الجمهورية الجزائرية الديمقراطية الشعبية People's Democratic Republic of Algeria
وزارة التعليم العالي والبحث العلمي
Ministry of Higher Education and Scientific Research
اللجنة البيداغوجية الوطنية لميدان العلوم و التكنولوجيا
National Educational Committee for the field of Science and Technology

ACADEMIC MASTER HARMONIZE

National program

Update 2022

Domain	Sector	Speciality
Science And Technologies	***Civil Engineering***	***Civil Engineering Materials***

الجمهورية الجزائرية الديمقراطية الشعبية People's Democratic Republic of Algeria
وزارة التعليم العالي والبحث العلمي
Ministry of Higher Education and Scientific Research
اللجنة البيداغوجية الوطنية لميدان العلوم و التكنولوجيا
National Educational Committee for the field of Science and Technology

مواءمة

ماستر أكاديمي

تحيين 2022

الميدان	الفرع	التخصص
علوم و تكنولوجيا	هندسة مدنية	مواد الهندسة المدنية

I–Master's identity sheet

Access conditions

Sector	Harmonized Master	Access licenses to the master's degree	Ranking according to license compatibility	Coefficient assigned to the license
Civil engineering	**Civil engineering materials**	Civil engineering	**1**	**1.00**
		Public works	**1**	**1.00**
		Hydraulic	**2**	**0.80**
		Materials Engineering	**2**	**0.80**
		Chemistry of materials (SM field)	**2**	**0.80**
		Materials physics (SM field)	**2**	**0.80**
		Metallurgy	**3**	**0.70**
		Other licenses in the ST domain	**5**	**0.60**

II – Half-yearly teaching organization sheets of the specialty

Semester 1 Master: Materials in Civil Engineering

Teaching unit	Materials	Credits	Coefficient	Weekly hourly volume			Half-yearly Hourly Volume (15 weeks)	Additional Work in Consultation (15 weeks)	Evaluation method	
	Titled			**Course**	**T.D.**	**TP**			**Continuous monitoring**	**Exam**
Fundamental EU Code: UEF 1.1.1 Credits: 8 Coefficients: 4	Elasticity theory	4	2	1h30	1h30		45:00	55:00	40%	60%
	Mineral binders	4	2	1h30	1h30		45:00	55:00	40%	60%
Fundamental EU Code: UEF 1.1.2 Credits: 10 Coefficients: 5	Concrete technology	4	2	1h30	1h30		45:00	55:00	40%	60%
	Reinforced concrete structures	6	3	3:00 a.m.	1h30		67h30	82h30	40%	60%
Methodological EU Code: UEM 1.1 Credits: 9 Coefficients: 5	TP Physics of Materials	2	1			1h30	10:30 p.m.	27:30	100%	
	TP Binders	3	2			2h30	37:30	37:30	100%	
	Practical concrete technology	4	2			3:00 a.m.	45:00	55:00	100%	
EU Discovery Code: UED 1.1 Credits: 2 Coefficients: 2	*Material of your choice*	1	1	1h30			10:30 p.m.	02:30		100%
	Material of your choice	1	1	1h30			10:30 p.m.	02:30		100%
Transversal EU Code: UET 1.1 Credits: 1 Coefficients: 1	Technical English and terminology	1	1	1h30			10:30 p.m.	02:30		100%
Total semester 1		**30**	**17**	**12:00 p.m.**	**6:00 a.m.**	**7:00 a.m.**	**375h00**	**375h00**		

Semester 2 Master: Materials in Civil Engineering

Teaching unit	Materials	Credits	Coefficient	Weekly hourly volume			Half-yearly Hourly Volume (15 weeks)	Additional Work in Consultation (15 weeks)	Evaluation method	
	Titled			**Course**	**T.D.**	**TP**			**Continuous monitoring**	**Exam**
Fundamental EU Code: UEF 1.2.1 Credits: 10 Coefficients: 5	Plasticity and damage	6	3	3:00 a.m.	1h30		67h30	82h30	40%	60%
	Special building materials	4	2	3:00 a.m.			45:00	55:00		100%
Fundamental EU Code: UEF 1.2.2 Credits: 8 Coefficients: 4	Innovative concretes 1	4	2	3:00 a.m.			45:00	55:00		100%
	Metal frame structures	4	2	1h30	1h30		45:00	55:00	40%	60%
Methodological EU Code: UEM 1.2 Credits: 9 Coefficients: 5	TP Mechanics of materials	2	1			1h30	10:30 p.m.	27:30	100%	
	Computer science applied to the calculation of reinforced concrete structures	3	2			2h30	37:30	37:30	100%	
	Experimental methods	4	2	1h30		1h30	45:00	55:00	40%	60%
EU Discovery Code: UED 1.2 Credits: 2 Coefficients: 2	*Material of your choice*	1	1	1h30			10:30 p.m.	2h30		100%
	Material of your choice	1	1	1h30			10:30 p.m.	2h30		100%
Transversal EU Code: UET 1.2 Credits: 1 Coefficients: 1	Compliance with standards and rules of ethics and integrity	1	1	1h30			10:30 p.m.	02:30		100%
Total semester 2		**30**	**17**	**4:30 p.m.**	**3:00 a.m.**	**5:30 a.m.**	**375h00**	**375h00**		

Semester 3 Master: Materials in Civil Engineering

Teaching unit	Materials	Credit	Coefficient	Weekly hourly volume			Half-yearly Hourly Volume (15 weeks)	Additional Work in Consultation (15 weeks)	Evaluation method	
	Titled			**Course**	**T.D.**	**TP**			**Continuous monitoring**	**Exam**
Fundamental EU Code: UEF 2.1.1 Credits: 12 Coefficients: 6	Composite materials	4	2	1h30	1h30		45:00	55:00	40%	60%
	Recycled materials	4	2	1h30	1h30		45:00	55:00	40%	60%
	Prestressed concrete	4	2	1h30	1h30		45:00	55:00	40%	60%
Fundamental EU Code: UEF2.1.2 Credits: 6 Coefficients: 3	Material durability	4	2	3:00 a.m.			45:00	55:00		100%
	Innovative concretes 2	2	1	1h30			10:30 p.m.	27:30		100%
Methodological EU Code: UEM 2.1 Credits: 9 Coefficients: 5	Finished elements	4	2	1h30		1h30	45:00	55:00	40%	60%
	TP Durability of materials	2	1			1h30	10:30 p.m.	27:30	100%	
	Innovative concrete works	3	2			2h30	37:30	37:30	100%	
EU Discovery Code: UED 2.1 Credits: 2 Coefficients: 2	*Material of your choice*	1	1	1h30			10:30 p.m.	02:30		100%
	Material of your choice	1	1	1h30			10:30 p.m.	02:30		100%
Transversal EU Code: UET 2.1 Credits: 1 Coefficients: 1	Documentary research and dissertation design	1	1	1h30			10:30 p.m.	02:30		100%
Total semester 3		**30**	**17**	3:00 p.m.	4:30 a.m.	5:30 a.m.	**375h00**	**375h00**		

Discovery Unit (S1, S2, S3)

1. *Building thermal*
2. *Code and regulations*
3. *Rheology of materials*
4. *Hydration and structuring of cement pastes*
5. *Experiment plans*
6. *Construction pathology*
7. *Business organization and management*
8. *Organization of construction sites*
9. *Notions on civil and industrial constructions*
10. *Market Code*
11. *Concepts on hydrotechnical works*
12. *Construction law*

Semester 4

Internship in a company or in a research laboratory culminating in a dissertation and a defense.

	VHS	coefficient	Credits
Personal work	550	09	18
Internship in a company or laboratory	100	04	06
Seminars	50	02	03
Other (Framing)	50	02	03
Total Semester 4	750	17	30

This table is given for information purposes only.

Evaluation of the End of Master Cycle Project

- Scientific value (jury assessment) /6
- Writing of the dissertation (jury assessment) /4
- Presentation and response to questions (Jury assessment) /5
- Appreciation of the supervisor /3
- Presentation of the internship report (Jury assessment) /5

III - Detailed program by subject for the S1 semester

Semester: 1
Teaching unit: UEF 1.1.1
Subject 1: Theory of elasticity
VHS: 45h00 (Class: 1h30, tutorial: 1h30)
Credits: 4
Coefficient: 2

Teaching objectives:

Define the behavior of continuous solid elastic media, understand the mechanisms of deformation of materials in the elastic domain and be able to carry out some calculations.

Recommended prior knowledge:

Differential Equations, Strength of Materials

Content of the material:

Chapter 1. General information on the theory of elasticity- (3 weeks)

Chapter 2.Stress state theory (4 weeks)

Chapter 3.: Theory of the state of deformation **(4 weeks)**

Chapter 4.Relationships between stresses and strains (4 weeks)

Evaluation method:

Continuous monitoring: 40%; Review:60%.

Bibliographic references:

TIMOSHENKO (SP) and GOODIER (JN). – Theory of elasticity.544 p., 2 ed. Béranger (1961
COURBON (J.). – Calculation of structures. Dunod (1972).
f.frey, Analysis of structures and continuous media finite element method volume 6, ppur
J.COURBON, Thin elastic plates. Eyrolles
R.L'HERMITE, Elasto-plastic buckling of straight bar systems. Eyrolles
S.TIMOSHINKO, Theory of elastic stability. Dunod
A.PFLUGER, Hull statics element. Dunod
M. Tichy and J. Rakosnik, "Plastic calculation of concrete frames", Eyrolles, 1975.
William A. Nash, "Strength of Materials 1: Courses and Issues," Schaum Series,

Semester: 1
Teaching unit: UEF 1.1.1
Material1:Mineral binders
VHS: 45h00 (Class: 1h30, tutorial: 1h30)
Credits: 4
Coefficient: 2

Teaching objectives:

Knowledge of binders (aerial and hydraulic): composition, manufacturing, properties and uses

Recommended prior knowledge:

General Chemistry, MDC

Content of the material:

Chapter 1. Classification of binders and normative aspects

Chapter 2. Ordinary and compound cements
Manufacturing, properties, standards and uses

Chapter 3. Hydraulic lime
Manufacturing, properties, standards and uses

Chapter 4 Air lime
Manufacturing, properties, standards and uses

Chapter 5 Plaster
Manufacturing, properties, standards and uses

Evaluation method:

Continuous monitoring: 40%; Examination: 60%.

Bibliographic references:

Semester:1
Teaching unit: UEF 1.1.2
Material1:Concrete technology
VHS: 45h00 (Class: 1h30, tutorial: 1h30)
Credits: 4
Coefficient: 2

Teaching objectives:

Describe the constituents of concrete, the main formulation methods and technological solutions in terms of mixing, placing, additions, additives and adjuvants.

Recommended prior knowledge:

Physical and chemical properties of materials. Construction materials.

Content of the material:

Chapter 1. Definition and constituents of concrete: **(1 week)**

Chapter 2. Chemical adjuvants **(2 weeks)**

Chapter 3. Mineral additions **(2 weeks)**

Chapter 4 Concrete formulation **(3 weeks)**

Chapter 5 Properties of concrete in the fresh and hardened state **(3 weeks)**

Chapter 6 Shrinkage and creep of concrete **(1 week)**

Chapter6 Implementation of concrete **(1 week)**

Chapter7 Control and quality of concrete **(1 week)**

Chapter8 Recent Advances in Concrete Technology **(1 week)**

Evaluation method:

Continuous monitoring: 40%; Examination: 60%.

Bibliographic references:

1. Neville MA, (2000), Properties of concrete. Ed. Eyrolles, France, 806p.
2. Mehta PK, Monteiro PJM, (2003), Concrete: Structure, Properties and Materials, Third Edition, Prentice-Hall, 652p.
3. Aitcin PC, (2008), Binders for Durable and Sustainable Concrete, Ed. Taylor & Francis, 529p.
4. Aitcin PC, (2000), High performance concretes, Ed. Eyrolles France, 700p.
5. Siddique R., (2008), Waste materials and by-products in concrete, Ed. Springer-Verlag Berlin Heidelberg, 427p.
6. Ollivier JP., Baron J., (1997), Concretes: Bases and data for their formulation, Ed Eyrolles, 522p.
7. Newman J., Choo BS, (2004), Advanced Concrete Technology 1, Constituent Materials, Elsevier Edition, 288p.
8. Newman J., Choo BS, (2004), Advanced Concrete Technology 2, Concrete Properties, Elsevier Edition, 352p

Semester:1
Teaching unit: UEF 1.1.2
Material1:Reinforced concrete structures
VHS: 45h00 (Class: 3h00, tutorial: 1h30)
Credits: 6
Coefficient: 3

Teaching objectives:

Choose and use the calculation methods appropriate to the pre-sizing and sizing of the elements making up the structure

Recommended prior knowledge:

Calculation of stresses, Calculation of straight sections in RC (simple tension, simple compression, simple bending, compound bending, buckling).

Content of the material:

Chapter 1: Floor and Slabs **(3 weeks)**

Chapter 2: Stairs **(1 week)**

Chapter 3: Beams **(3 weeks)**

Chapter 4: Poles **(2 weeks)**

Chapter 5: Bracing sails **(3 weeks)**

Chapter 6: Foundations **(3 weeks)**

References*(Booksand handouts, websites, etc.).*

1- Georges Dreux, “Practical calculation of reinforced concrete. BAEL 80 rules”, Eyrolles, 1981.
2- A. Guerrin and RC Lavaur, “Reinforced concrete treaty; General experimental mechanical properties of reinforced concrete, Volume 1”, Dunod, 1973.
3- A. Guerrin and RC Lavaur, “Reinforced concrete treaty; Frames of buildings and factories, floors, stairs, corbels, various building works, Volume 4", Dunod, 1971.
5- A. Guerrin and RC Lavaur, “Reinforced concrete treaty; Retaining walls and quay walls, Volume 7”, Dunod, 1976.
6- Jean Pierre Mougin, “Reinforced concrete, BAEL 91 modified 99 and associated DTU”, Eyrolles, 2000.
7- M. Albiges and M. Mingasson, “Theory and Practice of reinforced concrete in limit states”, Eyrolles, 1981.
8- BAEL 91 rules, “Technical rules for the design and calculation of reinforced concrete works and constructions using the limit states method”, Eyrolles, March 1992.
9- H. Renaud and F. Letertre, “Reinforced concrete structures”, Foucher, 1985.
10- Georges Dreux, “New concrete guide”, Eyrolles, 1985.
11- Georges Dreux, “Practical calculation of reinforced concrete. BAEL Rules 83”, 1983
12- R. Park and T. Paulay, “Reinforcedconcrete structures”, John Wiley and Sons.
13- Eurocode 2, Design of concrete structures- Part 1-1: general rules and rules for buildings, NF EN 1992-1-1 October 2005.
14- Christian Albouy, “Eurocode2: reinforced concrete - simple elements”, CERPET – STI, 2007.
15- JA Calgaro, “Applications of Eurocode 2 – Calculation of concrete buildings”, bridges and roads, 2007.

Semester:1
Teaching unit: UEM1.1
Material1:TP Physics of materials
VHS: 10:30 p.m. (TP: 1:30 a.m.)
Credits: 2
Coefficient: 1

Teaching objectives:

Know and carry out the different physical tests on construction materials

Recommended prior knowledge:

Physical and chemical properties of materials. Construction materials.

Content of the material:

TP 1 Particle size analysis

TP2: Volumic mass

TP 3: Content and absorption

TP 4: Micro Deval test, Los Angeles, dynamic diffraction

TP 5: Cleanliness of aggregates

TP 6: Mechanical resistance tests

Evaluation method:

Continuous control: 100%; Review: 0%.

Bibliographic references:

Semester:1
Teaching unit: UEM1.1
Material1:TPLiants
VHS: 37h30 (TP: 2h30)
Credits:3
Coefficient: 2

Teaching objectives:

Characterize mineral binders (plaster, lime and cement)

Recommended prior knowledge:

Physical and chemical properties of materials. Construction materials,mineral binders

Content of the material:

TP 1. Tests on cements:

Setting test, laser particle size, loss on ignition, insoluble residue, fineness, density
Analysis by fluorescence spectrometry, mineralogical analysis by X-ray diffraction.
Determination of compressive strength
Determination of bending strength

TP 2. Tests on hydraulic lime

Determining the start of setting
Determination of volume stability
Determination of compressive strength

TP3. Tests on aerial lime

Determination of calcium and magnesium oxide content
Determination of active lime content
Determination of quicklime reactivity
Determination of grinding fineness

TP 4 Tests on plaster

Determination of pouring and smoothing time
Determination of grinding fineness
Determination of compressive strength
Determination of bending strength
Determination of impurity content

Evaluation method:

Continuous control: 100%; Review: 0%.

Bibliographic references:

Semester:1
Teaching unit: UEM 1.1
Material1:TP Concrete technology
VHS: 45h00 (TP: 3h00)
Credits:4
Coefficient:2

Teaching objectives:

Learning about practical work and introduction to experimental methods.

Recommended prior knowledge:

Construction materials,Concrete technology

Content of the material:

TP1:Concrete formulation
Dreux Gorise method
Baron Lesage method

TP2:Workability tests
Abrams cone, LCPC maneuverability meter,…

TP3:Effect of admixture on concrete
Tests on grout, saturation dosage,

TP4:Mechanical tests
Compression, bending, splitting

Evaluation method:

Continuous control: 100%; Review: 0%.

Bibliographic references:

Semester:1
Teaching unit: UET1.1
Matter:Technical English and terminology
VHS: 10:30 p.m. (Class: 1h30)
Credits: 1
Coefficient: 1

Teaching objectives:

Introduce the student to technical vocabulary. Strengthen your knowledge of the language. Help him atunderstand and synthesize a technical document. Allow him to understand a conversation in English held in a scientific framework.

Recommended prior knowledge:

Basic English vocabulary and grammar

Material content:

- Written comprehension :Reading and analysis of texts relating to the specialty.
- Oral comprehension: Based on authentic popular science video documents,note taking, summary and presentation of the document.
- Oral expression: Presentation of a scientific or technical subject,development and exchange of oral messages (ideas and data), Telephone communication, Gestural expression.
- Written expression :Extraction of ideas from a scientific document, Writing a scientific message, Exchange of information in writing,writing CVs, application letters for internships or jobs.

Recommendation:
It is strongly recommended that the person responsible for the subject presents and explains at the end of each session (at most) around ten technical words of the specialty in the three languages (if possible) English, French and Arabic.

Evaluation method:

Review: 100%.

Bibliographic references:

1. *PT Danison.Practical guide to writing in English: uses and rules, practical advice. Organization Editions.*
2. *A. Chamberlain, R. Steele. Practical guide to communication: English. Ed. Didier.*
3. *R. Ernst.Dictionary of applied techniques and sciences: French-English. Ed.Dunod.*
4. *J. Comfort, S. Hick, A. Savage.Basic Technical English.Ed. Oxford University Press.*
5. *EH Glendinning, N. Glendinning.Oxford English for Electrical and Mechanical Engineering.Ed. Oxford University Press.*
6. *TN Huckin, AL Olsen.Technical writing and professional communication for nonnative speakers of English.Ed. McGraw-Hill.*
7. *J. Orasanu.Reading Comprehension from Research to Practice.Ed. Erlbaum Associates.*

III - Detailed program by subject for the S2 semester

Semester:2
Teaching unit: UEF 1.2.1
Subject 1: Plasticity and damage
VHS: 67h30 (Class: 3h00, tutorial: 1h30)
Credits: 6
Coefficient: 3

Teaching objectives:

Understand the deformation mechanisms of materials in the plastic and p domainallow students to dimension structures in the plastic field.

Recommended prior knowledge:

Differential equations, Resistance of Materials, elasticity.

Content of the material:

Chapter 1: Introduction

Chapter 2: Appearance and phenomenon

Chapter 3: Behavior and plasticity criterion

Chapter 4: Law of plastic behavior

Chapter 5: Law of plastic flow

Chapter 6: Plastic calculation method

Chapter 7: Linear elastic fracture mechanics

Chapter 8: Extension of fracture mechanics

Chapter 9: Material fatigue

Evaluation method:

Continuous monitoring: 40%; Review:60%.

Bibliographic references:

C. Wielgosz, RDM, elasticity, plasticity, finite elements, Ed Ellipses.
R. Guenfoud, introduction to nonlinear theory, Ed DPU Guelma
M. Tichy and j. Rakosnik, “plastic calculation of concrete frames”, eyrolles, 1975.

Semester:2
Teaching unit: UEF 1.2.1
Subject 1: Special construction materials
VHS: 45h00 (Class: 3h00)
Credits: 4
Coefficient: 2

Teaching objectives:

Equip students with knowledge of other materials used in the construction field, as well as their properties.

Recommended prior knowledge:

Building materials 1.

Content of the material:

Chapter 1: Wood

Chapter 2: The glass

Chapter 3: Ceramic materials

Chapter 4: Bituminous materials

Chapter 5: Polymers

Chapter 6: Compressed earth products

Evaluation method:

Continuous monitoring: 0%; Review: 100%.

Bibliographic references:

Semester: 2
Teaching unit: UEF 1.2.2
Material 1: Innovative concretes 1
VHS: 45h00 (Class: 3h00)
Credits: 4
Coefficient: 2

Teaching objectives:

Design innovative materials for targeted civil engineering applications and put into perspective a material with very varied properties defined a priori within the framework of a construction project.

Recommended prior knowledge:

Construction materials,Concrete technology

Content of the material:

Chapter 1: Properties and performances of materials.

Chapter 2: High performance concrete

Chapter 3: Self-placing concrete

Chapter 4: Fiber concrete

Chapter 5: Reactive powder concrete

Chapter 6: Polymer-based concrete.

Chapters 7: Lightweight concrete

Chapter 8: Heavy concrete

Chapter 9: Concrete made from recycled aggregates

Evaluation method:

Continuous monitoring: 0%; Review: 100%.

Bibliographic references:

Jean-Marie Renouard, Gilles Pijaudier-Cabot. Mechanical behavior of concrete, chapter 8. Lavoisier 2005. p 283
GDTaylor. Materials in Construction. 3rd ed. Longman 2000
PK Mehta and PJ Monterio. Concrete Microstructure, properties and materials. 3rd McGraw-Hill. 2006 p.659
Bill Price, BH P. Advanced concrete technology. Chapter 3. Elsevier Ltd. 2003 p.
Caijun Shi. Y. Mo. High performance construction materials. World Scientific Publishing. 2008 p.431
C.Hall. Civil engineering materials. 5th ed. 1996 p. 527
HFW Taylor. Cement Chemistry. 2nd ed. 1997 p. 469
GD Taylor. Materials in construction (2000), 3 ed. 332p

Semester: 2
Teaching unit: UEF 1.2.2
Subject 1: Metal frame structures
VHS: 45h00 (Class: 1h30, tutorial: 1h30)
Credits: 4
Coefficient: 2

Teaching objectives:

Dimension structural elements, simple welded or bolted assemblies with Eurocode 3

Recommended prior knowledge:

Structural mechanics (RDM) - Drawing diagrams (M, N, T) for structures - different resolution methods (truss, continuous beam, gantry).

Content of the material:

Chapter 1: Calculation of assemblies (6 weeks)
- Welding
- Ordinary bolts
- HR bolts with controlled tightening

Chapter 2: Calculation of column bases (4 weeks)
- Joint
– Embedding

Chapter 3: Calculation of composite floors with collaborating slabs (**3 weeks)**
- Resistance calculation
- Deformation calculation
- Calculation of connectors

Chapter 4: design of hall-type industrial buildings (2 weeks)

Evaluation method:

Continuous monitoring: 0%; Review: 100%.

Bibliographic references:

1- Rules for calculating steel constructions (CM66), Eyrolles, 1979.
2- Rules defining the effects of snow and wind on buildings and annexes (Rules NV65), Eyrolles, 1980.
3- Eurocode 3, “Calculation of steel structures”, NF EN 1993-1-1, 2005.
4- J.MOREL, Design and calculation of metal structures, Eyrolles
5- J.brozzetti, Calculation of steel structures: eurocode 3, Eyrolles
6- A. Manfred, Metal frames: design and sizing of halls and buildings volume 11, PPEUR

Semester: 2
Teaching unit: UEM1.2
Material1:TP Mechanics of materials
VHS: 10:30 p.m. (TP: 1:30 a.m.)
Credits: 2
Coefficient: 1

Teaching objectives:

Identify the mechanical properties of materials and know the influence of some parameters.

Recommended prior knowledge:

Building materials, Concrete technology

Content of the material:

TP 1 Mechanical tests (compression, traction, flexion)

TP 2. Effects of some parameters influencing the mechanical properties of materials

Effect of water/cement ratio
Effect of the treatment
Effect of adjuvant

TP3:Rheology of concrete -Determination of shear threshold and plastic viscosity

TP4. Scaling effect on the properties of mortar and concrete specimens

TP 5 Tensile tests on steel

TP 6 Steel – concrete adhesion tests

Evaluation method:

Continuous control: 100%

Bibliographic references:

Semester: 2
Teaching unit: UEM1.2
Material1:Computer science applied to the calculation of reinforced concrete structures
VHS: 37h30 (TP: 2h30)
Credits: 3
Coefficient: 2

Teaching objectives:

Train the student in the use of professional software which allows them to dimension and calculate structures

Recommended prior knowledge:

Physical and chemical properties of materials. Construction materials,mineral binders

Content of the material:

Software training

Representation of the structure in three dimensions (modeling) in the form of bars and plates
Setting up connections between bars and with the outside

Application of loads: own weight, snow and wind, operating loads

Calculation and determination of stresses in the different elements

Calculation of reinforced concrete elements

Evaluation method:

Continuous control: 100%

Bibliographic references:

Semester: 2
Teaching unit: UEM1.2
Material1:Experimental methods
VHS: 45h00 (Lecture 1h30, practical work: 1h30)
Credits: 4
Coefficient: 2

Teaching objectives:

Mastery of advanced experimental investigation techniques

Recommended prior knowledge:

Construction materials course taught in the Bachelor's degree course

Content of the material:

Chapter 1: Classical methods, description and application
- Gravimetry
- Volumetry
- Differential thermal analysis
- Calorimetric analysis

Chapter 2: Physical and physico-chemical methods, description and application
- Emission spectroscopy, X-ray fluorescence
- X-ray diffraction
- Scanning electron microscopy

Chapter 3: Mechanical methods
- Static tests
- Dynamic tests
- Measurement of deformations

Evaluation method:

Continuous control: 40; Examination: 60%.

Bibliographic references:

1. Wheeler AJ and Ganji AR (1996), "Introduction to Engineering Experimentation", Prentice Hall, 417p.
2. Malhotra and Carino, "Handbook of Nondestructive Testing of Concrete", CRC Press, 1991
3. Montgomery, DC and Runger, GC (2003), "Applied Statistics and probability for engineers", 3rd Ed., John Wiley & Sons, 922p.
4. Goupy J. (2005), "Practicing experimental designs". Dunod. Paris. 551p.
5. Placko D. (2000), "Fundamentals of Instrumentation and Measurement", Hermes Science Europe Ltd, 555p.
6. Engineering technique

Semester: 2
Teaching unit: UET 1.2
Subject: Respect forstandards and rules of ethics and integrity.
VHS: 10:30 p.m. (Class: 1h30)
Credit: 1
Coefficient: 1

Teaching objectives:

Develop students' awareness of respect for ethical principles and the rules that govern life at university and in the world of work. Raise awareness about respecting and valuing intellectual property. Explain to them the risks of moral evils such as corruption and how to combat them, alert them to the ethical issues raised by new technologies and sustainable development.

Recommended prior knowledge:

Ethics and professional conduct (the foundations)

Content of the material:

A.The respect of the rulesethics and integrity,

1. **Reminder on the MESRS Charter of Ethics and Professional Conduct:**Integrity and honesty. Academic freedom. Mutual respect. Requirement for scientific truth, objectivity and critical thinking. Equity.Rights andobligationsof the student,the teacher, administrative and technical staff,

2. Integrity and responsible research

- Respect for ethical principles in teaching and research
- Responsibilities in teamwork: Professional equality of treatment. Conduct against discrimination. The search for the general interest. Inappropriate conduct in the context of collective work
- Adopt responsible conduct and combat abuses: Adopt responsible conduct in research. Scientific fraud. Conduct against fraud. Plagiarism (definition of plagiarism, different forms of plagiarism, procedures to avoid unintentional plagiarism, detection of plagiarism, sanctions against plagiarists, etc.). Falsification and fabrication of data.

3. Ethics and professional conduct in the world of work:

Legal confidentiality in business. Loyalty to the company. Responsibility within the company, Conflicts of interest. Integrity (corruption in the workplace, its forms, its consequences, methods of combating and sanctions against corruption)

B- Intellectual property

I- Fundamentals of intellectual property

1- Industrial property. Literary and artistic property.
2- Rules for citing references (books, scientific articles, communications in a congress, theses, dissertations, etc.)

II- Copyright

1. **Copyright in the digital environment**

Introduction. Copyrightdatabases, software copyright.Specific case of free software.

2. Copyright in the Internet and e-commerce

Domain name law. Intellectual property on the internet. E-commerce site law. Intellectual property and social networks.

3. Patent

Definition. Rightsin a patent. Usefulness of a patent. Therepatentability. Patent applicationin Algeria and around the world.

III- Protection and valorization of intellectual property

How to protect intellectual property. Violation of rights and legal tool. Vvaluation of intellectual property. Protection of intellectual propertyin Algeria.

C. Ethics, sustainable development and new technologies

Link between ethics and sustainable development, energy saving, bioethics and new technologies (artificial intelligence, scientific progress,Humanoids, Robots, drones,

Evaluation method:

Review: 100%

Bibliographic references:

1. Charter of university ethics and professional conduct,https://www.mesrs.dz/documents/12221/26200/Charte+fran__ais+d__f.pdf/50d6de61-aabd-4829-84b3-8302b790bdce
2. Orders No. 933 of July 28, 2016 setting the rules relating to the prevention and fight against plagiarism
3. The ABCs of Copyright, United Nations Educational, Scientific and Cultural Organization (UNESCO)
4. E. Prairat, On teaching ethics. Paris, PUF, 2009.
5. Racine L., Legault GA, Bégin, L., Ethics and engineering, Montreal, McGraw Hill, 1991.
6. Siroux, D., Deontology: Dictionary of Ethics and Moral Philosophy, Paris, Quadrige, 2004, p. 474-477.
7. Medina Y., Ethics, what will change in the company, Editions d'Organisation, 2003.
8. Didier Ch., Thinking about the ethics of engineers, Presses Universitaires de France, 2008.
9. Gavarini L. and Ottavi D., Editorial. of professional ethics in training and research, Research and training, 52 | 2006, 5-11.
10. Caré C., Morality, ethics, deontology. Administration and education, 2nd quarter 2002, n°94.
11. Jacquet-Francillon, François. Concept: professional ethics. The telemaque, May 2000, n° 17
12. Carr, D. Professionalism and Ethics in Teaching. New York, NY Routledge. 2000.
13. Galloux, JC, Industrial property law. Dalloz 2003.
14. Wagret F. and JM., Patent of invention, trademarks and industrial property. PUF 2001
15. Dekermadec, Y., Innovating through patents: a revolution with the internet. INSEP 1999
16. AEUTBM. The engineer at the heart of innovation. Belfort-Montbéliard University of Technology
17. Fanny Rinck etléda Mansour, literacy in the digital age: copying and pasting among students, University of Grenoble 3 and University of Paris-Ouest Nanterre la Défense Nanterre, France
18. Didier DUGUEST IEMN, Cite your sources, IAE Nantes 2008
19. Similarity detection software: a solution to electronic plagiarism? Report of the Working Group on Electronic Plagiarism presented to the CREPUQ Subcommittee on Pedagogy and ICT
20. Emanuela Chiriac, Monique Filiatrault and André Régimbald, Student guide: intellectual integrity plagiarism, cheating and fraud… avoiding them and, above all, how to properly cite your sources, 2014.

21. Publication of the University of Montreal, Plagiarism prevention strategies, Integrity, fraud and plagiarism, 2010.
22. Pierrick Malissard, Intellectual property: origin and evolution, 2010.
23. The website of the World Intellectual Property Organizationwww.wipo.int
24. http://www.app.asso.fr/

III - Detailed program by subject for the S3 semester

Semester: 3
Teaching unit: UEF 2.1.1
Material1: Composite materials
VHS: 45h00 (Class: 1h30, 1h30 TD)
Credits: 4
Coefficient: 2

Teaching objectives:

Obtain basic knowledge of composite materials. Acquire the fundamental notions for developing composites and subsequently address all the problems of sizing laminated or sandwich structures.

Recommended prior knowledge:

Organic chemistry, Building materials,Resistance of materials, Mechanics of continuous media

Content of the material:

1. General

History, definition, classification and uses of composites

2-Composition of composites

Reinforcements or reinforcing fibers
Matrices (resins)
Admixtures
Laminates (multi-layer)

3-Composite manufacturing technology

4-Properties of composites

Elastic Properties, Fracture Properties and Chemical Properties

5-Behavior of composites to interior and exterior actions

Evaluation method:

Continuous monitoring: 40%; Review:60%.

Bibliographic references: (If possible):

JM Berthelot “Composite materials” Ed. Lavoisier, 2005.
N. Bahlouli “Composite materials”
http://www-ipst.u-strasbg.fr/nadia/courcomp/comp1.htm
J. Molimard “mechanics of composite materials” version 2, September 2004.
D. Guy “Composite materials”

Semester: 3
Teaching unit: UEF 2.1.1
Material1: Recycled materials
VHS: 45h00 (Class: 1h30, tutorial: 1h30)
Credits: 4
Coefficient: 2

Teaching objectives:

Make students aware of the importance of waste recycling in the context of environmental protection and sustainable development

Recommended prior knowledge:

MDC, Concrete technology, Innovative concretes

Content of the material:

Waste management
- Definition of waste
- Collection, transport and storage
- Waste treatment
- Costs in waste management

Assessment of environmental impacts
- Life cycle and sustainable development
- Industry by-products and their recovery in civil engineering
- Blast furnace slag, steelworks slag and fly ash

Recycling
- Recycling, definition and issues
- Alternative materials; deposits and management
- Concrete recycling
- Recycling of the cement industry
- Recycling in the field of pavements
- Environmental approach to concrete production

Waste recovery
- Sludge from wastewater treatment plants
- Dredging/cleaning sludge
- The rubber

Construction waste

Evaluation method:

Continuous monitoring: 40%; Exam: 60%.

Bibliographic references:

Semester: 3
Teaching unit: UEF 2.1.1
Material 1: Prestressed concrete
VHS: 45h00 (Class: 1h30, 1h30 TD)
Credits: 4
Coefficient: 2

Teaching objectives:

Know the general principle, the materials used, and the prestressing modes, calculate the prestressing losses and dimension a concrete section as well as the prestressing force with respect to normal stresses.

Recommended prior knowledge:

Knowledge of the resistance of materials and calculations of reinforced concrete.

Content of the material:

Chapter 1 :

General:
General principle of prestressing,
Materials used in prestressing,
Prestressing modes.

Chapter 2 :

Prestressing losses: Instantaneous losses, deferred losses, construction losses, pretension losses.

Chapter 3:

Calculation of isostatic beams at the service limit state: Calculation section, load combination, verification class, justification of normal stresses, dimensioning of sections, dimensioning of the prestressing force, trace of cables, longitudinal passive reinforcement, justification of tangential constraints.

Chapter 4:

Resistance of a beam section at the ultimate limit state: combination of loads and behavior of materials, calculation of moment of resistance, justification of tangential stresses

Chapter 5:

Constructive provisions

Evaluation method:

Continuous monitoring: 40%; Exam: 60%.

Bibliographic references: (If possible):

Georges Dreux, Practical course in prestressed concrete, BPEL Rules 83, 1983.
LACROIX (R.) and FUENTES (A.). – The prestressed concrete project. Eyrolles (1975).
TUNA BOAT (H.). – Prestressed concrete in limit states. ENPC Press (1985).
CHAUSSIN (R.), MAHUT (B.) and LEBLANC (J.-Y.). – BPEL 83 user guide. SETRA (1985).
CALGARO (J.-A.) and VIRLOGEUX (M.). – Project and construction of bridges. Structural analysis of bridge decks. ENPC Press (1989).

Semester: 3
Teaching unit: UEF 2.1.2
Subject 1: Durability of materials
VHS: 45h00 (Class: 3h00)
Credits: 4
Coefficient: 2

Teaching objectives:

Understanding the factors and aggressive environments and the means to implement to protect buildings against degradation

Recommended prior knowledge:

Construction materials, Mineral binders, Concrete technology, Innovative materials, Mineral chemistry

Content of the material:

Chapter 1 : Aggressive agents and modes of action
- Classification of aggressive environments
- Modes of action of agents
- Basic mechanisms of interaction between aggressive agents and concrete
- Porosity and cracking: concrete durability factors

Chapter 2:Permeability and diffusion in concrete
- Modes of transport of matter
- Water – porous medium interactions
- Permeability and diffusion in concrete: influential parameters
- Influence of hydrate stability on concrete durability
- Stability of hydrates in aggressive environments

Chapter 3:Durability of concrete against aggressive agents
- Carbonation of concrete
- Durability of concrete in an acidic environment
- Durability of concrete in a sulfate environment
- Attack on concrete by chlorides
- Concreting in hot climates

Chapter 4: Concreting in hot and cold climates

Chapter 5:Durability of steels
- Corrosion of reinforcements
- Failure of steels by flow
- Failure of steels by cracking
- Steel fatigue
- Creep and relaxation of steels

Chapter 6:**Durability of wood**
- Insect damage
- Marine xylophages
- Mushroom Growth

Evaluation method:

Review: 100%.

Bibliographic references:

Semester 3
Teaching unit: UEF 2.1.2
Material 1: Innovative concretes 2
VHS: 10:30 p.m. (Class: 1h30)
Credits: 2
Coefficient: 1

Teaching objectives:

Deal with and learn the different types of innovative concretes that can be used for particular cases.

Recommended prior knowledge:

MDC, Concrete technology, Innovative concretes 1

Content of the material:

Chapter 1 :mass concrete

Chapter 2 :pavement concretes

Chapter 3: pre-use concrete

Chapter 4:refractory concretes

Chapter 5: :sprayed concrete

Chapter 6:pumped concrete

Evaluation method:

Review: 100%.

Bibliographic references:

Semester: 3
Teaching unit: UEM 2.1
Subject 1: Finite elements
VHS: 452h00 (Class: 1h30, tutorial: 1h30)
Credits: 4
Coefficient: 2

Teaching objectives:

Familiarization with the finite element method (FEM). Master the basic principles of MEF. Be able to solve problems in the field of structural calculations. Use of the finite element method in the linear domain. Learn to program and raise awareness of the proper use of finite element codes.

Recommended prior knowledge:

Elasticity and r modulesresistance of materials, digital methods and computer science of the license.

Content of the material:

Chapter 1 : Approximation methods

1. The weighted residual method, the collocation method, the least squares method, the Galerkin method,
2. Variational calculus, the Euler-Lagrange equation, the Ritz method, Strong and weak formulation.
3. Applications: solving an ordinary differential equation of order one and two

Chapter 2 : Principles of the finite element method

1. Nodal approximation – shape functions,
2. Elemental warp energy,
3. Elementary work of volume and surface forces,
4. Principle of virtual work and the principle of minimum potential energy

Chapter 3 Bar and spring elements

1. Spring element, linear spring, spiral spring
2. Local-global numbering, connectivity table, Assembly of elementary matrices.
3. Bar element, Governing equation, Direct formulation of the element.
4. Elementary stiffness matrices for a flat bar (2D bar), treatment of distributed loads, single, double, embedded and inclined support conditions.
5. 3D space bar element.
6. Applications: Spring systems, combined bar-spring systems, truss systems, space truss.

Chapter 4: Beam elements

1. Introduction and applications, General equation of plane beams.
2. Plane beam element with 2 nodes (Bernoulli beam), elementary stiffness matrix and load vector
3. Elementary rigidity matrix of the generalized plane beam (flexion, traction and compression), transformation of the rigidity matrix and the load vector, calculation of reactions and stresses, treatment of distributed loads, equivalent loads, temperature effect, settlement effect supports.
4. Timoshenko beam, universal beam.
5. Space beam element (3D).
6. Applications: continuous beam, gantry in 2D and 3D.

Chapter 5: Isoparametric elements

1. General introduction, mesh issues

2. Geometric transformation
3. Families of elements, Family C0, Family C1,
4. Basic characteristics
5. Numerical integration, Gaussian integration.

Evaluation method:

Continuous monitoring: 40%; Exam: 60%.

Bibliographic references:

1. The finite element method, Zienckiewicz OC and RL Taylor., McGraw Hill, 1989. 4th edition, 2 volumes.
2. Finite Element Procedures, Bathe KJ, Prentice Hall, 1996.
3. An Introduction to the Finite Element Method, Reddy, JN, McGraw Hill, 2005, 3rd edition.
4. A presentation of the finite element method, Dhatt G. and Touzot G., Maloine, 1981.
5. Finite Element Method, Dhatt G., Touzot G., and Lefrançois E., Wiley, 2012.
6. Finite element modeling: Courses and corrected exercises, Jean-Charles Craveur, Dunod, 2008 (3rd edition).
7. Finite element method, Practical approach in structural mechanics, Cazenave M., Dunod, 2010.
8. MATLAB Codes for Finite Element Analysis Solids and Structures, Ferreira AJM, Springer 2009.
9. The finite element method using Matlab, Young WK and Hyochoong B., CRC Press, 1997.
10. The Finite Element Method, A Practical Course, Liu GR and Quek SS, Butterworth-Heinemann, 2003.

Semester: 3
Teaching unit: UEM 2.1
Material2: TP material durability
VHS: 10:30 p.m. (TP: 2:30 a.m.)
Credits: 3
Coefficient: 2

Teaching objectives:
Understand material degradation phenomena and become familiar with durability testing

Recommended prior knowledge:
MDC, Concrete technology, Innovative concretes

Content of the material:

TP 1: Absorption by immersion and capillarity
TP 2:. Permeability of concrete

TP 3: Porosity

TP 4: Attack of concrete by sulfates

TP 5: Attack of concrete by acids

TP 6: Attack by chlorine ions

Evaluation method:
Continuous control: 100%

Bibliographic references:

Semester: 3
Teaching unit: UEM 2.1
Material 1: innovative concrete works
VHS: 10:30 p.m. (TP: 1:30 a.m.)
Credits: 2
Coefficient: 1

Teaching objectives:

The formulation of an innovative concrete and understanding the influential factors in the implementation of these concretes. Become familiar with innovative concretes

Recommended prior knowledge:

MDC, Concrete technology, Innovative concretes

Content of the material:

TP 1: High performance concrete

TP 2: Self-placing concrete

TP 3: Fiber concrete

TP 4: Reactive powder concrete

TP 5: Lightweight concretes.

TP 6: Heavy concrete.

TP 7: Concrete made from recycled aggregates.

Evaluation method:

Continuous control: 100%

Bibliographic references:

Semester: 3
Teaching unit: UET 1.3
Subject 1:Documentary research and dissertation design
VHS: 10:30 p.m. (Class: 1h30)
Credits: 1
Coefficient: 1

Teaching objectives:
Give the student the necessary tools to search for useful information to better use it in their end-of-studies project.Help them go through the different stages leading to the writing of a scientific document. Tell himthe importance of communication and itlearn to present the work carried out in a rigorous and educational manner.

Recommended prior knowledge:
Writing methodology, Presentation methodology.

Content of the subject:

Part I-: Documentary research:

Chapter I-1: Definition of the subject (02 Weeks)
- Subject title
- List of keywords relating to the subject
- Gather basic information (acquisition of specialized vocabulary,meaning of terms, linguistic definition)
- The information sought
- Take stock of your knowledge in the field

Chapter I-2:Select information sources (02 Weeks)
- Type of documents (Ldrunk, Theses, Memoirs, Periodical articles, Conference proceedings, Audiovisual documents, etc.)
- Type of resources (Libraries, Internet, etc.)
- Evaluate the quality and relevance of information sources

Chapter I-3:Locate documents (01 Week)
- Research techniques
- Search operators

Chapter I-4: To process information (02 Weeks)
- Work organization
- Starting questions
- Summary of documents retained
- Links between different parties
- Final plan of the documentary research

Chapter I-5: Presentation of the bibliography (01 Week)
- Systems for presenting a bibliography (The Harvard system, The Vancouver system, The mixed system, etc.)
- Presentation of documents.
- Citation of sources

Part II: Design of the dissertation

Chapter II-1: Plan and stages of the dissertation (02 Weeks)

- Identify and delimit the subject (Summary)
- Problem and objectives of the dissertation
- Other useful sections (Acknowledgments, Table of abbreviations, etc.)
- The introduction (The writing of*the introduction last)*
- State of the specialized literature
- Formulation of hypotheses
- Methodology
- Results
- Discussion
- Recommendations
- conclusion and perspectives
- Table of contents
- The bibliography
- Annexes

Chapter II-2: Writing techniques and standards (02 Weeks)

- Formatting.Numbering of chapters, figures and tables.
- Cover Page
- Typography and punctuation
- Writing. Scientific language: style, grammar, syntax.
- Spelling.Improved general language skills in terms of comprehension and expression.
- Back up, secure, archive your data.

Chapter II-3:Workshop : Critical study of a manuscript **(01 Week)**

Chapter II-4: Oral presentations and defenses (01 Week)

- How to present a Poster
- How to present an oral communication.
- Defense of a dissertation

Chapter II-5: How to avoid plagiarism? **(01 Week)**

(Formulas, sentences, illustrations, graphs, data, statistics,...)

- The quote
- The paraphrase
- Indicate the complete bibliographic reference

Evaluation method:

Review: 100%

Bibliographic references:

1. *M. Griselin et al., Guide to written communication, 2nd edition, Dunod, 1999.*
2. *JL Lebrun, Practical guide to scientific writing: how to write for the international scientific reader, Les Ulis, EDP Sciences, 2007.*
3. *HAS.Mallender Tanner, ABC of technical writing: instructions for use, user manuals, online help, Dunod, 2002.*
4. *M. Greuter, Write your dissertation or internship report well, L'Etudiant, 2007.*
5. *Mr. Boeglin, reading and writing in college. From the chaos of ideas to structured text. The Student, 2005.*
6. *M. Beaud, the art of the thesis, Editions Casbah, 1999.*
7. *M. Beaud, the art of the thesis, The discovery, 2003.*
8. *M. Kalika, Master's thesis, Dunod, 2005.*

Detailed programs by subject of some Discovery Units (S1, S2, S3)

Semester :
Teaching unit: UED
Material1:Rheology of materials
VHS: 10:30 p.m. (Class: 1h30)
Credits: 1
Coefficient: 1

Teaching objectives:

Understanding the law of behavior of concrete in the fresh state and in the hardened state

Recommended prior knowledge:

Construction materials course taught in the Bachelor's degree course, RDM, binders, concrete

Content of the material:

-Definition of rheology
-Reminders of basic fluid mechanics (simple fluids, viscometric flows, viscoelastic fluids)
-Notions of experimental rheology (the spring, the friction pad, the piston
-Shear movement (model assumptions),
-Viscosities (dynamic viscosity, kinematic viscosity, Influence of thermodynamic properties on viscosity)
-Different rheological behaviors (Newtonian fluids and non-Newtonian fluids (non-linear) and thixotropy
-Rheology of fresh concrete
-Rheology of hardened concrete (laws of behavior: traction, bending, torsion, creep and relaxation)
-Rheology of granular media (interactions between grains, flow situations (free or confined surface), blocking mechanisms: correlations of movements, role of walls
-Rheology of polymers
-Measuring methods and instruments: Viscometers and Rheometers

Evaluation method:

Review: 100%.

Bibliographic references:

GC COUARRAZE and JL GROSSIORD, Introduction to rheology, TECH.DOC edition
J - M TORRENTI, From fresh concrete to hardened concrete - Elements of behavior, engineering techniques.
J-M GEOFFRAY Hydraulic concrete – Implementation – Rheology and maturity of concrete, engineering techniques.

Semester :
Teaching unit: UED
Subject 1: Hydration and structuring of cement pastes
VHS: 10:30 p.m. (Class: 1h30)
Credits: 1
Coefficient: 1

Teaching objectives:

Understand and explain the mechanisms of formation and structuring of hydrates as well as the origin of the mechanical resistance of cements and concretes

Recommended prior knowledge:

Mineral binders, mineral chemistry, physical chemistry

Content of the material:

Chapter 1 -Formation of clinker minerals

Chapter 2 Material structure

Chapter 3- Hydraulicity and hydration theories

Chapter 4 -Origin of mechanical resistance

Chapter 5- Phenomena accompanying hydration

Evaluation method:

Review: 100%.

Bibliographic references:

Semester :
Teaching unit: UED
Subject 1: Experimental design method
VHS: 10:30 p.m. (Class: 1h30)
Credits: 2
Coefficient: 1

Teaching objectives:

Recommended prior knowledge:

Content of the material:

Chapter 1 : Principle of the method

Chapter 2 :2k two-level full factorial designs

Chapter 3:2k–p two-level fractional factorial designs

Chapter 4: Experimental errors

Chapter 5: Other two-level plans

Chapter 6: Second degree plans

Chapter 7: Variance analysis

Chapter 8: Mixing plans

Chapter 9: Software (practical)

Evaluation method:
Review: 100%.

Bibliographic references:

Semester :
Teaching unit: UED
Subject 1: Pathology of constructions
VHS: 10:30 p.m. (Class: 1h30)
Credits: 2
Coefficient: 1

Teaching objectives:

Understanding construction pathologies to be able to repair

Recommended prior knowledge:

MDC, mineral binders, Concrete technology

Content of the material:

Chapter 1 : Evaluation and diagnosis of concrete structures

Chapter 2 : Main construction pathologies

Chapter 3: Construction inspection methods

Chapter 4: The main repair materials

Chapter 5: The main repair techniques

Chapter 6: Reinforcement of buildings

Chapter 7: Construction monitoring and maintenance

Evaluation method:

Review: 100%.

Bibliographic references:

Semester :
Teaching unit: UED
Material1:Organization and management of construction sites
VHS: 10:30 p.m. (Class: 1h30)
Credits: 2
Coefficient: 1

Teaching objectives:

The student must know the methods of internal organization of construction sites, installation of construction sites, management of construction sites and commissioning.

Recommended prior knowledge:

Content of the material:

CHAPTER I: Internal organization of construction sites

CHAPTER II: Installation of construction sites

CHAPTER III: Site management

CHAPTER IV: Commissioning

CHAPTER V: Organization methods

CHAPTER VI: Work planning instruments

Evaluation method:

Review: 100%.

Bibliographic references:

C.CHARTON, Organization and management of building and public works companies. Eyrolles
E.OLIVIER, Technical organization of construction sites. Volume I., EME
E.OLIVIER, Technical organization of construction sites. Volume II. , EME
E.OLIVIER, Technical organization of construction sites. Volume I., EME
JP.BOUSQUET, Potential planning and its application to buildings. Eyrolles