity and organization (2 points)*

6- Web references (useful links):

- Yves WIDLOECHER, David CUSANT, Price study manual for construction companies, EYROLLES, 2023.

- Jean Pierre GOUSSET, Technical drawing and reading of plans, EYROLLES, 2012.

- Michel MANTEAU, Building survey, EYROLLES, 2000.

Course Specification

Dynamics of structures

1. General

Coded	**GC-PC 5 108**	Level/Semester	*3/S5*	Coefficient	*1.5*	Credits	*2*
Course	CIVIL ENGINEERING					Volume. H. (CI)	*21h.*
Responsible	Sami ANTIT					Volume. H. (TP)	
Module	*Dynamics of structures*					Version	*10/2023*

Course description (Course objective):
Knowledge of the basic notions of continuum mechanics.

Prerequisites:	*Keywords :*
Engineering mathematics, numerical analysis	*Lagrangian description,* Eulerian description, deformation tensor, stress tensor, *generalized Hooke's law*

Specific objectives of the course (OBJ $_i$):	
OBJ 1 :	Determine the dynamic properties of a structure.
OBJ 2 :	Study the dynamic behavior in the case of a free, harmonic, random oscillation.
OBJ 3 :	Study the dynamic response using the modal superposition method.
OBJ 4 :	Determine the natural frequencies and vibration modes of a Nddl system

Necessary material :
…

2- Content elements (Course)

Week(s)	Chapters/Content Items	No. HR	Goals
1-2	**Chapter 1: Introduction to structural dynamics** 1. General introduction	*3h*	*Know the types of dynamic forces*

	2. Type of dynamic forces 3. Degree of freedom 5. Rigidity of the posts (recessed case, simply supported case) 6. Equivalent stiffness		
3-8	**Chap2 : System with 1 degree of freedom** 1. Free undamped oscillation 2. Damped free oscillation 2. Damped free oscillation 3. Forced oscillation	*9h*	*Determine and solve the equation of motion of a system with 1 degree of freedom*
9-14	**Chap3 : System with several degrees of freedom** 1. Free undamped oscillation 2. Clean modes and clean pulsation 3. Illustration of dynamic behavior 4. Modal coordinates	*9h*	*Solve a system with several degrees of freedom. Determine the natural pulsations and diagram the natural mode vectors*

3- Content elements (Practical work)

Week(s)	Activities/Content Items	No. HR	Goals
…	…	…	…
…	…	…	…
	Practical exam, mini-project defense, …	*3h*	*Summative evaluation*

4- Evaluation methods & Marks Distribution

Type of assessment	Yes No	Tx Weighting
CC - Continuous assessment (Test/Quiz, Presentation, Report, etc.)	☐ *Yes* ■ *No*	
DS - Supervised Duty	■ *Yes* ☐ *No*	

EE - Written test (Final exam)	■ *Yes* ☐ *No*	
EP - Practical test (TP- TP exam / MP- Mini project)	☐ *Yes* ☐ *No*	

- *Material 100% TP : Average = 20% CC + 80% EP*
- *100% CI material : Average = 40% DS + 60% EE*
- *CI+TP material : Average = 20% DS + 20% EP + 60% EE*

5- Evaluation criteria

- *Authorized documents* : ■ *Yes* ☐ *No*
- *Authorized search engine* : ☐ *Yes* ☐ *No*
- *Criterion 1: Understanding of the content (4 points)*
- *Criterion 2: Application of knowledge (10 points)*
- *Criterion 3: Critical analysis (4 points)*
- *Criterion 4: Clarity and organization (2 points)*

6- Web references (useful links):

1. Dynamics of structures / Clough, Ray w, - 1980- D28

2. dynamic calculation of structures in seismic zones /Alain Capia – 1982 – D40

3. dynamics of structures in engineering seismology /Lucia Dobrescu – 1983 – D50-1

4. Theoretical and numerical aspects of structural dynamics / J. Donea – 1988 – D58

7- Working environment (Facilities necessary for learning)

- *NONE*

Course Specification

Plates and shells

1. General

Coded	**GC-PC 5 109**	Level/Semester	*3/S5*	Coefficient	*1.5*	Credits	*2*
Course	CIVIL ENGINEERING					Volume. H. (CI)	*21h.*
Responsible	Moez SELMI					Volume. H. (TP)	
Module	Plates and shells					Version	*10/2023*

Course description (Course objective):
Master the calculation of stresses and the sizing of special thin-walled structures: plates, domes and tanks.

Prerequisites:	*Keywords :*
Mechanics of continuous media, Structure theory	*Thin-walled structure, Lagrange differential equation, Kirchhoff*

Specific objectives of the course (OBJ $_i$):
OBJ 1 : *Define a plate or shell as well as the associated generalized constraints*
OBJ 2 : *Describe the classic models of plates and shells, their hypotheses, the associated generalized deformations*
OBJ 3 : *equate problems of balance and stability of plates and shells and solve these problems analytically in the simplest cases*

Necessary material :
…

2- Content elements (Course)

Week(s)	Chapters/Content Items	No. HR	Goals
1-3	***Chapter 1: Reminder Mechanics of continuous media in linear elasticity***	*4:30*	*Master the basic notions of*

	- Definition of the displacement gradient tensor - Deformation displacement relationship - Definition of the stress tensor - Generalized Hooke's law in linear elasticity - Simplifying hypotheses: plane strain problem, plane stress problem		*continuum mechanics in linear elasticity*
4-9	***Chapter 2: General theory of thin-walled plates*** - Introduction and hypotheses - Kirchoff plate theory - Equation of the Lagrange deformation - Study of a rectangular plate subjected to a uniform load and sinusoidal load	*9h*	*Determine the stresses, deformation and loading in a plate subjected to several types of loading*
10-14	***Chapter 3: General theory of thin-walled shells*** - Introduction and hypotheses - Different types of hulls, revolution hulls - Calculation of the thickness of the revolution shells - Internal forces in dome type structures - Application to reinforced concrete sizing of spherical domes of revolution	*7:30*	*Determine the stresses and strains in a shell of revolution around an axis*

3- Content elements (Practical work)

Week(s)	Activities/Content Items	No. HR	Goals
…	…	…	…
…	…	…	…
12	*Practical exam, mini-project defense, …*	*3h*	*Summative evaluation*

4- Evaluation methods & Marks Distribution

Type of assessment	Yes No	Tx Weighting
CC - Continuous assessment (Test/Quiz, Presentation, Report, etc.)	☐ *Yes* ■ *No*	
DS - Supervised Duty	■ *Yes* ☐ *No*	
EE - Written test (Final exam)	■ *Yes* ☐ *No*	
EP - Practical test (TP- TP exam / MP- Mini project)	☐ *Yes* ☐ *No*	

- *Material 100% TP : Average = 20% CC + 80% EP*
- *100% CI material : Average = 40% DS + 60% EE*
- *CI+TP material : Average = 20% DS + 20% EP + 60% EE*

5- Evaluation criteria

- *Authorized documents : ■ Yes ☐ No*
- *Authorized search engine : ☐ Yes ☐ No*
- *Criterion 1: Understanding of the content (4 points)*
- *Criterion 2: Application of knowledge (10 points)*
- *Criterion 3: Critical analysis (4 points)*
- *Criterion 4: Clarity and organization (2 points)*

6- Web references (useful links):

- P. Bisch. Shell mechanics - Theory and applications. Presses des Ponts, 2013.

- D. Chapelle and K.-J. Bathe. The Finite Element Analysis of Shells - Fundamentals. 2011.

-. PM Naghdi. “The Theory of Shells and Plates”. In: Linear Theories of Elasticity and Thermoelasticity. PDC Truesdell. Springer Berlin Heidelberg, 1973, p. 425-640.

-. BATOZ, JL BENTAHAR, M and DHATT, GS The DKT and DKQ elements and the analysis of thin plates and shells. 1982. presented at the conference “Current Trends in Structural Calculation” held in Sophia-Antipolis, February 1-2-3

-. BEN TAHAR, M. elastoplastic analysis of thin plates and shells by finite elements. 1981. Doctoral dissertation. University of Technology of Compiegne, p 130

7- Working environment (Facilities necessary for learning)

- *NONE*

Course Specification

GC software: Revit + Primavera: "Revit"

1. General

Coded	**GC-PC 5 107**	Level/Semester	*5*	Coefficient	*3*	Credits	*4*
Course	Civil Engineering					Volume. H. (CI)	
Responsible	Lassad TIZAOUI					Volume. H. (TP)	*42h*
Module	GC software: Revit + Primavera					Version	*09/2023*

Course description (Course objective):
▪ Study the building structures of a project and calculate the constraints of the work (structure, resistance, sizing, etc.) ▪ Study the feasibility of the project and propose technical solutions ▪ Study the design of the project (modeling on Revit) ▪ Create or modify diagrams and plans of works according to standards and changes in constraints

Prerequisites:	*Keywords :*
CAD, RDM and Structural Calculation Knowledge of the Windows environment Knowledge of construction trades	Modeling, BIM, digital model, analytical model…

Specific objectives of the course (OBJ $_i$):
OBJ 1 : Become familiar with the Revit tool. **OBJ 2 :** Model and configure a structural model with specific tools .

Necessary material :
Computer, video projector, Primavera software, MS Project, Autodesk Robot, Revit, Arche, Navisworks

2- Content elements (Practical work)

Week(s)	Activities/Content Items	No. HR	Goals

1	**BIM process description and definition** The interface: Revit Structure interface presentation Overview of the analytical model Project Families Template	*3*	*Use the Revit interface to model a structure* *Generate the 3D model* *Exploitation of results*
2-3	Concepts: Project settings: Units, snaps, object styles Classification of entities: Categories, Families, Occurrence Types Project tree: Views, Bills of materials. Families and Groups Transfer of project standards	*6*	Model and configure a structural model with specific tools .
4-5-6	Importing Revit Architecture files: Importing and linking a DWG file Adding levels and grids Importing and linking an Architecture Revit file Copy/Check from imported template. Modeling a project: Adding walls Adding a structural slab Adding cage openings Addition of a raft / insulated foundations Adding concrete/steel/wood posts Adding curved concrete/steel beams and beams Automatic placement of beam systems Sketch of a network of beams	*9*	Model and configure a structural model with specific tools . *Modeling report*

	Adding an opening to a beam/column <u>Carrying out a project :</u> - Extension of the structure up to the roof - Modification of a flat slab <u>Documentation of a project:</u> - Creation of sheets - Thematic addition of sail impacts - Creation of project and shared settings - Creation of sectional and detail views - Placement of views - Creation of dimensions and dimension style - Creation of level dimensions - Creation of an annotation legend - Labeling of beams - Label family modification - Creation of a custom beam label - Creation of a framework nomenclature		
7	*Mastery assessment*	*3h*	*Summative evaluation*

3- Evaluation methods & Marks Distribution

Type of assessment	Yes No	Tx Weighting
CC - Continuous assessment (Test/Quiz, Presentation, Report, etc.)	■ *Yes* ☐ *No*	*20%*
DS - Supervised Duty	☐ *Yes* ■ *No*	
EE - Written test (Final exam)	☐ *Yes* ■ *No*	
EP - Practical test (TP- TP exam / MP- Mini project)	■ *Yes* ☐ *No*	*80%*

- ***<u>Material 100% TP : Average = 20% CC + 80% EP</u>***
- *100% CI material : Average = 40% DS + 60% EE*
- *CI+TP material : Average = 20% DS + 20% EP + 60% EE*

4- Evaluation criteria

- *Authorized documents* : ■ *Yes* ☐ *No*
- *Authorized search engine* : ■ *Yes* ☐ *No*

- *Criterion 1: Clarity of answers (1 points)*
- *Criterion 2: Clear description of phenomena or situations (Variable… points)*
- *Criterion 3: Proposal of solutions, techniques for modeling situations (Variable. points)*
- *Criterion 4: Clear calculation, correct drawing to scale (Variable… points)*

5- Web references (useful links):

Acquire the fundamentals of Autodesk REVITstructural: training book volume 1

- https://www.autodesk.fr/

Revit Initiation and improvement by the Jonathan RENOU structure

6- Working environment (Facilities necessary for learning)

- *Video projector, computer laboratory, Autodesk Robot Structural Analysis Professional software, Auto-cad*

Course Specification

GC software: Revit + Primavera: "Primavera"

1. General

Coded	**GC-PC 5 107**	Level/Semester	*3/S5*	Coefficient	*3*	Credits	*4*
Course	Civil Engineering					Volume. H. (CI)	
Responsible	Lassad Tizaoui					Volume. H. (TP)	*42h*
Module	GC software: Revit + Primavera					Version	*10/2023*

Course description (Course objective):
▪ Study the feasibility of the project and propose technical solutions

Prerequisites:	*Keywords :*
Planning and organization of work	Milestone, WBS, OBS, Critical task, critical path, resources, Over-allocation of resources, Predecessors/Successors….

Specific objectives of the course (OBJ $_i$):
OBJ 3 : Creation of EPS of the company (organizational structure of the company); (departments and services of the company).
OBJ 4 : Creation of a functional organization chart for the company OBS (functional hierarchy of the company). (The managers of each department);
OBJ 5 : Creation of new project (name of the project, their position in relation to the general structure of the company, the necessary resources, etc.);
OBJ 6 : Creation of the project structure in the form of tasks (decomposition of the project in the form of summary tasks (milestones), under tasks; in chronological order); WBS: Work Breakdown Structure.
OBJ 7 : Organizing tasks in chronological order we respect the basic logical relationships between tasks.
OBJ 8 : Calculation of durations (based on the available resources allocated to the project), as well as the flow date and the end date, deducing the critical path and the free and total margin of each task.
OBJ 9 : Calculation of the company's general budget and allocation of budgets reserved for each project.

OBJ 10 :	Determination of 3M resource requirements (Materials, Materials and Labor) and the budget cost necessary for each project execution period.
OBJ 11 :	Determination of the total project execution time (GANTT planning).

Necessary material :
Computer, video projector, Primavera software, MS Project, Autodesk Robot, Revit , Arche, Navisworks.

2- Content elements (Practical work)

Week(s)	Activities/Content Items	No. HR	Goals
8	***Reminder on work planning*** *:* *- Work planning techniques* *- Task scheduling (critical and non-critical task, critical path)* ******Description of the Primavera software environment*** ***General software settings*** *:* *- Types of calendars* *- Choice of currencies* *- Setting up working time…*	*3 a.m.*	Project planning and organization
9-10-11	***Creating a project on Primavera*** *:* - Creation of the company's EPS (company organizational structure) - Creation of a functional organization chart for the OBS company (Functional hierarchy of the company) - Creation of the project structure in the form of tasks (decomposition of the project in the form of summary tasks (milestones), under tasks; in chronological order); WBS: Work Breakdown Structure. - Organization of tasks in chronological order we respect the basic logical relationships between tasks.	*9 a.m.*	Project planning and organization

	(Definition of Predecessors/Successors for each task)		
12	***Creation/allocation of resources*** *:* - *Definition of resources,* the 3M (Materials, Materials and Labor) and the cost to budget for each resource. - Allocation of the resources necessary for the execution of each task. ***Exploitation of results :*** *- Resource usage report by task* *- Over-allocation of resources (resource graph)* *- Review of the assignment* *- Moving the project and calculating the duration of the project* .	*3 a.m.*	Project planning and organization
13-14	**Layout :** - Preparation of the GANTT schedule - Printing schedules : - Layout - Configuration of headers and footers - Date management - Printing reports : - Project summary report - Report of planned and actual costs - Reports of hourly loads by task and by resources - Visual reporting of treasury expenses.	*6h*	Project planning and organization

3- Evaluation methods & Marks Distribution

Type of assessment	Yes No	Tx Weighting

CC - Continuous assessment (Test/Quiz, Presentation, Report, etc.)	■ *Yes* ☐ *No*	*20%*
DS - Supervised Duty	☐ *Yes* ■ *No*	
EE - Written test (Final exam)	☐ *Yes* ■ *No*	
EP - Practical test (TP- TP exam / MP- Mini project)	■ *Yes* ☐ *No*	*80%*

- ***Material 100% TP : Average = 20% CC + 80% EP***
- *100% CI material : Average = 40% DS + 60% EE*
- *CI+TP material : Average = 20% DS + 20% EP + 60% EE*

4- Evaluation criteria

- *Authorized documents :* ■ *Yes* ☐ *No*
- *Authorized search engine :* ■ *Yes* ☐ *No*

- *Criterion 1: Clarity of answers (1 points)*
- *Criterion 2: Clear description of phenomena or situations (Variable… points)*
- *Criterion 3: Proposal of solutions, techniques for modeling situations (Variable. points)*
- *Criterion 4: Clear calculation, correct drawing to scale (Variable… points)*

5- Web references (useful links):

- Oracle Primavera User Guide

6- Working environment (Facilities necessary for learning)

- *Video projector, computer laboratory, Autodesk Auto-cad software, Primavera software…*

Civil engineering
Major: Buildings & Energy: S5

Course Specification

Design and calculation of building projects

1. General

Coded	**GC-BE 5 101**	Level/Semester	*3/S5*	Coefficient	*3*	Credits	*3*
Course	CIVIL ENGINEERING					Volume. H. (CI)	*42h*
Responsible	Kais GHenia					Volume. H. (TP)	
Module	Design and calculation of building projects					Version	*09/2023*

Course description (Course objective):
- Master the design stages of building projects - Master the calculation of the different structural elements of a Building. - Development of execution plans: Formwork – Foundation – details…

Prerequisites:	*Keywords :*
Reinforced concrete 1 and 2 - DAO GC software: Ark / Robot	Structural design – Lowering of loads – execution plans – reinforcement specifications

Specific objectives of the course (OBJ $_i$):
OBJ 1: *Design the structure of a building based on architectural plans* ***OBJ 2:*** *Carry out the lowering of loads and size the supporting elements* ***OBJ 3:*** *Carry out a Heating and Air Conditioning study aimed at minimizing energy consumption.*

Necessary material :
Video projector – CAD lab

2- Content elements (Course)

Week(s)	Chapters/Content Items	No. HR	Goals
1-2	Reading plans	6h	OBJ 1

	Detailed description of the mini-project		
3-4	Structural design of the different supporting elements Analysis of architectural constraints	6h	OBJ 2+ OBJ 3
5-6	Pre-sizing Import on Arche Frame	6h	
7-8	Calculation assumptions Finalization of formwork and foundation plans	6h	
9-11	Reinforced concrete calculation and preparation of reinforcement books	9h	
12-14	Preparation of the mini-project summary report (structure and content including drawing of plans)	9h	

4- Evaluation methods & Marks Distribution

Type of assessment	Yes No	Tx Weighting
CC - Continuous assessment (Test/Quiz, Presentation, Report, etc.)	☐ *Yes* ☐ *No*	
DS - Supervised Duty	X *Yes* ☐ *No*	*40%*
EE - Written test (Final exam)	X *Yes* ☐ *No*	*60%*
EP - Practical test (TP- TP exam / MP- Mini project)	■ *Yes* C *No*	

- ***100% CI material : Average = 40% DS + 60% EE***

5- Evaluation criteria

- *Authorized documents* : ■ *Yes* ☐ *No*
- *Authorized search engine* : ■ *Yes* ☐ *No*
- *Criterion 1: Understanding of the content (4 points)*
- *Criterion 2: Application of knowledge (10 points)*
- *Criterion 3: Critical analysis (4 points)*
- *Criterion 4: Clarity and organization (2 points)*

6- Web references (useful links):

- Henry Thonier -Design and calculation of building structures - Volume 2 Collection Design and calculation of building structures

https://www.accasoftware.com/fr/conception-structures-de-batiments

Course Specification

Energy studies of buildings

1. General

Coded	**GC-BE 5 102**	Level/Semester	*3/S5*	Coefficient	*3*	Credits	*3*
Course	CIVIL ENGINEERING					Volume. H. (CI)	*42h*
Responsible	Nawfel SASSI					Volume. H. (TP)	
Module	Energy studies of buildings					Version	*09/2023*

Course description (Course objective):
- Design of a Low Energy Consumption Building *- Economic study of heating power and cooling power of a building.*

Prerequisites:	*Keywords :*
Thermal Course	*$_2$ Emission Class , Overall Insulation Index, Losses, Contributions: $_{Glazed}$ and $_{Walled}$*

Specific objectives of the course (OBJ $_i$):
OBJ 1: *Design BBC houses* ***OBJ 2:*** *Carry out an Energy Performance Diagnostic.* ***OBJ 3:*** *Carry out a Heating and Air Conditioning study aimed at minimizing energy consumption.*

Necessary material :
Video projector

2- Content elements (Course)

Week(s)	Chapters/Content Items	No. HR	Goals
1-2-3	*Chapter 1: Energy issues*		*Carry out studies*

	- Housing and Energy: commitments, Grenelle de l'environnement. *- Essential definitions: Primary Energy, Final Energy, Positive Energy Building, BBC* *- Greenhouse gas effects* *- Energy Assessment: Energy Performance Diagnosis, Energy and climate labels* *- Architectural design for a reduction in energy consumption: Compactness, orientation, bioclimatic concept, ventilation...* *- Renewable energy: photovoltaic solar energy, biomass, wind, hydroelectric plants.* *- Climatic zoning of Tunisia* *- Videos: BBC projects carried out around the world.* *- Determination of Global Insulation Index.* *- Building classification*	*9h*	*with the aim of:* *- reduce dependence on energy imports,* *- make investments in new technologies (renewable energy)* *- make energy savings in the home,* *- reduce greenhouse gases,* *- limit, treat waste and recover it,*
4-5-6	*Chapter2: Thermal insulation* *- Thermal reminder (transfer modes)* *- Qualities of thermal insulators* *- How to insulate* *- Complete list and properties of insulating materials: mineral fibers, natural fibers, mineral foams, synthetic organic insulators, etc. (photos, samples)* *- Construction defects (thermal bridges)* *- Climatic zoning of Tunisia* *- Application :* ** Library of materials: Determination of surface transmission coefficients (walls, floors, joinery)*	*9h*	*Find the elements necessary for the thermal study of the walls of a building.*

7	*revision*	*3h*	*Test the required knowledge in the first part*
8-9	*Chapter 3: Heating Study* *- Losses: surface, linear and by air renewal* *- Case study: Determination of the heating power of rooms in a building.*	*6H*	*Minimize energy consumption due to heating by offering suitable materials for the walls*
10-11	*Chapter 4: Refrigeration study* *- Air conditioning system* *- External contributions through glazing, opaque walls and internal contributions.* *- Case study: Determination of the cooling capacity of rooms in a building.*	*6H*	*Minimize energy consumption due to air conditioning by offering suitable materials, especially for glass walls*
12-13	*Mini summary project:* *- Diagnostic* *- Heating and air conditioning study (use of spreadsheets)*	*6H*	*Become familiar with practical studies*
14	*Practical activity and Project*	*3h*	*- Carry out a building diagnosis* *-Carry out a heating and air conditioning study of a few rooms*

4- Evaluation methods & Marks Distribution

Type of assessment	Yes No	Tx Weighting

CC - Continuous assessment (Test/Quiz, Presentation, Report, etc.)	☐ *Yes* ☐ *No*	
DS - Supervised Duty	x *Yes* ☐ *No*	*40%*
EE - Written test (Final exam)	x *Yes* ☐ *No*	*60%*
EP - Practical test (TP- TP exam / MP- Mini project)	☐ *Yes* ☐ *No*	

- ***100% CI material : Average = 40% DS + 60% EE***

5- Evaluation criteria

- *Authorized documents : ☐ Yes x No*
- *Authorized search engine : ☐ Yes x No*
- *Criterion 1: Understanding of the content (4 points)*
- *Criterion 2: Application of knowledge (10 points)*
- *Criterion 3: Critical analysis (4 points)*
- *Criterion 4: Clarity and organization (2 points)*

6- Web references (useful links):

- De Vriendt, Gaétan Morin, Air Conditioning: Humid Air Calculations, Parisian Editions 1994.

- Trades Guide, Air conditioning, Editions NATHAN.

- Trades Guide, Insulation and waterproofing, Editions NATHAN.

Course Specification

Special works of GC

1. General

Coded	**GC-BE 5 103**	Level/Semester	*3/S5*	Coefficient	*3*	Credits	*4*
Course	CIVIL ENGINEERING					Volume. H. (CI)	*42h*
Responsible	Sami ANTIT					Volume. H. (TP)	
Module	Special works of GC					Version	*09/2023*

Course description (Course objective):
Sizing of particular RC elements according to EC2

Prerequisites:	*Keywords :*
RDM- Structural calculation – BA1 – BA2	*Eurocode2 – Reinforced concrete – Sizing*

Specific objectives of the course (OBJ $_i$):
- ***OBJ 1 :*** Mastery of reinforced concrete calculation according to EC2 ***OBJ 2 :*** Design and calculation of structures and special elements in reinforced concrete

Necessary material :
…

2- Content elements (Course)

Week(s)	Chapters/Content Items	No. HR	Goals
1-4	**Chapter I : RC slabs** 1 General 2 RDM reminders 3 Isostatic slabs 4 Continuous slabs 5 Diagrams and programming of spreadsheets 6 Applications	*6h*	*Obj 1+Obj 2*

5-8	**Chapter II : Calculation of sails in BA** 1 General 2 Reminders : Calculation of the buckling of RC walls 3 Unreinforced Concrete Walls 4 Reinforced Concrete Walls 5 Diagramming and programming spreadsheets 6 Applications	*6h*	*Obj 1+Obj 2*
9-10	**Chapter III : Eccentric soles** 1 General 2 RDM reminders 3 Eccentric sole with straightening sill 4 Eccentric sole not requiring a straightening sill 5 Diagramming and programming spreadsheets 6 Applications	*3h*	*Obj 1+Obj 2*
11-12	**Chapter IV : Footings on piles** 1 General 2 Footings on 2 piles 3 Footings on 3 piles 4 Footings on 4 piles 5 Diagramming and programming spreadsheets 6Applications	*3h*	*Obj 1+Obj 2*
13-14	**Chapter V : BA rafts** 1 General 2 RDM reminders 3 General sizing procedure 4 Diagramming and programming spreadsheets 5Applications	*3h*	*Obj 1+Obj 2*

3- Content elements (Practical work)

Week(s)	Activities/Content Items	No. HR	Goals
…	…	…	…
…	…	…	…

4- Evaluation methods & Marks Distribution

Type of assessment	Yes No	Tx Weighting
CC - Continuous assessment (Test/Quiz, Presentation, Report, etc.)	☐ *Yes* ☐ *No*	
DS - Supervised Duty	■ *Yes* ☐ *No*	
EE - Written test (Final exam)	■ *Yes* ☐ *No*	
EP - Practical test (TP- TP exam / MP- Mini project)	☐ *Yes* ☐ *No*	

- *Material 100% TP : Average = 20% CC + 80% EP*
- *100% CI material : Average = 40% DS + 60% EE*
- *CI+TP material : Average = 20% DS + 20% EP + 60% EE*

5- Evaluation criteria

- *Authorized documents* : ☐ *Yes* ☐ **X** *No*
- *Authorized search engine* : ☐ *Yes* ☐ ***x*** *No*
- *Criterion 1: Understanding of the content (4 points)*
- *Criterion 2: Application of knowledge (10 points)*
- *Criterion 3: Critical analysis (4 points)*
- *Criterion 4: Clarity and organization (2 points)*

6- Web references (useful links):

1 - JA Calgaro, Bases for calculating structures according to Eurocode 0, Edition Le Moniteur

2- H.Thonier, Design and calculation of building structures (Volume 7,) Presse des Ponts 2010 (2nd edition)

3 - D.Ricotier, Sizing of concrete structures according to Eurocode 2, Edition le Moniteur 2012

4 - J.Roux, Mastery of Eurocode 2, Edition Eyrolles 2009

7- Working environment (Facilities necessary for learning)

- *NONE*

Course Specification

Green buildings

1. General

Coded	**GC-BE 5 104**	Level/Semester	*3/S5*	Coefficient	*1.5*	Credits	*2*
Course	CIVIL ENGINEERING					Volume. H. (CI)	*21h.*
Responsible	Lassad Tizaoui					Volume. H. (TP)	*0*
Module	Green buildings					Version	*09/2023*

Course description (Course objective):
- Preserve resources such as raw materials, energy and water, - Learn the foundations of bioclimatic architectural study, - Fight against global warming, - Contribute to environmental sustainability, - Sustainable development, - Construction with ecological transition issues …

Prerequisites:	*Keywords :*
- Mathematical and computer knowledge. - Thermal and sound insulation. - The physical and mechanical characteristics of construction materials.	Renewable energies, low energy consumption building, sustainable materials, thermal and sound insulation, recycling…

Specific objectives of the course (OBJ $_i$):
The objective of this course is to give students the means to: ***OBJ 1 :*** Discover the basic principles of eco-construction. ***OBJ 2 :*** Describe the basics of bioclimatic architecture (ecological building).

OBJ 3 : Define the different types of renewable energy. ***OBJ 4 :*** Discover sustainable building materials ***OBJ 5 :*** Sensitization.

Necessary material :
Computer, video projector

2- Content elements (Course)

Week(s)	Chapters/Content Items	No. HR	Goals
1 - 2	Basic principle of eco-construction	*3*	Define the basic principles of eco-construction: - Design according to local climatic conditions - choose the right materials - isolate without confining - Ventilate wisely - Heat yourself if necessary - Cool without air conditioning - Equip yourself intelligently
3 - 4	Bioclimatic architecture (ecological building)	*3*	*Architectural*

			design of a project
5 - 7	Renewable energy	*4:30*	*Know the different types of renewable energy*
8-10	Sustainable building materials	*4:30*	*Criteria for choosing sustainable building materials*
9 - 10	Sensitization	*3*	*Establish good practices among consumers*
11 - 12	*Presentations*	*3*	

3- Evaluation methods & Marks Distribution

Type of assessment	Yes No	Tx Weighting
CC - Continuous assessment (Test/Quiz, Presentation, Report, etc.)	☐ *Yes* ☐ *No*	
DS - Supervised Duty	■ *Yes* ☐ *No*	*40%*
EE - Written test (Final exam)	■ *Yes* ☐ *No*	*60%*
EP - Practical test (TP- TP exam / MP- Mini project)	☐ *Yes* ■ *No*	

- *Material 100% TP : Average = 20% CC + 80% EP*
- ***100% CI material : Average = 40% DS + 60% EE***
- *CI+TP material : Average = 20% DS + 20% EP + 60% EE*

4- Evaluation criteria

- *Authorized documents* : ☐ *Yes* ■ *No*
- *Authorized search engine* : ☐ *Yes* ■ *No*
- *Criterion 1: Clarity of answers (1 points)*
- *Criterion 2: Clear description of phenomena or situations (Variable… points)*

- *Criterion 3: Proposal of solutions, techniques for construction situations (Variable. points)*
- *Criterion 4: Clear calculation, correct drawing to scale (Variable… points)*

5- Web references (useful links):

- Ecological houses, Practical cases (Louise Ranck)

Ecological architecture (eco construction architect)

6- Working environment (Facilities necessary for learning)

- *Video projector*

Course Specification

Risk management

1. General

Coded	**GC-BE 5 106**	Level/Semester	*3/S5*	Coefficient	*1.5*	Credits	*2*
Course	CIVIL ENGINEERING					Volume. H. (CI)	*21h.*
Responsible	Nawfel BOUFAIED					Volume. H. (TP)	
Module	*Risk management*					Version	*09/2023*

Course description (Course objective):
Analyze a work situation by giving the causes and solutions

Prerequisites:	*Keywords :*
PGC	*Security – Protection – risk*

Specific objectives of the course (OBJ $_i$):
OBJ 1 : *Defining risks: accidental and chronic processes*
OBJ 2 : *Give the causes and solutions of risks in the construction sector*
OBJ 3 : *Present the risks linked to earthworks, machinery and falls from height*
OBJ 4 : *Classify security into integrated security, collective protection and individual protection*
OBJ 5 : *Present personal protective equipment*
OBJ 6 : *Develop the specific safety and health protection plan (PPSPS)*

Necessary material :
Video projector and board and a real example of a PPSP

2- Content elements (Course)

Week(s)	Chapters/Content Items	No. HR	Goals
1-4	*Chapter 1: Twinning*	*6h*	*Obj 1*
5-8	*Chapter 2: Risks in the construction sector*	*6h*	*Obj2 – Obj3*
9-11	*Chapter 3: Collective and individual protective equipment*	*4:30 a.m.*	*Obj4 – Obj5*
12-14	*Chapter 4: Development of the PPSPS plan*	*4:30 a.m.*	*Obj6*

3- Content elements (Practical work)

Week(s)	Activities/Content Items	No. HR	Goals
…	…	…	…
…	…	…	…
12	*Practical exam, mini-project defense, …*	*3h*	*Summative evaluation*

4- Evaluation methods & Marks Distribution

Type of assessment	Yes No	Tx Weighting
CC - Continuous assessment (Test/Quiz, Presentation, Report, etc.)	☐ *Yes* ☐ *No*	
DS - Supervised Duty	X *Yes* ☐ *No*	
EE - Written test (Final exam)	X *Yes* ☐ *No*	
EP - Practical test (TP- TP exam / MP- Mini project)	☐ *Yes* ☐ *No*	

- *Material 100% TP : Average = 20% CC + 80% EP*
- *100% CI material : Average = 40% DS + 60% EE*
- *CI+TP material : Average = 20% DS + 20% EP + 60% EE*

5- Evaluation criteria

- *Authorized documents : ☐ Yes ☐ No*

- *Authorized search engine : ☐ Yes ☐ No*
- *Criterion 1: Understanding of the content (4 points)*
- *Criterion 2: Application of knowledge (10 points)*
- *Criterion 3: Critical analysis (4 points)*
- *Criterion 4: Clarity and organization (2 points)*

6- Web references (useful links):

- *Risk diagnosis: Identify, analyze and map vulnerabilities* . Sophie Gaultier-Gaillard, Jean-Paul Louisot. AFNOR Editions. 2007 . (ISBN 2124755757) .
- Riseo quarterly review (Risks: studies and observations) on www.riseo.fr
- "ISO Standard", *31000:2009 Risk management - Principles and guidelines* November 2009.
- "ISO/IEC Standard", 31010:2009 Risk management - Risk assessment techniques *November 2009.*
- *I., Zulqarnain. (2014). Risk Management in Civil Engineering Projects.*
- *Masovic, Snezana & Pecic, Nenad & Stošić, Saša & Hajdin, Rade & Tanasic, Nikola. (2023). Risk management in civil engineering. Gradjevinski materijali i konstrukcije. 66. 3-3. 10.5937/GRMK2300003M.*

7- Working environment (Facilities necessary for learning)

- *None*

Course Specification

MEASUREMENT AND PRICE ESTIMATION

1. General

Coded	**GC-BE 5 105**	Level/Semester	*3/S5*	Coefficient	*1.5*	Credits	*2*
Course	CIVIL ENGINEERING					Volume. H. (CI)	*21h.*
Responsible	Nawfel SASSI					Volume. H. (TP)	
Module	*MEASUREMENT AND PRICE ESTIMATION*					Version	*10/2023*

Course description (Course objective):
Techniques for establishing a preliminary estimate and sub-details of prices for elementary works of a construction in order to develop the price schedule and the estimated estimate for the project.

Prerequisites:	*Keywords :*
Mathematics, Markets and regulations, PGC	*Preliminary Survey, Attachment, Dry Disbursements, Construction Costs, General Costs, Profits and Contingencies*

Specific objectives of the course (OBJ $_i$):
OBJ 1 : *Know how to use the information provided by the CCAP and the CCTP*
OBJ 2 : *Provide an execution file*
OBJ 3 : *Establish quantitative quotes*
OBJ 4 : *Establish sub-details of unit sales prices (all elementary works combined)*

Necessary material :
Video projector

2- Content elements (Course)

Week(s)	Chapters/Content Items	No. HR	Goals

1-2	*Chapter 1: Determination of quantities of elementary works* *1.1 Course:* *-Basic terminology* *- Main units of measurement by trade* *- Methods and rules for drafting quantitative quotes* *- Useful math formulas*	*3H*	*Methodology allowing the development of a clear, controllable and accurate quantitative estimate as quickly as possible*
3-4-5-6	*1.2 Study of different cases (development of different models of quantitative estimates):* *- Reinforced Concrete Structures* *- Metal constructions* *- VRD* *- Masonry…* *(The choice of subject depends on the Manager: Building or Bridges and Roads)*	*6H*	*Handle working documents and accurately calculate the quantities of the constituent elements of a work*
7	*Knowledge review and assessment*	*1h30*	*Successfully complete a Survey task*
8-9	*Chapter 2: Estimation of the value of a work* *2.1 Course:* *-Basic terminology* *- Notions related to the term price* *- Sub-Details of the Dry Disbursement of supplies* *- Sub-Details of Dry Disbursement of productive labor* *- Sub-Details of the Dry Disbursement of the assignable material* *- Additional Costs (Construction Costs, Costs* *General, Special Charges)* *- Settlement coefficient*	*3H*	*Methodology for developing sub-price details*

	- Sub-Details of the Dry Disbursement of an Elementary Work *- Determination of the Unit Sales Price*		
10-11-12-13	*1.2 Study of different cases (development of different price sub-details):* *- Excavations and earthworks* *- Reinforced Concrete Elements in Foundations and Superstructure.* *- Masonry* *- Roads…* *(The choice of subject depends on the Building or Bridges and Roads Manager)*	*6H*	*- Handle working documents and accurately calculate forecast unit sales prices for elementary works* *- Know the margins of current disbursements*
14	*Project*	*1h30*	*Estimate the total selling price of an elementary work*

3- Content elements (Practical work)

Week(s)	Activities/Content Items	No. HR	Goals
…	…	…	…
…	…	…	…

4- Evaluation methods & Marks Distribution

Type of assessment	Yes No	Tx Weighting
CC - Continuous assessment (Test/Quiz, Presentation, Report, etc.)	☐ *Yes* ☐ *No*	
DS - Supervised Duty	x *Yes* ☐ *No*	*40%*
EE - Written test (Final exam)	x *Yes* ☐ *No*	*60%*
EP - Practical test (TP- TP exam / MP- Mini project)	☐ *Yes* ☐ *No*	

- ***100% CI material : Average = 40% DS + 60% EE***

5- Evaluation criteria

- *Authorized documents : ☐ Yes x No*
- *Authorized search engine : ☐ Yes x No*
- *Criterion 1: Understanding of the content (4 points)*
- *Criterion 2: Application of knowledge (10 points)*
- *Criterion 3: Critical analysis (4 points)*
- *Criterion 4: Clarity and organization (2 points)*

6- Web references (useful links):

- Yves WIDLOECHER, David CUSANT, Price study manual for construction companies, EYROLLES, 2023.

- Jean Pierre GOUSSET, Technical drawing and reading of plans, EYROLLES, 2012.

- Michel MANTEAU, Building survey, EYROLLES, 2000.

Course Specification

Dynamics of structures

1. General

Coded	**GC-BE 5 108**	Level/Semester	*5*	Coefficient	*1.5*	Credits	*2*
Course	CIVIL ENGINEERING					Volume. H. (CI)	*21h.*
Responsible	Moez SELMI					Volume. H. (TP)	
Module	*Dynamics of structures*					Version	*10/2023*

Course description (Course objective):
Knowledge of the basic notions of continuum mechanics.

Prerequisites:	*Keywords :*
Engineering mathematics, numerical analysis	*Lagrangian description,* Eulerian description, deformation tensor, stress tensor, *generalized Hooke's law*

Specific objectives of the course (OBJ $_i$):	
OBJ 1 :	Determine the dynamic properties of a structure.
OBJ 2 :	Study the dynamic behavior in the case of a free, harmonic, random oscillation.
OBJ 3 :	Study the dynamic response using the modal superposition method.
OBJ 4 :	Determine the natural frequencies and vibration modes of a Nddl system

Necessary material :
…

2- Content elements (Course)

Week(s)	Chapters/Content Items	No. HR	Goals
1-2	**Chapter 1: Introduction to structural dynamics** 1. General introduction	*3h*	*Know the types of dynamic forces*

	2. Type of dynamic forces 3. Degree of freedom 5. Rigidity of the posts (recessed case, simply supported case) 6. Equivalent stiffness		
3-8	**Chap2 : System with 1 degree of freedom** 1. Free undamped oscillation 2. Damped free oscillation 2. Damped free oscillation 3. Forced oscillation	*9h*	*Determine and solve the equation of motion of a system with 1 degree of freedom*
9-14	**Chap3 : System with several degrees of freedom** 1. Free undamped oscillation 2. Clean modes and clean pulsation 3. Illustration of dynamic behavior 4. Modal coordinates	*9h*	*Solve a system with several degrees of freedom. Determine the natural pulsations and diagram the natural mode vectors*

3- Content elements (Practical work)

Week(s)	Activities/Content Items	No. HR	Goals
…	…	…	…
…	…	…	…

4- Evaluation methods & Marks Distribution

Type of assessment	Yes No	Tx Weighting
CC - Continuous assessment (Test/Quiz, Presentation, Report, etc.)	☐ *Yes* ■ *No*	
DS - Supervised Duty	■ *Yes* ☐ *No*	*40%*

EE - Written test (Final exam)	■ *Yes* ☐ *No*	*60%*
EP - Practical test (TP- TP exam / MP- Mini project)	☐ *Yes* X *No*	

- *Material 100% TP : Average = 20% CC + 80% EP*
- ***100% CI material : Average = 40% DS + 60% EE***
- *CI+TP material : Average = 20% DS + 20% EP + 60% EE*

5- Evaluation criteria

- *Authorized documents : ■ Yes ☐ No*
- *Authorized search engine : ☐ Yes ☐ No*
- *Criterion 1: Understanding of the content (4 points)*
- *Criterion 2: Application of knowledge (10 points)*
- *Criterion 3: Critical analysis (4 points)*
- *Criterion 4: Clarity and organization (2 points)*

6- Web references (useful links):

1. Dynamics of structures / Clough, Ray w, - 1980- D28

2. dynamic calculation of structures in seismic zones /Alain Capia – 1982 – D40

3. dynamics of structures in engineering seismology /Lucia Dobrescu – 1983 – D50-1

4. Theoretical and numerical aspects of structural dynamics / J. Donea – 1988 – D58

7- Working environment (Facilities necessary for learning)

- *NONE*

Course Specification

Plates and shells

1. General

Coded	**GC-BE 5 109**	Level/Semester	*3/S5*	Coefficient	*1.5*	Credits	*2*
Course	CIVIL ENGINEERING					Volume. H. (CI)	*21h.*
Responsible	Moez SELMI					Volume. H. (TP)	
Module	*Plates and shells*					Version	*10/2023*

Course description (Course objective):
Master the calculation of stresses and the sizing of special thin-walled structures: plates, domes and tanks.

Prerequisites:	*Keywords :*
Mechanics of continuous media, Structure theory	*Thin-walled structure, Lagrange differential equation, Kirchhoff*

Specific objectives of the course (OBJ $_i$):
OBJ 1 : *Define a plate or shell as well as the associated generalized constraints* ***OBJ 2 :*** *Describe the classic models of plates and shells, their hypotheses, the associated generalized deformations* ***OBJ 3 :*** *equate problems of balance and stability of plates and shells and solve these problems analytically in the simplest cases*

Necessary material :
…

2- Content elements (Course)

Week(s)	Chapters/Content Items	No. HR	Goals
1-3	***Chapter 1: Reminder Mechanics of continuous media in linear elasticity***	*4:30*	*Master the basic notions of*

	- Definition of the displacement gradient tensor - Deformation displacement relationship - Definition of the stress tensor - Generalized Hooke's law in linear elasticity - Simplifying hypotheses: plane strain problem, plane stress problem		*continuum mechanics in linear elasticity*
4-9	***Chapter 2: General theory of thin-walled plates*** - Introduction and hypotheses - Kirchoff plate theory - Equation of the Lagrange deformation - Study of a rectangular plate subjected to a uniform load and sinusoidal load	*9h*	*Determine the stresses, deformation and loading in a plate subjected to several types of loading*
10-14	***Chapter 3: General theory of thin-walled shells*** - Introduction and hypotheses - Different types of hulls, revolution hulls - Calculation of the thickness of the revolution shells - Internal forces in dome type structures - Application to reinforced concrete sizing of spherical domes of revolution	*7:30*	*Determine the stresses and strains in a shell of revolution around an axis*

3- Content elements (Practical work)

Week(s)	Activities/Content Items	No. HR	Goals
…	…	…	…
…	…	…	…

4- Evaluation methods & Marks Distribution

Type of assessment	Yes No	Tx Weighting
CC - Continuous assessment (Test/Quiz, Presentation, Report, etc.)	☐ *Yes* ■ *No*	
DS - Supervised Duty	■ *Yes* ☐ *No*	*40%*
EE - Written test (Final exam)	■ *Yes* ☐ *No*	*60%*
EP - Practical test (TP- TP exam / MP- Mini project)	☐ *Yes* ■ *No*	

- *Material 100% TP : Average = 20% CC + 80% EP*
- ***100% CI material : Average = 40% DS + 60% EE***
- *CI+TP material : Average = 20% DS + 20% EP + 60% EE*

5- Evaluation criteria

- *Authorized documents :* ■ *Yes* ☐ *No*
- *Authorized search engine :* ☐ *Yes* ☐ *No*
- *Criterion 1: Understanding of the content (4 points)*
- *Criterion 2: Application of knowledge (10 points)*
- *Criterion 3: Critical analysis (4 points)*
- *Criterion 4: Clarity and organization (2 points)*

6- Web references (useful links):

- P. Bisch. Shell mechanics - Theory and applications. Presses des Ponts, 2013.

- D. Chapelle and K.-J. Bathe. The Finite Element Analysis of Shells - Fundamentals. 2011.

-. PM Naghdi. “The Theory of Shells and Plates”. In: Linear Theories of Elasticity and Thermoelasticity. PDC Truesdell. Springer Berlin Heidelberg, 1973, p. 425-640.

-. BATOZ, JL BENTAHAR, M and DHATT, GS The DKT and DKQ elements and the analysis of thin plates and shells. 1982. presented at the conference “Current Trends in Structural Calculation” held in Sophia-Antipolis, February 1-2-3

-. BEN TAHAR, M. elastoplastic analysis of thin plates and shells by finite elements. 1981. Doctoral dissertation. University of Technology of Compiegne, p 130

7- Working environment (Facilities necessary for learning)

- *NONE*

Course Specification

GC software: Revit + Primavera: "Revit"

1. General

Coded	**GC-BE 5 107**	Level/Semester	*3/S5*	Coefficient	*3*	Credits	*4*
Course	Civil Engineering					Volume. H. (CI)	
Responsible	LAssad TIZAOUI					Volume. H. (TP)	*42h*
Module	GC software: Revit + Primavera					Version	*09/2023*

Course description (Course objective):
▪ Study the building structures of a project and calculate the constraints of the work (structure, resistance, sizing, etc.) ▪ Study the feasibility of the project and propose technical solutions ▪ Study the design of the project (modeling on Revit) ▪ Create or modify diagrams and plans of works according to standards and changes in constraints

Prerequisites:	*Keywords :*
CAD, RDM and Structural Calculation Knowledge of the Windows environment Knowledge of construction trades	Modeling, BIM, digital model, analytical model…

Specific objectives of the course (OBJ $_i$):
OBJ 1 : Become familiar with the Revit tool. **OBJ 2 :** Model and configure a structural model with specific tools .

Necessary material :
Computer, video projector, Primavera software, MS Project, Autodesk Robot, Revit, Arche, Navisworks

2- Content elements (Practical work)

Week(s)	Activities/Content Items	No. HR	Goals

1	**BIM process description and definition** The interface: Revit Structure interface presentation Overview of the analytical model Project Families Template	*3*	*Use the Revit interface to model a structure* *Generate the 3D model* *Exploitation of results*
2-3	Concepts: Project settings: Units, snaps, object styles Classification of entities: Categories, Families, Occurrence Types Project tree: Views, Bills of materials. Families and Groups Transfer of project standards	*6*	Model and configure a structural model with specific tools .
4-5-6	Importing Revit Architecture files: Importing and linking a DWG file Adding levels and grids Importing and linking an Architecture Revit file Copy/Check from imported template. Modeling a project: Adding walls Adding a structural slab Adding cage openings Addition of a raft / insulated foundations Adding concrete/steel/wood posts Adding curved concrete/steel beams and beams Automatic placement of beam systems Sketch of a network of beams	*9*	Model and configure a structural model with specific tools . *Modeling report*

	Adding an opening to a beam/column <u>Carrying out a project:</u> - Extension of the structure up to the roof - Modification of a flat slab <u>Documentation of a project:</u> - Creation of sheets - Thematic addition of sail impacts - Creation of project and shared settings - Creation of sectional and detail views - Placement of views - Creation of dimensions and dimension style - Creation of level dimensions - Creation of an annotation legend - Labeling of beams - Label family modification - Creation of a custom beam label - Creation of a framework nomenclature		
7	*Mastery assessment*	*3h*	*Summative evaluation*

3- Evaluation methods & Marks Distribution

Type of assessment	Yes No	Tx Weighting
CC - Continuous assessment (Test/Quiz, Presentation, Report, etc.)	■ *Yes* ☐ *No*	*20%*
DS - Supervised Duty	☐ *Yes* ■ *No*	
EE - Written test (Final exam)	☐ *Yes* ■ *No*	
EP - Practical test (TP- TP exam / MP- Mini project)	■ *Yes* ☐ *No*	*80%*

- ***Material 100% TP : Average = 20% CC + 80% EP***
- *100% CI material : Average = 40% DS + 60% EE*
- *CI+TP material : Average = 20% DS + 20% EP + 60% EE*

4- Evaluation criteria

- *Authorized documents* : ■ *Yes* ☐ *No*
- *Authorized search engine* : ■ *Yes* ☐ *No*

- *Criterion 1: Clarity of answers (1 points)*
- *Criterion 2: Clear description of phenomena or situations (Variable… points)*
- *Criterion 3: Proposal of solutions, techniques for modeling situations (Variable. points)*
- *Criterion 4: Clear calculation, correct drawing to scale (Variable… points)*

5- Web references (useful links):

Acquire the fundamentals of Autodesk REVITstructural: training book volume 1
- https://www.autodesk.fr/

Revit Initiation and improvement by the Jonathan RENOU structure

6- Working environment (Facilities necessary for learning)

- *Video projector, computer laboratory, Autodesk Robot Structural Analysis Professional software, Auto-cad*

Course Specification

GC software: Revit + Primavera: "Primavera"

1. General

Coded	**GC-BE 5 107**	Level/Semester	*5*	Coefficient	*3*	Credits	*4*
Course	Civil Engineering					Volume. H. (CI)	
Responsible	LAssad TIZAOUI					Volume. H. (TP)	*42h*
Module	GC software: Revit + Primavera					Version	*10/2023*

Course description (Course objective):
▪ Study the feasibility of the project and propose technical solutions

Prerequisites:	*Keywords :*
Planning and organization of work	Milestone, WBS, OBS, Critical task, critical path, resources, Over-allocation of resources, Predecessors/Successors….

Specific objectives of the course (OBJ $_i$):
OBJ 3 : Creation of EPS of the company (organizational structure of the company); (departments and services of the company).
OBJ 4 : Creation of a functional organization chart for the company OBS (functional hierarchy of the company). (The managers of each department);
OBJ 5 : Creation of new project (name of the project, their position in relation to the general structure of the company, the necessary resources, etc.);
OBJ 6 : Creation of the project structure in the form of tasks (decomposition of the project in the form of summary tasks (milestones), under tasks; in chronological order); WBS: Work Breakdown Structure.
OBJ 7 : Organizing tasks in chronological order we respect the basic logical relationships between tasks.
OBJ 8 : Calculation of durations (based on the available resources allocated to the project), as well as the flow date and the end date, deducing the critical path and the free and total margin of each task.
OBJ 9 : Calculation of the company's general budget and allocation of budgets reserved for each project.

OBJ 10 :	Determination of 3M resource requirements (Materials, Materials and Labor) and the budget cost necessary for each project execution period.
OBJ 11 :	Determination of the total project execution time (GANTT planning).

Necessary material :
Computer, video projector, Primavera software, MS Project, Autodesk Robot, Revit , Arche, Navisworks.

2- Content elements (Practical work)

Week(s)	Activities/Content Items	No. HR	Goals
8	***Reminder on work planning*** *:* *- Work planning techniques* *- Task scheduling (critical and non-critical task, critical path)* ******Description of the Primavera software environment*** ***General software settings*** *:* *- Types of calendars* *- Choice of currencies* *- Setting up working time…*	*3*	Project planning and organization
9-10-11	***Creating a project on Primavera*** *:* - Creation of the company's EPS (company organizational structure) - Creation of a functional organization chart for the OBS company (Functional hierarchy of the company) - Creation of the project structure in the form of tasks (decomposition of the project in the form of summary tasks (milestones), under tasks; in chronological order); WBS: Work Breakdown Structure. - Organization of tasks in chronological order we respect the basic logical relationships between tasks.	*9*	Project planning and organization

	(Definition of Predecessors/Successors for each task)		
12	***Creation/allocation of resources*** *:* - *Definition of resources,* the 3M (Materials, Materials and Labor) and the cost to budget for each resource. - Allocation of the resources necessary for the execution of each task. ***Exploitation of results :*** - *Resource usage report by task* - *Over-allocation of resources (resource graph)* - *Review of the assignment* - *Moving the project and calculating the duration of the project* .	*3*	Project planning and organization
13-14	**Layout :** - Preparation of the GANTT schedule - Printing schedules : - Layout - Configuration of headers and footers - Date management - Printing reports : - Project summary report - Report of planned and actual costs - Reports of hourly loads by task and by resources - Visual reporting of treasury expenses.	*6h*	Project planning and organization

3- Evaluation methods & Marks Distribution

Type of assessment	Yes No	Tx Weighting
CC - Continuous assessment (Test/Quiz, Presentation, Report, etc.)	■ *Yes* ☐ *No*	*20%*
DS - Supervised Duty	☐ *Yes* ■ *No*	
EE - Written test (Final exam)	☐ *Yes* ■ *No*	
EP - Practical test (TP- TP exam / MP- Mini project)	■ *Yes* ☐ *No*	*80%*

- ***Material 100% TP : Average = 20% CC + 80% EP***
- *100% CI material : Average = 40% DS + 60% EE*
- *CI+TP material : Average = 20% DS + 20% EP + 60% EE*

4- Evaluation criteria

- *Authorized documents : ■ Yes ☐ No*
- *Authorized search engine : ■ Yes ☐ No*

- *Criterion 1: Clarity of answers (1 points)*
- *Criterion 2: Clear description of phenomena or situations (Variable… points)*
- *Criterion 3: Proposal of solutions, techniques for modeling situations (Variable. points)*
- *Criterion 4: Clear calculation, correct drawing to scale (Variable… points)*

5- Web references (useful links):

- Oracle Primavera User Guide

6- Working environment (Facilities necessary for learning)

- *Video projector, computer laboratory, Autodesk Auto-cad software, Primavera software…*

language module sheets

Process of test of placement LANGUAGES (English & French)

➢ *New students :*

✓ **Registration & Admission**

All the new students has their admission has the PI register in line via a platform dedicated to the passage of tests level of languages “MyEPIADMISSION”

They provide of the information personal such that their name, their address E-mail And their number of CIN ..

✓ **Planning & Passage of Test of level :**

A times registered, THE students receive a confirmation registration And are scheduled For pass the tests in English And in French

THE tests are planned In THE labs of LANGUAGES .They pass THE test of language on PC (MCQ) Who evaluate their SKILLS linguistics

✓ **Fix of the Testing of level :**

THE tests are corrected automatically by the software And the results are generated instantly once that THE test East finished.

THE results are analyzes For determine the level of language of each student .

✓ **Attribution of the levels of language :**

THE levels are based on of the standards international such that THE frame European common of reference For the LANGUAGES (CEFR)

✓ **Ranking In the groups of LANGUAGES & Notification of the results :**

In function of their level of language, THE students are assigned has of the groups of language appropriate.

These groups can be constituted in function of level :

1- Beginner =A
2- Intermediate =B
3- Advanced = C

✓ **Notification of the results ;**

THE students receive their results via the app And Who understand their level of language And their assignment has A band specific

THE students are Next affected In their groups of language according to THE jobs of LANGUAGES displayed on the app

Follow up And assessment :

THE progress of the students are followed All At long of their course learning

Of the assessment periodicals are carried out such that (projects PPT , tests oral, exercises ..) For adjust their progression in function of their needs .

These process guarantee a assessment precise of level of language of the students And their assignment has of the course appropriate For to favor their learning linguistic

Former students:

Transition of former students from one level to another:

For language levels (former 23.24 => 24.25)

Initial level = A & Average 23.24 <13 → Level A (24.25)
Initial level = A & Average 23.24 >13 → Level B (24.25)
** Initial level = B & Average 23.24 <13 → Level B (24.25)
** Initial level = B & Average 23.24 >13 → Level C (24.25)
**Level C =>15 → Level C (24/25)

Course Specification

French (Level A)

1. General

Coded	*EN-ABC*	Level/Semester	*3-4*	Coefficient	*1.5*	Credits	*2*
Course	*Engineering*					Volume. H. (CI)	*21*
Responsible	*Sami MZOUGHI*					Volume. H. (TP)	*0*
Module	*Languages & Communication*					Version	*09/2023*

Course description (Course objective):
A -level French courses aim to develop the student's ability to understand the essential points of a message written in clear, standard language. The course materials are taken from Inspire 3, a DELF manual. They also aim to prepare the student to produce simple and coherent speeches on familiar subjects. Oral is preferred in all sessions.

Prerequisites:	*Keywords :*
Understand simple, decontextualized sentences. Communicate in a simple way.	*Understand, listen, communicate, react*

Specific objectives of the course (OBJ $_i$):
OBJ 1 : *Understand the materials and respond to instructions.*
OBJ 2 : *Participate orally in debates around the proposed subject.*
OBJ 3 : *Form a personal opinion.*

Necessary material :
Sound recording / JBL

2- Content elements (Course)

Week(s)	Chapters/Content Items	#HR	Goals
1-2	*1st unit: Is it possible to be different and live together ?*	*3 hours*	*- talking about oneself* *- understand others.*

			- explain cultural differences.
3-4	*2nd Unit: Are we all journalists?*	*3 hours*	*- talk about information professions.* *- transmit information.* *- question the information.*
5-6	*3rd Unit: Why do we travel?*	*3 hours*	*Tell about an experience.* *- talk about tourism* *- think about the trip.*
7-8	*4th Unit: Describing a profession*	*3 hours*	*- collect information about a profession.* *- talk about responsibilities.* *- the skills required for each profession.*
9-11	5th Unit: Organize a remote activity	4.5 hours	- discuss teleworking. - understand the advantages and challenges of managing remote activities.
12-14	6th Unit: Can we fight inequalities?	4.5 hours	- tell about a commitment. - to give his opinion. - talk about inequalities.

3- Evaluation methods & Marks Distribution

Type of assessment	Yes No		Tx Weighting
CC - Continuous assessment (Test/Quiz, Presentation, Report, etc.)	☐*Yes*	☒*No*	-
DS - Supervised Duty	☒*Yes*	☐*No*	*40%*
EE - Written test (Final exam)	☒*Yes*	☐*No*	*60%*
EP - Practical test (TP- TP/MP exam- Mini project)	☐*Yes*	☒*No*	-

- *Material 100% TP : Average = 20% CC + 80% EP*
- *100% CI material : Average = 40% DS + 60% EE*
- *CI+TP material : Average = 20% DS + 20% EP + 60% EE*

4- Evaluation criteria (of written production)

- *Authorized documents : ☐Yes☒ No*
- *Search engine allowed : ☐Yes☒ No*
- *Criterion 1: Understanding of the instructions : (8 points)*
- *Criterion 2: Relevance of ideas: (4 points)*
- *Criterion 3: Linguistic correction: (6 points)*
- *Criterion 4: Originality: (2 points)*

5- WebReferences (useful links):

- *Author, Title, URL, Year*
- Learn.TV5Monde

6-Working environment (Facilities necessary for learning)

- *NONE*

Course Specification

French (Level B)

1. General

Coded	*EN-ABC*	Level/Semester	*3-4*	Coefficient	*1.5*	Credits	*2*
Course	*Engineering*					Volume. H. (CI)	*21*
Responsible	*Sami MZOUGHI*					Volume. H. (TP)	*0*
Module	*Languages & Communication*					Version	*09/2023*

Course description (Course objective):
Level B courses set the objectives of understanding audio documents, understanding press articles and other authentic texts. Written production sessions are also on the program to introduce the student to the code of writing by inviting them to write various texts. The course materials are taken from Inspire 4, a DELF manual.

Prerequisites:	*Keywords :*
The student can understand isolated sentences and frequently used expressions. He can also communicate orally and describe his training using simple means , and address some subjects that concern him closely.	*Understand, communicate, describe, discuss subjects.*

Specific objectives of the course (OBJ $_i$):
OBJ 4 : *Understand the educational documents specific to each lesson.*
OBJ 5 : *Take a position on the subjects or problems raised by the materials.*
OBJ 6 : *Imagine other ways of acting.*

Necessary material :
Paper version documents / Sound recordings / JBL

2- Content elements (Course)

Week(s)	Chapters/Content Items	#HR	Goals
1-2	*Does work have the same meaning today?*	*3 hours*	*. explain*

			professional trends . analyze the workplace. .reveal professional taboos.
3-4	*How is technology transforming our lives?*	*3 hours*	*- improve a living space. - take a position on virtual meetings. - imagine new worlds.*
5-6	*Can we still save the planet?*	*3 hours*	*- make an inventory of pollution. -alert the public to a risk. -propose solutions*
7-8	*Is politics everyone's business?*	*3 hours*	*- define rights and duties. - defend a commitment. - question the right to vote.*
9-11	*Are we prisoners of our appearance?*	*4.5 hours*	- tell of discrimination. -imagine the human of the future. - talk about your appearance.
12-14	Is happiness utopian?	4.5 hours	- give a definition of happiness. - analyze preconceived ideas. - envision happiness.

3- Evaluation methods & Marks Distribution

Type of assessment	Yes No		Tx Weighting
CC - Continuous assessment (Test/Quiz, Presentation, Report, etc.)	☐*Yes*	☒*No*	-
DS - Supervised Duty	☒*Yes*	☐*No*	*40%*
EE - Written test (Final exam)	☒*Yes*	☐*No*	*60%*
EP - Practical test (TP- TP/MP exam- Mini project)	☐*Yes*	☒*No*	-

- *Material 100% TP : Average = 20% CC + 80% EP*
- *100% CI material : Average = 40% DS + 60% EE*
- *CI+TP material : Average = 20% DS + 20% EP + 60% EE*

4- Evaluation criteria (of written production)

- *Authorized documents* : ☐*Yes*X *No*
- *Search engine allowed* : ☐*Yes*X *No*
- *Criterion 1: Understanding of the subject and organization of the text: (8 points)*
- *Criterion 2: Care given to expression (6 points)*
- *Criterion 3: Knowledge of the subject : (4 points)*
- *Criterion 4: Originality of ideas : (2 points)*

5- WebReferences (useful links):

- *Author, Title, URL, Year*
- *Learn.TV5Monde*

6-Working environment (Facilities necessary for learning)

- *None*

Course Specification

French (Level C)

1. General

Coded	*EN-ABC*	Level/Semester	*3-4*	Coefficient	*1.5*	Credits	*2*
Course	*Engineering*					Volume. H. (CI)	*21*
Responsible	*Sami MZOUGHI*					Volume. H. (TP)	*0*
Module	*Languages & Communication*					Version	*09/2023*

Course description (Course objective):
The French Communication Techniques course, at level C , aims to develop three skills in the student: Comprehension of writing (CE), Oral production (PO) and Written production (PE), with a view to preparing them for the DELF exam. The course material is generally a paper version document which offers various educational activities, relating to the materials. The role of the teacher is to provide the student with a certain autonomy in the search for answers. The supports are those of DELF B 2, 2nd Edition - 100% SUCCESS.

Prerequisites:	*Keywords :*
In principle, the student should have the following abilities: understand the essential points of a discussion, a text, a press article when the language used is clear and standard and when it concerns familiar subjects having relates to the daily life of the student.	*Understand, listen well, interact*

Specific objectives of the course (OBJ_i):
OBJ 7 : *Make reading hypotheses and generally understand the content of a document.* ***OBJ 8 :*** Enter message scopes. ***OBJ 9 :*** React to messages. ***OBJ 10 :*** For PE, acquire a methodology allowing successful written productions.

Necessary material :
Paper version documents - Sound recordings - JBL

2- Content elements (Course)

Week(s)	Chapters/Content Items	#HR	Goals
1-2	*CE: How to read a text? / A set of short texts.* *PE: Analysis of the instructions / Different statements of written production*	*3 hours*	*Help the student understand various texts.* *Understand what is required by the instructions.*
3-4	*CE: Analysis of positions/testimonies* *PE: Learn to present a situation, facts / Various texts.*	*3 hours*	*Identification of tone, point of view.* *Learn to identify a situation, facts*
5-6	*CE: Search for relevant information / Various texts.* *PE: Expression of personal opinion / PE topics.*	*3 hours*	*Identification of the content of a text.* *Help to formulate ideas, to qualify your comments, to formulate proposals*
7-8	*informative text : its content, its characteristics.* *PE: Text production / Writing workshop.*	*3 hours*	*Enter the content of a text and report it in writing.* *PE: Master the structure of the text to be produced.*
9-11	*CE: The argumentative text / Various texts* *PE: Writing a formal letter. / Written production instructions.*	*4.5 hours*	*CE: Learn to recognize an argumentative text and grasp its specific features.* *PE: Learn the formal characteristics of the letter.*
12-14	*CE: Analysis of points of view / Written testimonies*	*4.5 hours*	*Recognize the different positions*

			and their nuances.

3- Evaluation methods & Marks Distribution

Type of assessment	Yes No		Tx Weighting
CC - Continuous assessment (Test/Quiz, Presentation, Report, etc.)	☐*Yes*	☒*No*	-
DS - Supervised Duty	☒*Yes*	☐*No*	*40%*
EE - Written test (Final exam)	☒*Yes*	☐*No*	*60%*
EP - Practical test (TP- TP/MP exam- Mini project)	☐*Yes*	☒*No*	-

- *Material 100% TP : Average = 20% CC + 80% EP*
- *100% CI material : Average = 40% DS + 60% EE*
- *CI+TP material : Average = 20% DS + 20% EP + 60% EE*

4- Evaluation criteria (of written production)

- *Authorized documents* : ☐*Yes*X *No*
- *Search engine allowed* : ☐*Yes*X *No*
- *Criterion 1: Understanding of the subject structuring of the text: (8 points)*
- *Criterion 2: Relevance of the argument: (6 points)*
- *Criterion 3: Linguistic correction: (4 points)*
- *Criterion 4: Originality of ideas: (2 points)*

5- WebReferences (useful links):

- Learn.TV5Monde

6-Working environment (Facilities necessary for learning)

- *None*

Course Specification

English (A level)

1. General

Coded	*ENG-ABC*	Level/Semester	*3-4*	Coefficient	*1.5*	Credits	*2*
Course	*Engineering*					Volume. H. (CI)	*21*
Responsible	*Sawcen LAAMIRI*					Volume. H. (TP)	*0*
Module	*Languages & Communication*					Version	*09/2023*

Course description (Course objective):
Whether you already have some basic English or are completely new to it, our English program is divided into three levels (A, B and C). At the start of the academic year, your teacher will define your objectives with you and test your level during an initial assessment in order to help you integrate one of the three levels. *- You will be able to acquire or strengthen your basics in business English as well as your self-confidence.* *- You will review and learn the grammatical, oral and written basics.* *- You will learn to communicate orally and in writing and you will enrich your vocabulary.* *- You will be able to respond orally and follow a conversation.*

Prerequisites:	*Keywords :*
***Level A** : No specific knowledge necessary*	*Business English*

Specific course objectives (OBJ):
OBJ 1 : *Oral expression : acquisition of vocabulary relating to working English (Business English)* ***OBJ 2 :*** *Written expression : writing letters, messages, formats, references, abbreviations, etc.* ***OBJ 3 :*** *The fundamentals : tense, auxiliaries, adjectives, comparatives, pronouns*

Necessary material :
The printed course purchased from the printing, data show and baffles service

2- Content elements (Course)

Week(s)	Chapters/Content Items	No. HR	Goals
1-2	*The working day*	*3h*	*Vocab: Company departments(ex: HR, PR, finance) and job titles(ex: production manager)* *Gr: present simple and present continuous*
3-4	*Corporate culture*	*3h*	*Vocab: corporate culture vocabulary and asking for information* *Gr: collocations*
5-6	*Developing contacts*	*3h*	*Networking vocabulary, present perfect and past simple tenses*
7-8	*Cultural issues*	*3h*	*Cultural awareness, marketing in china and business in Finland vocabulary*
9-10	*Teamwork*	*3h*	*Describing a team, slogans, team-building and verbs with their corresponding nouns and adjectives*
11-12	*Job applications*	*3h*	*How to write a CV, a letter of application and wait for an interview*
13-14	*Revision*	*3h*	*Tenses and vocabulary of all chapters*

3- Evaluation methods & Marks Distribution

Type of assessment	Yes No		Tx Weighting
CC - Continuous assessment (Test/Quiz, Presentation, Report, etc.)	☐*Yes*	☒*No*	
DS - Supervised Duty	☒*Yes*	☐*No*	*40%*
EE - Written test (Final exam)	☒*Yes*	☐*No*	*60%*

- *Material 100% TP : Average = 20% CC + 80% EP*
- *100% CI material : Average = 40% DS + 60% EE*
- *CI+TP material : Average = 20% DS + 20% EP + 60% EE*

4- Evaluation criteria (of written production)

- *Authorized documents* : ☐*Yes*X *No*
- *Search engine allowed* : ☐*Yes*X *No*

- *Criterion 1: Understanding of the subject structuring of the text: (8 points)*
- *Criterion 2: Relevance of the argument: (6 points)*
- *Criterion 3: Linguistic correction: (4 points)*
- *Criterion 4: Originality of ideas: (2 points)*

5- WebReferences (useful links):

- *TOIC; TOFEL*

6-Working environment (Facilities necessary for learning)

- *Title, Version, URL*
- *…*

Course Specification

English (level B)

1. General

Coded	*ENG-ABC*	Level/Semester	*3-4*	Coefficient	*1.5*	Credits	*2*
Course	*Engineering*					Volume. H. (CI)	*21h*
Responsible	*Sawcen LAAMIRI*					Volume. H. (TP)	*0*
Module	*Languages & Communication*					Version	*09/2023*

Course description (Course objective):
Whether you already have some basic English or are completely new to it, our English program is divided into three levels (A, B and C). At the start of the academic year, your teacher will define your objectives with you and test your level during an initial assessment in order to help you integrate one of the three levels. *You will be able* ***to acquire or strengthen your basics in business English*** *as well as your self-confidence. You will review and learn the grammatical, oral and written basics. You will learn to communicate orally and in writing and you will enrich your vocabulary. You will be able to respond orally and follow a conversation.*

Prerequisites:	*Keywords :*
Level B *: No specific knowledge necessary*	*Business English*

Specific course objectives (OBJ):
OBJ 1 : *Oral expression : acquisition of vocabulary relating to working English (Business English)* ***OBJ 2 :*** *Written expression : writing letters, messages, formats, references, abbreviations, etc.* ***OBJ 3 :*** *The fundamentals : tense, auxiliaries, adjectives, comparatives, pronouns*

Necessary material :
The printed course purchased from the printing, data show and baffles service

2- Content elements (Course)

Week(s)	Chapters/Content Items	No. HR	Goals
1-2	*Job description and job satisfaction*	*3h*	*Vocab: Company departments, corporate culture vocabulary* *Gr: asking questions at a job interview*
3-4	*Letters of enquiry and applications*	*3h*	*Vocab : How to write a letter of enquiry and an email of application* *Gr: complex questions*
5-6	*Promotional activities and branding*	*3h*	*The 15 different promotional activies, the power of brands, supermarkets' own brands*
7-8	*Presenting your business idea*	*3h*	*Vocab : Structuring a presentation, signalling the parts of a presentation, making the most presentations* *Gr: modal verbs*
9	*Business meetings*	*1h30*	*Vocab: Why have meetings? purpose, benefits, importance of team discussions* *Gr: use of "too" and "enough"*
10-11	*Customer loyalty*	*3h*	*Vocab: the factors which make customers loyal to a company, words and definitions* *Gr: relative pronouns*
12-13-14	*Révision*	*4h30*	*Revision of the tenses and vocabulary of all chapters*

3- Methods evaluation & marks Distribution

Type of assessment	Yes No	Tx Weighting
CC - Continuous assessment (Test/Quiz, Presentation, Report, etc.)	☐*Yes* ☐*No*	
DS - Supervised Duty	☒*Yes* ☒*No*	*40%*

EE - Written test (Final exam)	☒*Yes*	☐*No*	*60%*

- *Material 100% TP : Average = 20% CC + 80% EP*
- *100% CI material : Average = 40% DS + 60% EE*
- *CI+TP material : Average = 20% DS + 20% EP + 60% EE*

4- Evaluation criteria (of written production)

- *Authorized documents* : ☐*Yes*X *No*
- *Search engine allowed* : ☐*Yes*X *No*
- *Criterion 1: Understanding of the subject structuring of the text: (8 points)*
- *Criterion 2: Relevance of the argument: (6 points)*
- *Criterion 3: Linguistic correction: (4 points)*
- *Criterion 4: Originality of ideas: (2 points)*

5- WebReferences (useful links):

- *TOIC; TOFEL*

6-Working environment (Facilities necessary for learning)

- *Title, Version, URL*
- *…*

Course Specification

English (level C)

1. General

Coded	*ENG-ABC*	Level/Semester	*3-4*	Coefficient	*1.5*	Credits	*2*
Course	*Engineering*					Volume. H. (CI)	*21h*
Responsible	*Sawcen LAAMIRI*					Volume. H. (TP)	*0*
Module	*Languages & Communication*					Version	*09/2023*

Course description (Course objective):
Improve your English to communicate in writing and orally in a professional classroom context, and prepare for the TOEIC test (Test of English for International Communication). Prepare to improve your TOEIC score in 18 hours of lessons. ***TOEIC teaching resources and methods:*** *Table, internet access. Interactivity with the teacher. Refresher, time management strategy, practical exercises, mini tests targeted to student needs, detailed corrections. Review of progress made. Tips and revision strategy before the exam.* ***Composition:*** *200 multiple choice questions (MCQ)* • *100 oral comprehension questions with audio support (4 exercises, duration 45 minutes)* • *100 written comprehension questions (3 exercises, duration 75 minutes)* ⇨ *The TOEIC is based on authentic examples taken from international professional situations (meetings, travel, telephone, etc.)* ***Results:*** *a distinct assessment of oral comprehension and written comprehension* • *a score of 5 to 495 points for each* • *a total score between 10 and 990 points*

Prerequisites:	*Keywords :*
***Level C** : This course is intended for all students registered at level C in order to take the TOEIC exam*	*TOEIC , time management, oral and written*

Specific course objectives (OBJ):
OBJ 4 : *Prepare in the best conditions for taking the TOEIC* ***OBJ 5 :*** *Master the essential points of grammar and conjugation* ***OBJ 6 :*** *Enrich your vocabulary* ***OBJ 7 :*** *Improve your oral and written comprehension*

Necessary material :
The printed course purchased from the printing, data show and baffles service

2- Content elements (Course)

Week(s)	Chapters/Content Items	No. HR	Goals
1-2	***Detailed overview of the exam***	*3h*	• *General presentation of the test and its objectives.* • *Detailed breakdown of the test: written part/oral part.* ⇨ *Complete mock test in real time, complete and detailed correction*
3-4	***Assessment of student level and revisions***	*3h*	• *Review of current knowledge, strengths and areas for improvement.* • *Consolidation at the level of fundamental grammatical structures* ⇨ *Fill-in-the-blank exercises, multiple choice questions, reformulation exercises*
5-6-7	***Preparation for the oral comprehension part***	*4h30*	• *Listening and reconstitution of professional dialogues.* • *Improved oral comprehension.* • *Vocabulary recognition* • *Understand the story of a current event or a news item: know how to distinguish the main elements (date, place, actions, etc.).*
8-9-10	***Improvement of written comprehension***	*4h30*	• *Work on enriching everyday vocabulary* • *Work to enrich professional and commercial vocabulary.* • *Know how to read and analyze*

			documents used in professional situations: e-mails, summaries, reports, notices, etc.
11-12-13-14	***Final mock test***	*6h*	• *Real exam situation to evaluate and validate your progress. Detailed correction*

3- Evaluation methods & Marks Distribution

Type of assessment	Yes No	Tx Weighting
CC - Continuous assessment (Test/Quiz, Presentation, Report, etc.)	☐*Yes* ☒*No*	
DS – Supervised duty	☒*Yes* ☐*No*	*40%*
EE - Written test (Final exam)	☒*Yes* ☐*No*	*60%*

- *Material 100% TP : Average = 20% CC + 80% EP*
- *100% CI material : Average = 40% DS + 60% EE*
- *CI+TP material : Average = 20% DS + 20% EP + 60% EE*

4- Evaluation criteria (of written production)

- *Authorized documents* : ☐*Yes*X *No*
- *Search engine allowed* : ☐*Yes*X *No*
- *Criterion 1: Understanding of the subject structuring of the text: (8 points)*
- *Criterion 2: Relevance of the argument: (6 points)*
- *Criterion 3: Linguistic correction: (4 points)*
- *Criterion 4: Originality of ideas: (2 points)*

5- WebReferences (useful links):

- *TOIC; TOFEL*

6-Working environment (Facilities necessary for learning)

- *Title, Version, URL*
- *…*

Transversal module sheets

Course Specification

Preparing for MOS certification

1. General

Coded	**TV-401**	Level/Semester	2	Coefficient	1.5	Credits	2
Course	engineering					Volume. H. (CI)	
Responsible	Moez ZOUARI					Volumet. H. (TP)	21h
Module	Preparing for MOS certification					Version	09/2023

Course description (Course objective):
Acquire the basic notions necessary to create simple tables and graphs.

Prerequisites:	*Keywords :*
Know the Windows environment, excel I	*If nested, date function, text, filter database, subtotals, TCD*

Specific objectives of the course (OBJ $_i$):
OBJ 1 : *Manage complex formulas*
OBJ 2 : *Filter and conditional formatting*
OBJ 3 : *Subtotals*
OBJ 4 : *Create a pivot table*

Necessary material :
PC, Excel software (2013,2016,2019)

2- Content elements (Practical work)

Week(s)	Chapters/Content Items	No. HR	Goals
1-2	Inserting complex functions • *If nested, logical (AND, OR)*	*3*	*Mastering logical IS*

3-4	Database and complex functions • Searchv , SearchH , • index , equiv	*3*	*Database function*
5-6	Functions • Date, dateif , end.month , dayweek , month, year • No., no.if, no.if.together , sum.if, sum.if.together , reduced.average , average.if	*3*	*Statistical function and date*
7-8	Filters • Automatic • Advance	*3*	*Query a database*
9-10	• Simple sort, combined sort • Subtotals	*3*	*Sort a database*
11-12	Pivot table	*3*	*Synthesize a database*
13-14	Practical Project and Synthesize	*3*	*Global evaluation*

3- Content elements (Course)

Week(s)	Activities/Content Items	No. HR	Goals
…	…	…	…
…	…	…	…
…	…	…	…

4- Evaluation methods & Marks Distribution

Type of assessment	Yes No	Tx Weighting
CC - Continuous assessment (Test/Quiz, Presentation, Report, etc.)	☐ *Yes* ☒*No*	
DS - Supervised Duty	☐ *Yes* ☒*No*	
EE - Written test (Final exam)	☐ *Yes* ☒*No*	
EP - Practical test (TP- TP exam / MP- Mini project)	☒ *Yes* ☐ *No*	*100%*

- *Material 100% TP : Average = 100% EP*

5- Evaluation criteria

- *Authorized documents : ☐ Yes ☐ No*
- *Authorized search engine : ☐ Yes ☐ No*
  - *Criterion 1: Clarity of ideas (5 points)*
  - *Criterion 2: methodological approach (5 points)*
  - *Criterion 3: innovation (5 points)*
  - *Criterion 4: presentation and mastery (5 points)*

6- Web references (useful links):

- *https://excel.developpez.com/*

7- Working environment (Facilities necessary for learning)

- *Title, Version, URL*
- *…*

Course Specification

PFA

1. General

Coded	*TV-402*	Level/Semester	*2/S4*	Coefficient	*1.5*	Credits	*2*
Course	*engineer*					Volume. H. (CI)	
Responsible	*educational manager*					Volume. H. (TP)	*21h*
Module	*PFA (end of year project)*					Version	*09/2023*

Course description (Course objective):
• The PFA (End of Year Project) is a project which lasts one semester, which resolves a problem and which must be defended in front of a jury. • This project is an opportunity for the student to prepare themselves to know how to write a report, present their work, to highlight it and to improve their skills • PFAs start from the second semester and will end on the exam week of the second semester. • Each student is expected to contact one of these teachers for supervision • All 4th year engineering students must be called to a meeting with their educational supervisors and the head of the internship service so that they are properly oriented respectively: Pedagogically and administratively. • PFA internships must be validated at the end of a defense which is carried out following the submission of a report and an internship certificate duly completed by the company supervisor. • The teacher (school tutor) helps the student to refine the end-of-year project. He provides educational support to the student (working methodology, definition of the problem or mission, establishment of the plan, writing of the report, etc.)

Prerequisites:	*Keywords :*
…	…

Specific objectives of the course (OBJ $_i$):	
OBJ 1 :	*Discover the industrial world*
OBJ 2 :	*Solve a problem*
OBJ 3 :	*Writing of the report*
OBJ 4 :	

Necessary material :
…

2- Content elements (Course)

Week(s)	Chapters/Content Items	No. HR	Goals
1-2	*Discover society (observation and learning)*	*3h*	Read all documents relevant to the internship related to the company and the project Learn the tools and software used in the business. Meeting with the team and supervisor Introduction to projects and internship objectives
2-4	*Define the problem and objectives*	*4h30*	identification of the tasks to be accomplished. Taking inventory of all the missions to be carried out is necessary to be sure of achieving your objective on time. Observe operations in the field Make a project schedule
5-8	*The realization of the project*	*4h30*	all tasks will be accomplished and the project will come to life. You have to ensure that everything goes as planned and that the objectives are achieved.
	Autonomy and responsibility		Take more responsibility in the project Work more independently Regularly take into account the progress of tasks Work collaboratively with other team members
9-11	*Evaluation of the achievement and proposal of improvement actions*	*4h30*	*Study of the effectiveness of the achievement and compare with the objective* *Check the work accomplished with the supervisor*
12-14	*Close the work and propose forecasts*	*4h30*	*Prepare an internship report*

3- Content elements (Practical work)

Week(s)	Activities/Content Items	No. HR	Goals
…	…	…	…
…	…	…	…
14	*Practical exam, mini-project defense, …*	*3h*	*Summative evaluation*

4- Evaluation methods & Marks Distribution

- *The student must submit a PFA report with a monitoring sheet signed by their educational supervisor in order to validate authorization for submission on time.*
- *In the absence of an internship certificate on the day of the defense, the jury will not accept the student and consequently the student will have a zero (unless the student brings back an authorization signed by the internship service)*
- *The evaluation is carried out by at least two members of the jury (supervisor, jury 1)*
-
- *The evaluation is also done by assigning grades on a well-detailed report which is validated by the department head and the director.*
- *Among the evaluation criteria: Oral Expression, Rigor of the approach, content of the presentation, Discussion, Behavior and attendance, structure and content of the report, etc.*

5- Evaluation criteria

Written report (5pts)
Oral Presentation (5pts)
Mastery of the subject (5pts)
Project objective (5pts)

6- Web references (useful links):

- *NONE*
- *…*

7- Working environment (Facilities necessary for learning)

- *NONE*
- *…*

Course Specification

Human Resource Management

1. General

Coded	TV-501	Level/Semester	*3/S5*	Coefficient	*1.5*	Credits	*3*
Course	*Ingeneer*					Volume. H. (CI)	*21*
Responsible	*Ati Abderraouf*					Volume. H. (TP)	
Module	*HRM*					Version	*09/2023*

Course description (Course objective):
At the end of this module, the engineering student must be introduced to the main concepts, methods and most common practices of HRM. Know the practices – which vary depending on the company – by which an engineer employee is recruited, evaluated, paid, etc .; Identify the "shared" role of human resources manager that an engineer who supervises a few employees quickly has; Develop critical thinking skills in relation to themes and discussions relating to the human resources function.

Prerequisites:	*Keywords :*
…	…

Specific objectives of the course (OBJ $_i$):	
OBJ 1 :	*Identify key human resources activities and decision-making*
OBJ 2 :	*Identify key human resources activities and decision-making*
OBJ 3 :	*Identify the information needed to resolve certain problems.*

Necessary material :
…

2- Content elements (Course)

Week(s)	Chapters/Content Items	No. HR	Goals
1-2	*Chapter I: Rise of HRM*	*3 hours*	*Identify the transition from personnel management to HRM as well as the objectives of the latter*
3-4	*Chapter II: Study and analysis of positions within the company*	*3 hours*	*Role and importance of job analysis and its link with other HRM activities, describe the methods for collecting information on positions, write a description of the required profile*
5-6	*Chapter III: Recruitment and integration*	*3 hours*	*Presentation of the recruitment process, selection and integration*
7-8	*Chapter IV: Forecast Management of Jobs and Skills*	*3 hours*	*Understand the importance and purpose of GPEC, distinguish it from workforce management, successfully manage workforce and skills*
9-10	*Chapter V: Training*	*3 hours*	*Know the links between training and other HRM activities, know the different training methods, evaluate the effectiveness of a training program*
11-12	*Chapter VI: Remuneration*	*3 hours*	*Definition and importance for employees and for the company, present remuneration systems*
13-14	*Study of practical cases*	*3 hours*	*Evaluate students' level of learning with practical cases*

3- Content elements (Practical work)

Week(s)	Activities/Content Items	No. HR	Goals
…	…	…	…
…	…	…	…
13-14	*Mini-project support, …*	*3h*	*Summative evaluation*

4- Evaluation methods & Marks Distribution

Type of assessment	Yes No	Tx Weighting
CC - Continuous assessment (Test/Quiz, Presentation, Report, etc.)	x *Yes* ☐ *No*	*4%*
DS - Supervised Duty	☐ *Yes* ☐ *No*	
EE - Written test (Final exam)	x *Yes* ☐ *No*	*60%*
EP - Practical test (TP- TP exam / MP- Mini project)	☐ *Yes* ☐ *No*	

- *Material 100% TP : Average = 20% CC + 80% EP*
- ***100% CI material : Average = 40% CC + 60% EE***
- *CI+TP material : Average = 20% DS + 20% EP + 60% EE*

5- Evaluation criteria

- *Authorized documents* : x *No*
- *Authorized search engine* : ☐ *Yes* x *No*
- *Criterion 1: Clarity of ideas (5 points)*
- *Criterion 2: methodological approach (5 points)*
- *Criterion 3: innovation (5 points)*
- *Criterion 4: presentation and mastery (5 points)*

6- Web references (useful links):

- *HR's role in turning around a company - Daniel Cohen and Ivan Maltcheff*
- *Henri De Camagro : General and industrial administration (1917)*
- *François Stankiewicz and François Geuze , HR Manager. Concepts for action, 2007*
- *Dave Ulrich, Human Resource Champions. The Next Agenda for Adding Value and Delivering Results, 1999*
- *Tania Saba, Simon L. Dolan, Susan E. Jackson and Randall S. Schuler, Human Resource Management, Compagon Web, edition 4, 2008, p. 71-72*

7- Working environment (Facilities necessary for learning)

RAS

Course Specification

labor law

1. General

Coded	TV-502	Level/Semester	*3/S5*	Coefficient	*1.5*	Credits	*2*
Course	*Ingeneer*					Volume. H. (CI)	*21*
Responsible	*Walid Chriaa*					Volume. H. (TP)	
Module	*labor law*					Version	*09/2023*

Course description (Course objective):
Acquisition of knowledge in Labor Law (Social Law), in relation to the engineering profession and the functioning of the company. The labor contract: legal environment; hiring, working time; execution, conclusion, breach of contract; salary representation in the company

Prerequisites:	*Keywords :*
Management, business, organizational chart	*Termination, contract,…*

Specific objectives of the course (OBJ $_i$):
OBJ 1 : Sources of labor law
OBJ 2 : Labor inspection
OBJ 3 : Determination of the employment contract
OBJ 4 : Conclusion of the employment contract
OBJ 5 : End of employment contract

Necessary material :
NONE

2- Content elements (Course)

Week(s)	Chapters/Content Items	No. HR	Goals
1-2	*Chapter I: 1. General* *Definition* *The historical development of labor law in Tunisia* *Civil Code* *Labor Code* *Collective agreements* *Characteristics of labor law*	*3 hours*	*The different official sources of Tunisian labor law*
3-4	*Chapter II: 2. Sources of labor law* *Common Sources* *International Sources* *Universal conventions* *Regional sources* *National sources* *The Constitution* *The law (labor code)* *Decrees and orders* *Doctrine* *Jurisprudence* *Clean Sources* *Spontaneous clean sources* *Own voluntary sources:*	*3 hours*	*How to establish an employment contract that complies with different official sources*

	Collective agreements *The internal regulations* *The contract*		
5-6	*Chapter III: 3. LABOR INSPECTION* *Definition* *Missions* *Control* *Power of decision* *Advice* *Conciliation* *Powers of intervention of the labor inspector* *The finding of the labor inspector and its consequences* *The observations* *The notice* *The verbal procedure* *Temporary cessation of activity*	*3 hours*	*Understand the role of the work inspection as well as the types of findings and discrepancies*
7-8	*Chapter IV: 4. Determination of an employment contract* *Definition* *The distinctive criteria of the employment contract* *Work performance* *The link of subordination* *Compensation* *Distinction of employment contract from other contracts* *The mandate contract*	*3 hours*	*The different types of employment contracts as well as the specific clauses*

	The company contract *The business contract* *Types of employment contract* *The fixed-term contract (CDD)* *The permanent contract (CDI)*		
9-10	*Chapter V: 5. Conclusion of the employment contract* *Obligations of the parties* *Employee obligations* *Employer obligations* *Conditions of validity of employment contract* *The basic conditions* *The defects of consent* *The capacity* *The object* *The cause* *Formal conditions* *Mandatory information* *Sanction of the rules for forming contracts* *Negotiable elements*	*3 hours*	*Know the obligations of a contract and the elements of negotiation*
11-12	*Chapter VI: 6. End of the employment contract* *Termination of the employment contract by the employee* *Resignation* *Retirement* *Termination of employment contract by employer*	*3 hours*	*Understand the different types of end of an employment contract, the obligations and the sanctions*

	Dismissal for misconduct *Wrongful dismissal* *Dismissal for economic reasons* *Conventional termination (by collective agreement)* *Termination of the permanent employment contract (CDI)*		
13-14	*Study of practical cases and presentation of personal projects*	*3 hours*	*Evaluate students' level of learning with practical cases*

3- Content elements (Practical work)

Week(s)	Activities/Content Items	No. HR	Goals
…	…	…	…
…	…	…	…
13-14	*Mini-project support, …*	*3h*	*Summative evaluation*

4- Evaluation methods & Marks Distribution

Type of assessment	Yes No	Tx Weighting
CC - Continuous assessment (Test/Quiz, Presentation, Report, etc.)	x *Yes* ☐ *No*	*40%*
DS - Supervised Duty	x *Yes* ☐ *No*	
EE - Written test (Final exam)	x *Yes* ☐ *No*	*60%*
EP - Practical test (TP- TP exam / MP- Mini project)	☐ *Yes* ☐ *No*	

- *Material 100% TP : Average = 20% CC + 80% EP*
- *100% CI material : Average = 40% CC + 60% EE*
- *CI+TP material : Average = 20% DS + 20% EP + 60% EE*

5- Evaluation criteria

- *Authorized documents* : x *No*
- *Authorized search engine* : ☐ *Yes* x *No*
- *Criterion 1: Clarity of ideas (5 points)*

- *Criterion 2: methodological approach (5 points)*
- *Criterion 3: innovation (5 points)*
- *Criterion 4: presentation and mastery (5 points)*

6- Web references (useful links):

Civil Code
Labor Code
Collective agreements

7- Working environment (Facilities necessary for learning)

- *NONE*

Course Specification

ESB Entrepreneurship and Small Business

1. General

Coded	TV-503	Level	*3/S5*	Coefficient	*1.5*	Credits	*2*
Course	*Engineering*					Volume. H. (CI)	*21*
Responsible	*Moez ZOUARI*					Volume. H. (TP)	*0*
Module	*ESB*					Version	*09/2023*

Course description (Course objective):
The objective of the course is to master small business entrepreneurial skills and understand its different functions. *The ESB certification is designed to test and validate fundamental concepts and knowledge in entrepreneurship and small business management. These fundamental concepts include* - *Entrepreneurship;* - *Recognize and evaluate opportunities;* - *Plan, start and operate a business;* - *Marketing and sales;* - *and finance and business financing.*

Prerequisites:	*Keywords :*
None	*Entrepreneurship, management, business environment, accounting, commerce, finance*

Specific objectives of the course (OBJ $_i$):
OBJ 1 : *Identify the characteristics of entrepreneurs and as well as the risks, benefits, opportunities and disadvantages of being an entrepreneur* ***OBJ 2 :*** *Identify the advantages and disadvantages of different types of opportunities* ***OBJ 3 :*** *Identify the objectives, value of a business plan and the appropriate legal structure*

OBJ 4 :	*Identify the advantages and disadvantages of various sources of startup financing*
OBJ 5 :	*Identify business operations: human capital needs, intellectual property issues, standard operating procedures, etc.*
OBJ 6 :	*Develop a sales strategy, identify and analyze the costs/benefits of finding customers, identify how to retain customers, and determine the value and methods of communication.*
OBJ 7 :	*Interpret basic financial statements, identify and analyze cash flows, and identify the company's break-even point.*

Necessary material :
None

2- Content elements (Course)

Week(s)	Chapters/Content Items	No. HR	Goals
1.2	***The entrepreneur:*** - *Identify the characteristics of entrepreneurs* - *Given a scenario including a self-assessment result, identify the strengths, weaknesses, and risk tolerance the self-assessment identifies and how to compensate with services* - *Given a scenario, recognize a business opportunity* - *Identify the risks, benefits, opportunities and disadvantages of being an entrepreneur*	*3h*	*OBJ 1*
3.4	***Opportunity recognition :*** - *Identify the advantages and disadvantages of different types of opportunities (for example, starting a new business, purchasing an existing business, and purchasing a franchise)* - *Given a scenario, analyze the demand for the good or service and opportunities in an environment* - *Given a scenario, identify customers or potential customers for a business* - *Given a scenario, recognize a value proposition*	*3h*	*OBJ 2*

5.6	***Start a business :*** - *Identify the objectives and value of a business plan* - *Identify the appropriate legal structure, advantages and disadvantages for different legal structures for a business* - *Given a scenario, identify different types of licenses and regulations needed* - *Identify the pros and cons of various sources of startup funding: equity (friends/family, angel investors, venture capital), debt (bank, credit cards, personal loans), and grants (government, foundation, business)* - *In a given scenario, identify the support available to the business at the local, state, and federal levels* - *Identify ethical practices and social responsibilities of a company* - *Identify potential exit strategies for a business*	*3h*	*OBJ 3* *OBJ 4*
7.8	***Commercial operations :*** - *Based on a scenario, identify key positions and human capital needs (including compensation and benefits)* - *Given a scenario, determine if the work can be done by the owner or if employees or service providers are needed* - *In a given scenario, identify the required taxes* - *Using a scenario, identify intellectual property issues related to trademarks, copyrights and patents.* - *In a given scenario, identify standard operating procedures (e.g., setup, conduct, internal controls, segregation of duties)* - *Based on a scenario, identify the factors that led to sustainability*	*3h*	*OBJ 5*
9.10	***Marketing and sales:*** - *Based on a scenario, develop a sales strategy and identify the characteristics of a successful sale* - *Given a scenario, identify and analyze the costs/benefits of finding customers* - *Based on a scenario, identify how to retain customers and develop a relationship with loyal customers* - *Based on a scenario, determine the value and methods of communication, including: websites, brochures, social media and advertising.*	*3h*	*OBJ 6*

11-14	***Financial management :*** - *Given a scenario, interpret basic financial statements such as income statements and balance sheets* - *Using a scenario, identify the factors that influence credit ratings and the importance of a positive credit rating* - *From a list of expenses, identify which ones are fixed or variable* - *Given a scenario, identify the factors that impact the price for the customer* - *Given a scenario, identify and analyze cash flows, including accounts receivable, accounts payable, inventory and debt.* - *Given a scenario, create a cash budget* - *Given a scenario, identify the company's break-even point*	*6h*	*OBJ 7*

3- Evaluation methods & Marks Distribution

Type of assessment	Yes No	Tx Weighting
CC - Continuous assessment (Test/Quiz, Presentation, Report, etc.)	☐ *Yes* ☒ *No*	-
DS - Supervised Duty	☐ *Yes* ☒ *No*	-
EE - Written test	☒ *Yes* ☐ *No*	*50%*
EC – Certification Exam	☒ *Yes* ☐ *No*	*50%*

4- Evaluation criteria

- *Authorized documents : ☐ Yes ☒ No*
- *Authorized search engine : ☐ Yes ☒ No*
- *Criterion 1: The entrepreneur (4 points)*
- *Criterion 2: Recognition of opportunities (3 points)*
- *Criterion 3: Start a business (4 points)*
- *Criterion 4: Commercial operations (3 points)*
- *Criterion 5: Marketing and sales (3 points)*
- *Criterion 6: Financial management (3 points)*

5- Web references (useful links):

- *ESB overview, https://certiport.pearsonvue.com/Certifications/ESB/Certification/Overview*
- *Exam Objectives for ESB, C:\Users\LENOVO\Downloads\ESB OD Original 0221.pdf*

6- Working environment (Facilities necessary for learning)

- *None*

subject Sheets Projects and internships

Course of Internships at EPI

Importance of Internships:

Internships in companies are an integral part of the EPI Group's training.

These internships in companies are mandatory for obtaining the diploma.

Also, the EPI Group pays particular attention to their progress.

During these internships, students develop their personal qualities, learn to work in a team and carry out projects.

Professional internships must be validated at the end of a defense.

Types of Internships:

Internships in companies are of three types:

- **Introductory Internship**: they concern 3rd year students

  - ✓ Objective: To give students the opportunity to discover the professional world and join the company.
  - ✓ Minimum duration: 1 month

- **Professional internships** (design and/or implementation of projects linked to the specialty): they concern 4th year students

  - ✓ Objective: The student is expected to carry out the design and/or implementation of projects related to his specialty
  - ✓ Minimum duration: 1 month

- **PFE internships**: they concern 5th year students

  - ✓ Objective: Implementation of all the skills acquired during schooling to carry out a project allowing one to project oneself into the professional world
  - ✓ Minimum duration: 16 weeks

The EPI Group supports its students during these internships and provides them with the Internship Service for coordination with the different departments and host companies (choice, validation, etc.).

Evaluation of the Internships:

The internship results in the writing of a report, which must be presented before a jury. This jury must be composed of at least two members:

- A president who must be a teacher from the EPI Group.
- An examiner: who must be a teacher from the EPI Group.
- The university supervisor who must be a teacher from the EPI Group.
- An internship tutor who must represent the host structure.

All internships must be validated at the end of a defense.

For this, each student is required to submit to the internship service:

- A connection form (to download from the “Internship forms” menu on our website episup.com)
- An internship certificate obtained from the company and duly completed and signed.
- Supervision monitoring sheet duly completed by the educational supervisor
- Company appreciation form: duly completed by the professional supervisor
- The internship report bearing the EPI Group cover page (to be downloaded from the “Internship forms” menu) in at least two copies (depending on the number of jury members) and one scanned copy.

Course Specification

Projects and internships (PFE, Professional internships, Introductory Internship)

* PFE

1. General

Coded	Pro- 5 2 03	Level/Semester	*3/S6*	Coefficient	*10*	Credits	*24*
Course	*Engineering course*					Flight. H. (CI)	
responsible	Internships department					Flight. H. (TP)	
Module	*PFE*					Version	*09/2023*

Course description (Course objective):
This involves the implementation of all the skills acquired during schooling to carry out a project, generally proposed by a company, allowing one to project oneself into the professional world. The student works full-time within the company and is supervised by a teacher. During an End of Study Project (PFE), the student is led to develop a problem based on a specific professional situation. The main objective of this last internship is to affirm the skills of our future engineers and to prepare them effectively for their entry into professional life. The subject of the PFE internship generally leads the future engineer to encounter challenges and allows him to learn to act accordingly.

Prerequisites:	*Keywords :*
…	…

Specific objectives of the course (OBJ):
OBJ 4 : The PFE ideally allows the intern to carry out a project from A to Z… **OBJ 5 :** Go through all the stages necessary for its realization, from the study of specifications to final delivery **OBJ 6 :** Participate in technical studies: definition of problems, acquisition, compilation and analysis of data, formulation of hypotheses and recommendations; **OBJ 7 :** Put the student in the position of an engineer, **OBJ 8 :** Refine their first career orientations, **OBJ 9 :** Measure the role of the company's different engineers, **OBJ 10 :** Discover the different functions and their relationships, **OBJ 11 :** Write an end-of-studies report.

Necessary material :
...

2- Content elements (Course)

Week(s)	Chapters/Content Items	No. HR	Goals
1-2	*Discover society (observation and learning)*		Read all documents relevant to the internship related to the company and the project Learn the tools and software used in the business. Meeting with the team and supervisor Introduction to projects and internship objectives
3-4	Establishing project objectives	...	Clearly define the objectives to be achieved with the project. Observe operations in the field Make a project schedule Establish a Problem
4-5	Project planning and design	...	project delivery , including specific steps to follow and resources required. Design potential solutions to meet project objectives
5-7	Data collection and situation analysis		Collect relevant data necessary to carry out the project. Analyze data to understand the causes of the problem using analytics tools
7-8	Project implementation		Implement the solutions designed within the project framework .
8-9	*Autonomy and responsibility*		Take more responsibility in the project Work more independently Regularly take into account the progress of tasks Work collaboratively with other team members
9-12	Testing and validation		Test the developed solutions and ensure that they meet the specifications and needs of the project. Validate the results obtained with the internship supervisor or the team responsible for the project in the company.
12-14	*Close the work and propose forecasts*		*Prepare an internship report*

3- Content elements (Practical work)

Week(s)	Activities/Content Items	No. HR	Goals
...	...	...	...
...	...	...	...

12	*Practical exam, mini-project defense, …*	*3h*	*Summative evaluation*

4- Evaluation methods & Marks Distribution

- *The student must submit a PFE report with a monitoring sheet signed by their educational supervisor in order to validate authorization for submission on time.*
- *In the absence of an internship certificate on the day of the defense, the jury will not accept the student and consequently the student will have a zero (unless the student brings back an authorization signed by the internship service)*
- *The evaluation is carried out by at least three members of the jury (supervisor, president of the jury and rapporteur)*
- *The evaluation is also done by assigning grades on a well-detailed report which is validated by the department head and the director.*
- *Among the evaluation criteria: Oral Expression, Rigor of the approach, content of the presentation, Discussion, Behavior and attendance, structure and content of the report, etc.*

5- Evaluation criteria

Criteria	
Oral Expression: - Ability to keep the audience attentive - Judicious use and quality of transparencies. - Vocabulary, use of appropriate technical terms - Respect the planned time.	/04
Steps : - Rigor of the approach: choice, tools, method and synthesis	/04
Content of the presentation: - Level of know-how, technicality... - Personal work carried out. - Presentation of objectives achieved	/08
Discussion : - Mastery of aspects related to the subject, justifications, etc.	/04
Behavior, Attendance, Punctuality and Motivation	.. /04
Personal contribution and initiative	.. /06
Scientific and technological knowledge	.. /05
Level of know-how , technicality, creativity and functionality	.. /05
Report Structure -Acknowledgements, summary, introduction, presentation of the company, specifications, technical content, conclusion - Balanced ratio (Volume) - Clear and progressive presentation of information - Reasonable use and definition of technical terms, standardization	.. /06
Content of the Report - Presentation of the work requested (specifications) then of the entire made work. - Technical content - Meets standards -Importance of personal work (volume and level) - Justification for the choice of solutions adopted. - Comparison of the objectives achieved with the content of the specifications - Appendices, Bibliographies	.. /08
Presentation of the report -Pagination, layout -Spelling, grammar, style. - Clarity and quality of figures, diagrams, etc.	.. /06

6- Web references (useful links):

- *Author, Title, URL, Year*
- *…*

7- Working environment (Facilities necessary for learning)

- *None*
- *…*

* Professional internships

Coded	Pro- 5 2 02	Level/Semester	*3/S6*	Coefficient	*10*	Credits	*3*
Course	*Engineering course*					Flight. H. (CI)	
responsible	Internships department					Flight. H. (TP)	
Module	Professional internships					Version	*09/2023*

Course description (Course objective):
During his professional internship, the student, who has achieved his 4th year succesfully, must complete a practical case whose theme depends on his specialization The student works full-time within the company but is not supervised by a teacher. It's a period of practical training or work experience undertaken by a student in a professional setting relevant to his field of study and career goals. It provides the intern with the opportunity to apply theoretical knowledge gained in academic settings to real-world scenarios, gaining practical skills and insights into their chosen profession. Interns may also have the opportunity to network with professionals in their field, build valuable connections, and sometimes even secure PFE opportunities upon completion of the internship.

Prerequisites:	*Keywords :*
…	…

Specific objectives of the course (OBJ):
OBJ 1 : Providing students with practical, real-world experience in their field of study or desired career path. **OBJ 2 :** Develop and refine technical skills, soft skills, and industry-specific competencies necessary for future success in the profession. **OBJ 3 :** Receive constructive feedback from supervisors and mentors to identify strengths, areas for improvement, and opportunities for further growth. **OBJ 4 :** Gain insights into the expectations and realities of the workforce, facilitating a smoother transition from student life to professional employment post-graduation. **OBJ 5 :** Write a professional internship report.

Evaluation methods & Marks Distribution

- *The student must submit a professional internship report with a Internship certificate and Company appreciation form duly completed and signed in order to validate authorization for submission on time.*
- *In the absence of an internship certificate on the day of the defense, the jury will not accept the student and consequently the student will have a zero (unless the student brings back an authorization signed by the internship service)*
- *The evaluation is carried out by at two members of the jury.*
- *The evaluation is also done by assigning grades on a well-detailed report which is validated by the department head and the director.*
- *Among the evaluation criteria: Oral Expression, Rigor of the approach, content of the presentation, Discussion, Behavior and attendance, structure and content of the report, etc.*

* Introductory Internship

Coded	Pro- 5 2 01	Level/Semester	*3/S6*	Coefficient	*10*	Credits	*3*
Course	*Engineering course*					Flight. H. (CI)	
responsible	Internships department					Flight. H. (TP)	
Module	*Introductory Internship*					Version	*09/2023*

Course description (Course objective):
It is an internship for discovering the company the student spend time observing and shadowing experienced professionals within various departments or teams. This allows them to gain insights into different aspects of the organization's operations and understand the roles and responsibilities of various team members. As the internship progresses, the student is gradually given more opportunities to participate in hands-on tasks and projects under the guidance and supervision of mentors or supervisors. These tasks may be relatively simple or routine at first but gradually increase in complexity as the student gains confidence and demonstrates competence.

Prerequisites:	*Keywords :*
…	…

Specific objectives of the course (OBJ):
OBJ 1 : Help students explore different career paths within their field of study or industry by exposing them to various departments, roles, and responsibilities
OBJ 2 : Provide students with opportunities to develop fundamental skills relevant to their field, such as communication, teamwork, problem-solving, and time management
OBJ 3 : Offer students practical, hands-on experience through tasks, projects, and assignments that contribute to the organization's goals and objectives.

OBJ 4 : Facilitate networking opportunities for students to connect with professionals in their field,

OBJ 5 : Prepare students for future internships or employment opportunities by equipping them with essential skills, experiences, and insights into the professional world.