Semester 5

Teaching Unit	Subject Titled	Credits	Coefficient	Weekly number of hours			Semester number of hours (15 Weeks)	Supplementary Work through Consultation (15 weeks)	Assessment Methods	
				Course	**TW**	**PW**			**Continuous Assessment**	**Exam**
Fundamental CU Code : FCU 3.1.1 Credits : 12 Coefficients : 6	Resistance of Materials 2	4	2	1h30	1h30		45h00	45h00	40%	60%
	Reinforced concrete 1	4	2	1h30	1h30		45h00	45h00	40%	60%
	Steel Structures	4	2	1h30	1h30		45h00	45h00	40%	60%
Fundamental CU Code : UEF 3.1.2 Credits : 6 Coefficients : 3	Soil Mechanics 2	4	2	1h30	1h30		45h00	45h00	40%	60%
	Materials of construction 2	2	1	1h30			22h30	27h30		100%
Fundamental CU Code : UEM 3.1 Credits : 9 Coefficients : 5	PW Topography	2	1			1h30	22h30	27h30	100%	
	PW Soil Mechanics 2	2	1			1h30	22h30	27h30	100%	
	PW Materials of Construction 2	2	1			1h30	22h30	27h30	100%	
	Construction Drawing	3	2			2h30	37h30	37h30	100%	
Discovery CU Code : UED 3.1 Credits : 2 Coefficients : 2	Topography 2	1	1	1h30			22h30	02h30		100%
	General Hydraulics	1	1	1h30			22h30	02h30		100%
Transversal CU Code : UET 3.1 Credits : 1 Coefficients : 1	Construction Techniques and Rules	1	1	1h30			22h30	02h30		100%
Semester 5 Total		**30**	**17**	**12h00**	**6h00**	**7h00**	**375h00**	**375h00**		

Semester 6

Teaching Unit	Subject	Credits	Coefficient	Weekly number of hours			Semester number of hours (15 Weeks)	Supplementary Work through Consultation (15 weeks)	Assessment Method	
	Titled			**Course**	**TW**	**PW**			Continuous Assessment	**Examen**
Fundamental CU Code : FCU 3.2.1 Credits : 8 Coefficients : 4	Calcul of structures	4	2	1h30	1h30		45h00	55h00	40%	60%
	Steel Construction	4	2	1h30	1h30		45h00	55h00	40%	60%
Fundamental CU Code : FCU 3.2.2 Credits : 10 Coefficients : 5	Reinforced Concrete 2	6	3	3h00	1h30		67h30	82h30	40%	60%
	Foundations and Geotechnical Structures	4	2	1h30	1h30		45h00	55h00	40%	60%
Methodological CU Code : MCU 3.2 Credits : 9 Coefficients : 5	Graduation project	4	2			3h00	45h00	55h00	100%	
	Computer-Aided Design	3	2			2h30	37h30	37h30	100%	
	Measurement and Cost Estimation	2	1	1h30			22h30	27h30		100%
Discovery CU Code : DCU 3.2 Credits : 2 Coefficients : 2	Roads and Miscellaneous Networks	1	1	1h30			22h30	02h30		100%
	Construction Site Organization	1	1	1h30			22h30	02h30		100%
Transversal CU Code : TCU 3.2 Credits : 1 Coefficients : 1	Professional Project and Business Management	1	1	1h30			22h30	02h30		100%
Semester 5 Total		**30**	**17**	**13h30**	**6h00**	**5h30**	**375h00**	**375h00**		

The assessment methods outlined in these tables are indicative and non-binding; the academic staff of the institution may propose alternative weightings

Semester: 5
Teaching Unit: UEF 3.1.1
Course Title: Strength of Materials 2
Workload: 45h00 (Lecture: 1h30, TW: 1h30)
Credits: 4
Coefficient: 2

Learning outcomes:

This course is intended to deepen students' understanding of strength of materials. It focuses on learning the behavior of structural members under combined loading conditions, determining elastic deformations and internal energy, and introducing the analysis of statically indeterminate (hyperstatic) structures in one-dimensional elements.

Recommended prerequisites:

Strength of Materials 1

Course Contents:

Chapter 1: Combined Loading (5 Weeks)

Combined bending: stress formulation, fully tensioned section, fully compressed section, partially compressed section, and the concept of the core area.
Oblique bending: calculation of moments Mx and My, stress formulation, neutral axis.

Chapter 2: Deformation Analysis and Energy Methods (5 Weeks)

Differential equation of the elastic curve, Analytical method (direct integration), Energy methods: strain energy, Maxwell-Betti reciprocity theorem, Castigliano's theorem, Maxwell-Mohr theorem and application of the Vereschagin theorem, Initial parameters method for beams with constant moment of inertia, Conjugate beam method

Chapter 3: Analysis of Statically Indeterminate Single-Span Beams (2 Weeks)

Definition of a statically indeterminate beam, Solution methods: Initial parameters method, fictitious beam method, Ménabrea's theorem (removal of indeterminacy)

Chapter 4: Analysis of Multi-Span Statically Indeterminate Beams (3 Weeks)

Definition of indeterminacy, Continuous beams, Three-moment equation, Method of points of inflection (method of hinges)

Assessment Method:

Continuous Assessment: 40% , Exam: 60%

Bibliographic References

1. F. Beer, Mécanique à l'usage des ingénieurs – statique, McGraw-Hill, 1981.
2. G. Pissarenko et all, Aide-mémoire de résistance des matériaux.
3. I. Mirolioubov et coll, "Problèmes de résistance des matériaux", Editions de Moscou.
4. L. Aleinik& J. Durler, "Résistance des matériaux", Ed. Spes, Dunod.
5. M. Kerguignas&G. Caignaert, "Résistance des matériaux", Ed. Dunod Université.
6. P. Stepine, Résistance des matériaux, Editions MIR ; Moscou, 1986.
7. S. Timoshenko, Résistance des matériaux, Dunod, 1986.
8. William et Nash, Résistance des matériaux, cours et problème, série Schaum, 1983.

Semester: 5
Teaching unit: FTU 3.1.1
Course Title: Reinforced Concrete 1
Workload:: 45h00 (Course: 1h30, TW: 1h30)
Credits: 4
Coefficient: 2

Learning outcomes:

Teach the physical and mechanical characteristics of reinforced concrete. Learn the dimensioning of sections subjected to simple stresses (traction, compression and simple bending) according to BAEL, CBA93 rules.

Recommended prerequisites:

Resistance of materials 1, Building materials

Course Contents:

Chapter 1. Formulation and Mechanical Properties of Reinforced Concrete ...(2 Weeks)

Definition and General Concepts, Components of Reinforced Concrete, Mechanical Properties.

Chapter 2. Regulatory Requirements (3 Weeks)

Pivot Rule, Limit States, Load Combinations, Non-Brittleness Condition.

Chapter 4. Pure Compression (4 Weeks)

Ultimate Limit State of Resistance, Serviceability Limit State.

Chapter 5. Pure Tension (3 Weeks)

Ultimate Limit State of Resistance, Serviceability Limit State.

Assessment Method:
Continuous Assessment: 40%; Final Exam: 60%

Bibliographic References:

1. D.T.R-B.C.2-41, "Règles de conception et de calcul des structures en béton armé", (CBA 93).
2. Jean- Pierre Mouguin, "Cours de béton armé", B.A.E.L. 91", BERTI Edition.
3. Jean Perchat et Jean Roux, "Maitrise du B.A.E.L. 91 et des D.T.U associés", EYROLLES.
4. Jean Perchat et Jean Roux, "Pratique du B.A.E.L. 91 (Cours avec exercices corrigés)", EYROLLES.
5. Pierre Charon," Exercice de béton armé selon les règles B.A.E.L. 83", EYROLLES, 2ème édition.
6. Jean-Marie Paillé, " Calcul des structures en béton Guide d'application", Eyrolles, 2013.

Semester: 5
Teaching unit: FTU 3.1.1
Course Title: Steel Structure
Workload:: 45h00 (Course: 1h30, TW: 1h30)
Credits: 4
Coefficient: 2

Learning outcomes:

Upon completion of this subject, the acquired knowledge should enable the student to understand the basics of calculating metallic elements and to be familiar with current regulations (EC3 and CCM97), as well as to have a general understanding of the design philosophy and operation of assemblies.

Recommended prerequisites:

Applied mathematics, rational mechanics, Strength of materials 1.

Course Contents:

Chapter 1: General (1week)

Steel in construction, Steel materials, Mechanical properties of steels.

Chapter 2: Basic concepts and safety (3 weeks)

Safety concepts, Characteristic values of actions, Technical approaches in CM calculations, Regulations (CCM97 and Eurocode3), Safety verification principles, Loads and combinations of actions (EC3 and CCM97).

Chapter 3: Assemblies (4 Weeks)

General information on connections, Assembly methods (rivets, bolts, welding), Technological aspects and operating principles.

Chapter 4: Calculation of parts subjected to simple tension (3 Weeks)

Use of tensioned parts, Behavior of tensioned parts, Calculation of the net cross-sectional area, Verification of tensioned parts in ULS, Consideration of the effects of assembly eccentricities in the calculation of tensioned parts.

Chapter 5: Design of Bending Parts (4 Weeks)

Use of bending parts, Elastic calculation of resistance to bending moments, Introduction to plastic design of sections, Resistance to shear force, Verification of bending parts in ULS (bending moments, shear forces, combined forces), Verification of bending parts in SLS (Calculation of deflections).

Assessment Method:

Continuous Assessment: 40%; Final Exam: 60%

Bibliographic References:

1. J. MOREL, "Calcul des Structures Métalliques selon l'EUROCODE 3".
2. "Règles de conception des structures en acier CCM97", Edition CGS,Alger 1999
3. "Eurocode 3 version", 2008
4. J. BROZZETTI, M.A. HIRT, R. BEZ, "Construction Métallique, Exemples Numériques adaptes aux Eurocodes", Presses Polytechni**ques et Universitaires Romandes**
5. S.P. TIMOSHENKO, "Théorie de la Stabilité Elastique", DUNOD.

Semester: 5
Teaching Unit: UEF 3.1.2
Course Title: Soils Mechanics 2
Workload: 45h00 (Lecture: 1h30, TW: 1h30)
Credits: 4
Coefficient: 2

Learning outcomes:

The goal of this course is to enable students to build on the knowledge acquired in Soil Mechanics 1 in Semester 4. Students will receive instruction on the calculation of stresses in soils, as well as the calculation of settlements and soil consolidation. They will also gain knowledge of the behavior of soils under shear stress and methods of soil exploration.

Recommended prerequisites:

Soil Mechanics 1, Strength of Materials 1.

Course Contents:

Chapter 1. Stresses and Strains (3 Weeks)

Introduction to the mechanics of continuous media, principal stresses, distribution of stresses based on the orientation of planes around a point, Mohr's Circle, concept of effective stress (Terzaghi's Principle), geostatic stresses in soil.

Chapter 2. Settlement and Soil Consolidation (5 Weeks)

Determination of stresses due to surcharge, Boussinesq's Theory (Point and distributed loads), settlement magnitudes: instantaneous settlement, primary settlement, and secondary settlement, soil compressibility: characteristics of the compression curve, determination of the compression curve through laboratory tests, Terzaghi's one-dimensional consolidation theory.

Chapter 3. Shear Strength of Soils (4 Weeks)

Concepts on soil plasticity, intrinsic curve, laboratory shear tests: Casagrande box test and triaxial test (determination of cohesion and internal friction angle of a soil), drained and undrained behavior: distinction between granular soils and fine-grained soils.

Chapter 4. Soil Exploration and Investigation (3 Weeks)

The importance of an exploration campaign in a civil engineering project, general outline of a geotechnical study, geophysical exploration, geotechnical exploration, tools and techniques for sampling.

Assessment Method:

Continuous Assessment: 40% , Exam: 60%

Bibliographic References

1. COSTET J. ET SANGLERAT G, "Cours pratique de mécanique des sols", Dunod, 1981.
2. AMAR S., MAGNAN J.P , « Essais de mécanique des sols en laboratoire et en place », Aide-mémoire, 1980,
3. FILLIAT G, "La pratique des sols et des fondations", Editions du Moniteur. 1981
4. SCHLOSSER F, « Éléments de mécanique des sols, Presses de l'Ecole Nationale des Ponts et Chaussées », 1988.
5. J. COLLAS et M. HAVARD, "Guide de géotechnique: Lexique et Essais", Editions Eyrolles, 1983.

Semester: 5
Teaching Unit: UEF 3.1.2
Course Title: Materials of Construction 2
Workload: 22h30 (Lecture: 1h30)
Credits: 2
Coefficient: 1

Learning outcomes:

The objective is to enable students to build upon the material taught in Semester 4, specifically focusing on concrete components and their behavior in the fresh state (workability) and hardened state (mechanical strengths), while also describing the different types of concrete based on current normative texts. Additionally, students will learn the processes involved in the production of various materials, from raw materials to the final product.

Recommended prerequisites:

During Semester 4, students will have acquired preliminary and basic knowledge of the physical and mechanical characteristics of binders and aggregates. Students will be able to differentiate between the types of mortars.

Course Contents:

Chapter 1. Concrete (7 Weeks)

Definition and classification, physical and/or mechanical properties, additions, admixtures, concrete formulation, fresh concrete tests, hardened concrete tests, concepts on new concretes and their applications.

Chapter 2. Ceramic Products (4 Weeks)

General overview, classification of ceramic products, raw materials, manufacturing of ceramic products (bricks, tiles, wall and floor coverings, sanitary ceramics, etc.).

Chapter 3. Ferrous and Non-Ferrous Metals (2 Weeks)

General overview, properties of metals (physical, chemical, and mechanical), classification of steels according to composition, protection of ferrous metals against corrosion.

Chapter 4. Glass (2 Weeks)

Production, manufacturing process, properties, and uses.

Assessment Method:

Exam: 100%

Bibliographic References

1. Matériaux Volume 1, "Propriétés, applications et conception : cours et exercices : Licence 3, master, écoles d'ingénieurs", Edition, Dunod, 2013.
2. "Adjuvants du béton", Afnor, 2012.
3. "Granulats, sols, ciments et bétons: caractérisation des matériaux de génie civil par les essais de laboratoire : Ecoles d'ingénieurs", Castilla, 2009.
4. G. Dreux, "Le nouveau guide du béton". Editions Eyrolles.
5. "Ciments et bétons actuels", CIIC, Paris, 1987.

Semester: 5
Teaching Unit: UEM 3.1
Course Title: PW Topography
Workload: 22h30 (PW: 1h30)
Credits: 2
Coefficient: 1

Learning outcomes:

The topics covered in the practical works will allow students to apply the theoretical knowledge acquired during the Topography 1 and 2 courses. Students will therefore have the opportunity to carry out all the measurements, calculations, and plotting known in the field of topography.

Recommended prerequisites:

Knowledge acquired in the Topography 1 and 2 courses.

Course Contents:

PW.1: Measurement of Angles and Distances
Angles: horizontal and vertical; Distances: direct method, indirect method.

PW.2: Polygonal Surveying
Site reconnaissance, selection of stations, sketching of reference points, measurements (angles and distances), calculations and plotting.

PW.3: Tachometry
Preparation of field sketch, detailed surveying by radiation, calculations and plotting.

PW.4: Surveying by Abscissas and Ordinate and Quasi-ordinate
Selection of operational lines, measurements, calculations, and plotting.

PW.5: Measurements by Lateral Oblique Angles
Preparation of field sketch, detailed surveying by radiation, calculations and plotting.

PW.6: Setting Out
Setting out alignments: preliminary calculations (office work), setting out on site, setting out a curve, preliminary calculations (office work), setting out on site, setting out a building.

Assessment Method:

Continuous Assessment: 100%

Bibliographic References

1. L. Lapointe, G. Meyer, "Topographie appliquée aux travaux publics, bâtiment et levés urbains", Eyrolles, Paris, 1986.
2. R. D'Hollander, "Topographie générales, tome 1 et 2",Eyrolles, Paris, 1970.
3. M. Brabant, "Maîtriser la topographie", Eyrolles, Paris, 2003.

Semester: 5
Teaching Unit: UEM 3.1
Course Title: PW Soil Mechanics 2
Workload: 22h30 (PW: 1h30)
Credits: 2
Coefficient: 1

Learning outcomes:

The student will have the opportunity to perform practical laboratory tests that are related to the knowledge acquired in the MDS2 course.

Recommended prerequisites:

MDS1 and MDS2..

Course Contents:

Practical Work (TP) 1: Soil Permeability
Constant-head and variable-head permeameters.

Practical Work (TP) 2: Oedometer Compressibility Test

Practical Work (TP) 3: Direct Shear Test using the Casagrande box

Assessment Method:

Continuous Assessment: 100%

Bibliographic References

1. J. Collas et M. havard, "Guide de géotechnique: Lexique et Essais", Editions Eyrolles, 1983.

Semester: 5
Teaching Unit: UEM 3.1
Course Title: PW Materials of Construction 2
Workload: 22h30 (PW: 1h30)
Credits: 2
Coefficient: 1

Learning outcomes:

The primary goal of these practical works is to develop the student's interest in understanding specific properties of materials, in compliance with current standards, and, most importantly, to familiarize them with a key material in civil engineering: concrete. These sessions aim to provide hands-on experience with laboratory techniques.
Having acquired basic knowledge of materials in previous practical works, it is necessary for the student to deepen their understanding through more specific tests on concrete.

Recommended prerequisites:

Construction Materials, Construction Materials Laboratory, Strength of Materials 1

Course Contents:

PW.1: Determination of Fineness Modulus and Fines Content of Sand.

PW.2: Use of the Dreux-Gorisse Method for Determining the Composition of Concrete.

PW.3: Preparation and Testing of Mortars.

PW.4: Workability Test using the Abrams Cone.

PW.5: Crushing Test on Concrete.

PW.6: Non-Destructive Testing.

Assessment Method:

Continuous Assessment: 100%

Bibliographic References

1. G. Dreux, Le nouveau guide du béton, Editions Eyrolles.
2. F. Gorisse, Essais et contrôle des bétons, Editions Eyrolles.

Semester: 5
Teaching Unit: UEM 3.1
Course Title: Building Drawing
Workload: 37h30 (PW: 2h30)
Credits: 3
Coefficient: 2

Learning outcomes:

The student should be able to:

- Enhance their technological "literacy" (understanding and communicating information through graphical means),
- Understand commonly used vocabulary and graphical representation conventions,
- Consider the design/execution link (feasibility).

Recommended prerequisites:

Technical Drawing.

Course Contents:

Chapter 1. Principles of Technical Drawing (3 Weeks)

Conventions of technical drawing (line types, hatching, lettering, formats, title blocks), object representation (scales, orthographic projections, sections, cross-sections, dimensioning, perspectives).

Chapter 2. Building Drawing (4 Weeks)

Terminology and components of architectural drawings, standard scales, naming of façades, floor plans, room identification, sections, working drawings for steel and reinforced concrete frames, plan view representation of slabs and identification of their elements, building dimensioning, schematic and symbolic representation of doors, windows, and ducts in walls, various symbols, page layout and figure arrangement.

Chapter 3. Specific Rules and Conventions for Drawing Presentation (5 Weeks)

Site layout and soil investigation (conventional symbols for terrain, lithological legend for foundation soils, geological cross-sections, soil investigation borehole logs), Masonry (representation principles for different types of masonry), Reinforced and prestressed concrete (formwork and reinforcement plans), Steel structures (general arrangement drawings, connection details).

Chapter 4. Drawing of Sanitation Structures (3 Weeks)

Sanitation works (network plans, general rules for presenting drainage systems).

Assessment Method:

Continuous Assessment: 100%

Bibliographic References

1. G. Kienert et J. Pelletier, "Dessin technique de travaux publics et de bâtiment". Eyrolles.
2. Jean Pierre Gousset, "Techniques des dessins du bâtiment - Dessin technique et lecture de plan Principes et exercices", Editions Eyrolles, 2012.

Semester: 5
Teaching Unit: UED 3.1
Course Title: Topography 2
Workload: 22h30 (Lecture: 1h30)
Credits: 1
Coefficient: 1

Learning outcomes:

By the end of this course, the student should be able to carry out and verify the setting out of a structure or its components on site.

Recommended prerequisites:

Knowledge acquired in the Topography 1 course in Semester 4.

Course Contents:

Chapter 1. Polygonal Traversing (3 Weeks)

Types of polygonal traverses, Closed and open traverses, Traverse adjustment and calculations, Plotting.

Chapter 2. Tachometry (4 Weeks)

Definitions, Application of the tachometric method, Work preparation: Purpose, base documents; Site reconnaissance: Control networks, field sketches; Field work: Survey team organization, field measurements; Office work: Calculations and plotting.

Chapter 3. Surveying by Coordinates and Quasi-Coordinates (2 Weeks)

Definitions, Surveying method, Calculations.

Chapter 4. Lateral Oblique Surveying (2 Weeks)

Definitions, Surveying method, Calculations.

Chapter 5. Setting Out (4 Weeks)

Definitions, Setting out straight alignments, Setting out curves (circular connections), Setting out buildings.

Assessment Method:

Exam: 100%

Bibliographic References

1. A.G.Heerbrugg, "Topographie et navigation, laica – wild GPS system", gosystms 1992
2. L. Lapointe, G. Meyer "Topographie appliquée aux travaux publics, bâtiment et levés urbains", Eyrolles, Paris, 1986.
3. R. D'hollander, "Topographie générales, tome 1 et 2",. Eyrolles, Paris, 1970.
4. M. Brabant, "Maîtriser la topographie",. Eyrolles, Paris, 2003.
5. S. Milles, J. Lagofun, "Topographie et topométrie modernes",. Eyrolles, Paris,1999.

Semester: 5
Teaching Unit: UED 3.1
Course Title: General Hydraulics
Workload: 22h30 (Lecture: 1h30)
Credits: 1
Coefficient: 1

Learning outcomes:

To teach the fundamentals of hydraulics, the fundamental equations of flow, pressure drop assessment, and an introduction to network calculations.

Recommended prerequisites:

Fluid Mechanics.

Course Contents:

Chapter 1. Hydrostatics (2 weeks)
Physical characteristics and properties of liquids, Concept of pressure, Fundamental equation of hydrostatics, Pressure at a point on a wall, Pressure forces on walls

Chapter 2. Fundamental Equations of Hydrodynamics (2 weeks)
Streamlines, Stream Tubes, - Continuity Equations, Bernoulli's Theorem, Venturi Phenomenon, Pitot Tube.

Chapter 3. Dynamics of Real Liquids (3 weeks)
Liquid Flow, Pressure Loss, Generalized Bernoulli Theorem, Energy Diagram

Chapter 4. Flow Regimes in Pipes, Hydraulic Resistances (3 weeks)
Laminar Regime – Turbulent Regime, Reynolds Number, Calculation of Pressure Losses Applying the Manning Equation

Chapter 5. Flow through Orifices (2 weeks)
Flow through Orifices, Flow under Constant Head, Flow under Variable Head

Chapter 6: Free-Floor Flow and Weirs (3 weeks)
Classification of Flows, Geometric Characteristics of Flows, Flow Through Weirs

Assessment Method:

Exam: 100%

Bibliographic References

1. "Mécanique des fluides et hydraulique (cours et problèmes)" série Schaum.
2. Armando Lencastre, "Hydraulique générale", Edition: Eyrolles.
3. Michel Carlier, "Hydraulique générale et appliquée", Edition: Eyrolles.

Semester: 5
Teaching Unit: UET 3.1
Course Title: Construction Techniques and Rules
Workload: 22h30 (Lecture: 1h30)
Credits: 1
Coefficient: 1

Learning outcomes:

This course is divided into two main parts. The first part aims to introduce students to the technical and technological aspects of the construction process. The second part provides an introduction to the basic principles of various regulations applied in the design of civil and industrial structures, with an emphasis on the application of design and verification rules for reinforced concrete structures according to the Algerian seismic code (RPA).

Recommended prerequisites:

Courses taught during Semester 4.

Course Contents:

Chapter 1. Project Development Techniques (1 Week)
Overview of the construction project process; planning and preparatory steps for execution; site selection and layout; geotechnical investigations.

Chapter 2. Site Preparation Techniques (3 Weeks)
Work planning and organization techniques for building sites; staking out and delimiting the site; earthworks and embankments; excavation techniques, well digging, compaction, topsoil stripping, trenching, and shoring; slope profiling.

Chapter 3. Techniques for Constructing Reinforced Concrete Structures (2 Weeks)
Execution techniques for shallow and deep foundations; formwork and reinforcement procedures for building structures.

Chapter 4. Steel and Composite Structures (2 Weeks)
Welding and bolting; assembly of steel structures in buildings and industrial halls.

Chapter 5. Introduction to Construction Regulations (2 Weeks)
General overview and importance of regulations; introduction to construction standards, including BAEL and Eurocodes.

Chapter 6. Seismic Design Code – RPA 99 (2003 Version) (1 Week)
General principles of seismic design in earthquake-prone areas; structure classification criteria.

Chapter 7. Structural Design and Verification of Reinforced Concrete Structures (2 Weeks)
Load combinations; verification for strength, overall stability, and foundation stability; definition and design of joints.

Chapter 8. Specification of Structural Elements (2 Weeks)
Specifications for primary structural elements (columns, beams, floors, slabs, walls, and shear walls); specifications for secondary elements; material specifications.

Assessment Method:

Exam: 100%

Bibliographic References

1. J. MATHIVAT et C. BOITEAU, "Procédés généraux de construction Tome 1 : Coffrage et bétonnage", ENPC, Eyrolles.
2. J. MATHIVAT et FENOUX, "Procédés généraux de construction Tome 2 : Fondation et ouvrages d'art", ENPC,Eyrolles.
3. J. MATHIVATet J. F. BOUGARD, "Procédés généraux de construction Tome 3 : Travaux Souterrains", ENPC, Eyrolles.
4. Règles parasismiques Algériennes RPA 99 version 2003. DTR –BC-2.48.

Semester: 6
Teaching Unit: UEF 3.2.1
Course Title: Calcul of structures
Workload: 45h00 (Lecture: 1h30, TW: 1h30)
Credits: 4
Coefficient: 2

Learning outcomes:

This course is designed to enable students to deepen their knowledge of structural mechanics and to master analytical methods for solving statically indeterminate two-dimensional systems and structures.

Recommended prerequisites:

Strength of Materials I; Strength of Materials II

Course Contents:

Chapter 1. Analysis of Isostatic Truss Systems (4 Weeks)

General principles, Calculation of internal forces in members, Analytical method, Method of joints, Method of sections

Chapter 2. Isostatic Frames (2 Weeks)

General principles, Internal force analysis, Construction of axial force (N), shear force (T), and bending moment (M) diagrams

Chapter 3. Influence Lines (3 Weeks)

Definition and fundamentals of influence lines, Principle of moving loads, Influence lines for isostatic systems: Effect of a concentrated load, Effect of a uniformly distributed load, Influence lines for support reactions, Influence lines for shear forces, Influence lines for bending moments

Chapter 4. Statically Indeterminate Systems (6 Weeks)

Overview of indeterminate structures, Degree of static indeterminacy, Force method, Application of the force method to indeterminate frames

Assessment Method:

Continuous Assessment: 40% , Exam: 60%

Bibliographic References

1. F. Beer, Mécanique à l'usage des ingénieurs – statique, McGraw-Hill, 1981.
2. G. Pissarenko et all, Aide-mémoire de résistance des matériaux.
3. I. Mirolioubov et coll, "Problèmes de résistance des matériaux", Editions de Moscou.
4. L. Aleinik& J. Durler, "Résistance des matériaux", Ed. Spes, Dunod.
5. M. Kerguignas&G. Caignaert, "Résistance des matériaux", Ed. Dunod Université.
6. P. Stepine, Résistance des matériaux, Editions MIR ; Moscou, 1986.
7. S. Timoshenko, Résistance des matériaux, Dunod, 1986.
8. William et Nash, Résistance des matériaux, cours et problème, série Schaum, 1983.
9. R. Soltani, Lignes d'influence des poutres et des arcs isostatiques, O.P.U, 2003.

Semester: 6
Teaching Unit: UEF 3.2.1
Course Title: Steel Construction
Workload: 45h00 (Lecture: 1h30, TW: 1h30)
Credits: 4
Coefficient: 2

Learning outcomes:

At the end of this subject, the knowledge acquired in steel structures (Semester 5) should allow students to complete their general knowledge of elastic instability phenomena in thin sections: theoretical and regulatory aspects.

Recommended prerequisites:

To take this course, students must have completed the CM1 (Grade 5) subject and have some understanding of elastic stability theory

Course Contents:

Chapter 1: Elastic Instability Phenomena (2 Weeks)
Introduction to instability, different types of instability, regulations.

Chapter 2: Design of Parts Loaded in Simple Compression (5 Weeks)
Use of compression parts, buckling theory, buckling length, concepts of slenderness and imperfection, verification of compression parts in ULS.

Chapter 3: Design of Parts Loaded in Compound Buckling (6 weeks)
Theoretical and regulatory aspects of compound buckling (EC3 and CCM97)

Chapter 4: Tilting of Metal Parts (2 Weeks)
Introduction to the tilting phenomenon, Torsional moment of inertia of open profiles, Review of torsion with warping (non-uniform torsion).

Assessment Method:

Continuous Assessment: 40%, Exam: 60%

Bibliographic References

1. Polycopie prépare par l'enseignant.
2. J. MOREL, "Calcul des Structures Métalliques selon l'EUROCODE 3".
3. P. BOURRIER; J. BROZZETTI, "Construction Métallique et Mixte Acier – Béton – Tomes 1 et 2", EYROLLES.
4. M.A. HIRT; R. BEZ, "Construction Métallique – Volumes 10 et 11" - Presses Polytechniques et Universitaires Romandes.
5. "Règles de conception des structures en acier", CCM97 Edition CGS, Alger, 1999.
6. "Calcul pratique des structures métallique", Office des publications universitaires, Alger.
7. J. BROZZETTI; M.A. HIRT; R. BEZ, "Construction Métallique ≪ Exemples Numériques adaptes aux Eurocodes", Presses Polytechniques et Universitaires Romandes.
8. S.P. TIMOSHENKO, "Théorie de la Stabilité Elastique", DUNOD.

Semester: 6
Teaching Unit: UEF 3.2.2
Course Title: Reinforced Concrete 2
Workload: 45h00 (Lecture: 1h30, TW: 1h30)
Credits: 6
Coefficient: 3

Learning outcomes:

Teach the design of common sections (rectangular and T-shaped) under simple and combined loading, including the effects of shear force and torsion.

Recommended prerequisites:

Strength of Materials, Construction Materials, Reinforced Concrete 1.

Course Contents:

Chapter 1. Design of Reinforced Concrete Sections under Pure Bending (3 Weeks)
Rectangular and T-shaped sections. Ultimate limit state of resistance and serviceability limit state.

Chapter 2. Shear Force (3 Weeks)
Design of transverse reinforcement, checks in zones of concentrated loads, verification of punching shear resistance, and checks in junction zones with beam webs.

Chapter 3. Design of Reinforced Concrete Sections under Combined Bending (7 Weeks)
Design of sections for ultimate and service limit states / rectangular and T-shaped sections, buckling of compressed columns.

Chapter 4. Torsion (2 Weeks)
General overview of the torsion phenomenon and verification of concrete and reinforcement (solid and hollow sections).

Assessment Method:

Continuous Assessment: 40%, Exam: 60%

Bibliographic References

1. D.T.R-B.C.2-41, "Règles de conception et de calcul des structures en béton armé", (CBA 93).
2. Jean- Pierre Mouguin, "Cours de béton armé", B.A.E.L. 91", BERTI Edition.
3. Jean Perchat et Jean Roux, "Maitrise du B.A.E.L. 91 et des D.T.U associés", EYROLLES.
4. Jean Perchat et Jean Roux, "Pratique du B.A.E.L. 91 (Cours avec exercices corrigés)", EYROLLES.
5. Pierre Charon," Exercice de béton armé selon les règles B.A.E.L. 83", EYROLLES, 2ème édition.
6. Jean-Marie Paillé, " Calcul des structures en béton Guide d'application", Eyrolles, 2013.

Semester: 6
Teaching Unit: UEF 3.2.2
Course Title: Foundations and Geotechnical Structures
Workload: 45h00 (Lecture: 1h30, TW: 1h30)
Credits: 4
Coefficient: 2

Learning outcomes:

his course aims to provide students with foundational and applied knowledge in geotechnical engineering. By the end, students will be able to analyze and verify the stability of various geotechnical structures, including retaining structures, foundations, and slopes.

Recommended prerequisites:

Soil Mechanics I & II, Strength of Materials I & II, Reinforced Concrete I

Course Contents:

Chapter 1. Limit Equilibrium States (3 Weeks)

Rankine's lower and upper bound equilibrium theories (earth pressure and earth resistance coefficients), Boussinesq's general equilibrium conditions, Prandtl's theory (earth pressure due to surcharge), Determination of failure planes using Mohr's circle for active and passive earth pressures

Chapter 2. Retaining Structures (4 Weeks)

Definition and classification of retaining walls, Earth pressures: active and passive, Stability analysis of retaining walls

Chapter 3. Shallow Foundations (4 Weeks)

Definition and classification of shallow foundations, Bearing capacity theory and calculations

Chapter 4. Slope Stability (4 Weeks)

Introduction to slope stability, Overview of slope stability analysis methods, Concept of safety factor in slope stability

Assessment Method:

Continuous Assessment: 40% , Exam: 60%

Bibliographic References

1. J. Costet ; G. Sanglerat, "Cours pratique de Mécanique des sols", Tome 2, Dunod,1981.
2. G. Sanglerat; B. Cambou, G. Olivari, "Problèmes pratiques de Mécanique des sols, Tome 2, Dunod, 1983.
3. G. Phillipponat, B. Hubert "Fondations et ouvrages en terre", Edition Eyrolles, 1997
4. F. Schlosser, "Elément de Mécanique des sols",2e Ed., Presses des Ponts, 1997
5. F. Schlosser, "Exercices de Mécanique des sols", 2e Ed., Presses des Ponts, 1989
7. Schlosser F., 1988, "Éléments de mécanique des sols", Presses de l'Ecole Nationale des Ponts et Chaussées.

Semester: 6
Teaching Unit: UEM 3.2
Course Title: Graduation project
Workload: 45h00 (Practical Work: 3h00)
Credits: 4
Coefficient: 2

Learning outcomes:

This course contributes to the assimilation of the knowledge outlined in the program. It is particularly dedicated to the practical application of concepts. Its purpose is to foster students' intellectual openness. It is specifically designed to develop a sense of initiative and autonomy in carrying out a project, while intentionally leaving certain aspects open-ended. The project may be undertaken individually or in a group.

Recommended prerequisites:

This course requires a good knowledge of Strength of Materials – Reinforced Concrete – Soil Mechanics – Materials of constructions – Building Drawing – Computer-Aided Design – Foundations and Geotechnical Structures.

Course Contents:

Presentation and description of the project
Presentation of the various steps of project calculation
Design assumptions
Materials used
Codes and standards used
Selection of the structural system
Dimensioning of structural elements (columns, beams) and load assessment
Dimensioning and reinforcement detailing of slabs
Design of secondary elements (e.g., balcony, parapet) and reinforcement detailing
Dimensioning and reinforcement detailing of Stairs
Design and reinforcement detailing of reinforced concrete structural elements
Dimensioning and reinforcement detailing of foundation
Production of plans (formwork drawings, reinforcement detailing, etc.) for the designed elements
Conclusions and perspectives

Assessment Method:

Continuous Assessment: 100%

Bibliographic References

1. A. GUERRIN , R.C. LAUVAUR, "Traité du béton armé Tome 1-3-4-11", Edition Dunod.
2. Jean- Pierre Mouguin, "Cours de béton armé B.A.E.L. 91", BERTI Edition.
3. Jean Perchat et Jean Roux, "Maitrise du B.A.E.L. 91 et des D.T.U associés", EYROLLES.
4. Jean Perchat et Jean Roux, "Pratique du B.A.E.L. 91 (Cours avec exercices corrigés)", EYROLLES.

Semester: 6
Teaching Unit: UEM 3.2
Course Title: Computer-Aided Design
Workload: 37h00 (Practical Work: 2h30)
Credits: 3
Coefficient: 2

Learning outcomes:

To familiarize students with civil engineering calculation software. The student must understand the essential features of a calculation software by working on an existing project. They should be able to master the software interface, correctly input data, and retrieve results.

Recommended prerequisites:

Computer Science 1, 2, and 3..

Course Contents:

Chapter 1. Basic Concepts of Calculation Software (3 weeks)
Operating modes and calculation methods used; closed vs. open software; advantages and limitations of each.

Chapter 2. Getting Started with Available Software (6 weeks)
Interface presentation, work environment, data handling, options, numerical and graphical results, interpretation.

Chapter 3. Study and Monitoring of a Real Project (6 weeks)
Preferably a final-year project.

Assessment Method:

Continuous Assessment: 100%

Bibliographic References

1. User manual of the host software.

Semester: 6
Teaching Unit: UEM 3.2
Course Title: Measurement and Cost Estimation
Workload: 22h00 (Lucture: 1h30)
Credits: 2
Coefficient: 1

Learning outcomes:

The objective of this teaching unit is to provide the student with knowledge of the basic tools for preparing a preliminary estimate and a cost estimate, as well as an understanding of the various measurement procedures.

Recommended prerequisites:

This teaching unit requires essential prerequisites such as Civil Engineering Drawing and CAD (Computer-Aided Design).

Course Contents:

Chapter 1: General Concepts (1 Week)

Definition and purpose of measurement and preliminary estimates, the role of the quantity surveyor in construction, necessity and degree of precision in evaluating works, documents related to measurement and preliminary estimates.

Chapter 2: Acts of Measurement and Preliminary Estimates (2 Weeks)

Summary estimates, cost estimates, attachments, progress reports, accounts, and records.

Chapter 3: Methods of Measurement and Preliminary Estimates (2 Weeks)

Drafting and presentation format of preliminary estimates, order of preliminary estimates; Review of common formulas: measurement of areas and volumes (planes, polyhedra, etc.), measurement of classic volumes – three-level method, Simpson's formula, and Poncelet's formula.

Chapter 4: Application of Preliminary Estimates for Earthworks and Excavations (2 Weeks)

Preliminary estimates for foundation excavations, calculation of earthwork quantities.

Chapter 5: Preliminary Estimates in Masonry (2 Weeks)

Rubble masonry, brick or concrete block masonry.

Chapter 6: Preliminary Estimates for Reinforced Concrete (3 Weeks)

Concrete, formwork, reinforcement.

Chapter 7: Cost Analysis (3 Weeks)

Definition and purpose, breakdown of costs, calculation methods, structure, and presentation of cost breakdowns.

Assessment Method:

Exam: 100%.

Bibliographic References

1. 1. Michel Manteau,"Métré de Bâtiment", 7e Edition, Eyrolles, 1990.
2. 2. Jena-PierreGousset, Jean-Claude Capdebielle, René Pralat, "Le Métré, CAO-DAO avec Autocad- Etude de prix", Editions Eyrolles, 2011.

Semester: 6
Teaching Unit: UED 3.2
Course Title: Roads and Miscellaneous Networks
Workload: 22h00 (Lucture: 1h30)
Credits: 1
Coefficient: 1

Learning outcomes:

In this course, the student will learn about all infrastructure works related to the construction and development of access roads and circulation paths around buildings: roads, sidewalks, bicycle paths, green spaces, public lighting, street furniture, etc.

Recommended prerequisites:

Prior knowledge in construction materials, soil mechanics, technical drawing, and plan reading

Course Contents:

Chapter 1. Road Works (3 Weeks)

Definition, classification, characteristics of roads; Road layout, pavement composition (different layers of pavement); Parking areas (sidewalks, pedestrian paths, curbs, integration of disabled persons; Roads reserved for emergency vehicles, Fire engine access roads, Ladder access roads

Chapter 2. Sanitation (5 Weeks)

Sanitation networks definition, principles and arrangements, Water to be evacuated, quantity and quality, rainwater, runoff water, domestic wastewater, industrial discharges. Sizing of pipes, composition of sanitation networks (collectors and pipes, manholes, inspection chambers, connections), rainwater and runoff collection structures, ancillary structures.

Chapter 3. Miscellaneous Networks (5 Weeks)

Water supply networks (water needs, distribution network (types and materials), connections, fire service and reserves, Electrical distribution network; Fuel gas distribution network; Telecommunication network.

Chapter 4. Green Spaces (2 Weeks)

Green space design, green space components, green space management.

Assessment Method:

Exam: 100%.

Bibliographic References

1. R. Bayon, "Voiries et réseaux divers", Eyrolles.
2. La pratique des VRD. Le moniteur.

Semester: 6
Teaching Unit: UED 3.2
Course Title: Construction Site Organization
Workload: 22h30 (Lecture: 1h30)
Credits: 1
Coefficient: 1

Learning outcomes:

To acquire the theoretical and practical knowledge necessary to manage issues related to the organization and scheduling of construction works.

Recommended prerequisites:

Knowledge gained from the course General Construction Methods.

Course Contents:

Chapter 1. Site Setup (1 Week)

Site installation and preparation, Specific characteristics of construction sites

Chapter 2. Construction Equipment (1 Week)

Equipment and its use, Selection of appropriate equipment, Calculation of equipment productivity, Equipment maintenance

Chapter 3. Work Planning (3 Weeks)

Definition of unit labor time, Equipment productivity, Relationship between unit labor time and equipment productivity, Determination of unit labor times and productivity rates, Calculation of total estimated time for labor and equipment

Chapter 4. Scheduling and Task Sequencing (3 Weeks)

Overview of schedules, Common objectives of scheduling, Different types of schedules, Methods of presenting schedules

Chapter 5. PERT Methodology (3 Weeks)

Definition and graphical representation of PERT networks, Task combination within the PERT network, Conversion of PERT networks into Gantt charts

Chapter 6. Site Management (4 Weeks)

Key site installations, Development of detailed and simplified execution programs, Monitoring of site progress and work inspections

Assessment Method:

Exam: 100%

Bibliographic References

1. "Organisation et conduite des travaux : Partie 1 : Engins et Matériel de chantier", IUT de Saint Nazaire, Département de Génie Civil.
2. Olivier EMILE, "Organisation pratique des chantiers, Tome 1. Collection « Techniciens de la construction ».
3. MEAT, "Etude et préparation de l'ouverture d'un chantier", , INPE, -Rouiba, 1994
4. La méthode de PERT, Federal Electric Corporation. Collection « Techniciens de la construction ».

Semester: 6
Teaching Unit: UET 3.2
Course Title: Professional Project and Business Management
Workload: 22h30 (Lecture: 1h30)
Credits: 1
Coefficient: 1

Learning outcomes:

Prepare for professional integration at the end of undergraduate studies through both individual and group development. Implement a post-bachelor project (further studies or job search). Master the methodological tools required to define a post-bachelor career plan. Prepare for the job search process. Raise awareness of entrepreneurship through an overview of essential management knowledge useful for launching business activities.

Recommended prerequisites:

Basic knowledge + Language skills.

Targeted Competencies:

Ability to analyze and synthesize, Teamwork skills, Effective oral and written communication, Autonomy and time management, Responsiveness and proactiveness

Course Contents:

Chapter 1. Writing a Cover Letter and Resume (3 Weeks)
Chapter 2. Career Research Related to the Field (3 Weeks)
Chapter 3. Conducting Interviews with Industry Professionals (3 Weeks)
Chapter 4. Mock Job Interviews (2 Weeks)
Chapter 5. Individual and Group Presentations & Discussions (2 Weeks)
Chapter 6. Project Development: Giving Meaning to One's Career Path (2 Weeks)

Sequence 1. Introductory Plenary Session

Presentation of module objectives, Overview of available career and education resources, Distribution of an individual sheet to be completed based on selected sector and profession

Sequence 2. Group Work Preparation

Formation of working groups (4 students per group), Distribution of research guidelines, Development of an action plan for conducting professional interviews, Presentation of a sample interview questionnaire

Sequence 3. Field Research and Interviews

Flexible schedule, Each student must submit a signed interview confirmation from a professional to include in their final report

Sequence 4. Group Reflection and Synthesis

Individual presentations and group sharing of research findings, Preparation of a group synthesis to be annexed to each student's final report

Sequence 5. Job Search Preparation

Resume and cover letter writing, Sample recruitment tests and mock interviews

Sequence 6. Focus on Entrepreneurship

Presentation of key entrepreneurial management concepts, Optional: Two sessions on starting a business from idea to implementation, Topics: the role of an entrepreneur, project definition, market and competition analysis, business plan tools, administrative setup steps, basic management principles

Sequence 7. Development of the Individual Post-Bachelor Project
Presentation of the final individual report template, supervised preparation under instructor guidance

Assessment Method:

Exam: 100%

Bibliographic References

1. Patrick Koenblit, Carole Nicolas, Hélène Lehongre, « Construire son projet professionnel », ESF Editeur, 2011.
2. Lucie Beauchesne, Anne Riberolles, « Bâtir son projet professionnel », L'Etudiant, 2002.