Semester3

TeachingUnit	Subject Titled	Credits	Coefficient	Weeklynumber ofhours			Semesternumberofhours (15Weeks)	Supplementary WorkthroughConsultation(15weeks)	AssessmentMethods	
				Course	**TW**	**PW**			Continuous Assessment	Exam
FundamentalCU Code:FCU2.1.1 Crédits:10 Coefficients:5	Mathematics3	6	3	3h00	1h30		67h30	82h30	40%	60%
	Waves andvibrations	4	2	1h30	1h30		45h00	55h00	40%	60%
FundamentalCU Code:FCU2.1.2 Crédits:8 Coefficients:4	Fluid mechanics	4	2	1h30	1h30		45h00	55h00	40%	60%
	Rational mechanics	4	2	1h30	1h30		45h00	55h00	40%	60%
MethodologicalCU Code:MCU2.1 Crédits:9 Coefficients:5	Probability and statistics	4	2	1h30	1h30		45h00	55h00	40%	60%
	Computer Science 3	2	1			1h30	22h30	27h30	100%	
	Technical drawing	2	1			1h30	22h30	27h30	100%	
	PWWaves andvibrations	1	1			1h00	15h00	10h00	100%	
DiscoveryCU Code:DCU2.1 Crédits:2 Coefficients:2	Basic technology	1	1	1h30			22h30	02h30		100%
	Metrology	1	1	1h30			22h30	02h30		100%
TransversalCU Code:TCU2.1 Crédits:1 Coefficients:1	Technical English	1	1	1h30			22h30	02h30		100%
Semester3Total		**30**	**17**	**13h30**	**7h30**	**4h00**	**375h00**	**375h00**		

Semester4

TeachingUnit	Subject Titled	Credits	Coefficient	Weeklynumber ofhours			Semesternumberofhours (15Weeks)	SupplementaryWorkthroughConsultation(15weeks)	AssessmentMethods	
				Course	**TW**	**PW**			Continuous Assessment	Exam
UEFondamentale Code:UEF2.2.1 Crédits:6 Coefficients:3	Soil mechanics	4	2	1h30	1h30		45h00	55h00	40%	60%
	Building materials	2	1	1h30			22h30	27h30		100%
UEFondamentale Code:UEF2.2.2 Crédits:8 Coefficients:4	Mathematics4	4	2	1h30	1h30		45h00	55h00	40%	60%
	Numerical methods	4	2	1h30	1h30		45h00	55h00	40%	60%
UEFondamentale Code:UEF2.2.3 Crédits:4 Coefficients:2	Resistanceof Materials	4	2	1h30	1h30		45h00	55h00	40%	60%
MethodologicalCU **Code:**MCU**2.2 Crédits:9 Coefficients:5**	PWSoil mechanics	2	1			1h30	22h30	27h30	100%	
	PW Building materials	2	1			1h30	22h30	27h30	100%	
	Computer-Aided design	2	1			1h30	22h30	27h30	100%	
	PWNumerical methods	2	1			1h30	22h30	27h30	100%	
	PWFM&RM	1	1			1h00	15h00	10h00	100%	
DiscoveryCU **Code:**DCU**2.2 Crédits:2 Coefficients:2**	Geology	1	1	1h30			22h30	02h30		100%
	Topography	1	1	1h30			22h30	02h30		100%
TransversalCU **Code:**TCU**2.2 Crédits:1 Coefficients:1**	Expression and communication techniques	1	1	1h30			22h30	02h30		100%
Semester4Total		**30**	**17**	**12h00**	**6h00**	**7h00**	**375h00**	**375h00**		

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: 3
Teaching Unit: UEF 2.1.1
Subject 1: Mathematics 3
Teaching Hours: 67h30 (Lecture: 3h00, Tutorial: 1h30)
Credits: 6
Coefficient: 3

Course Objectives:

By the end of this course, the student should be able to understand the different types of series and their conditions of convergence as well as the different types of convergence.

Recommended Prerequisites:

Analysis 1 & 2 and Algebra 1 & 2

Course Content:

Chapter 1: Simple and Multiple Integrals — **3 weeks**

1.1 Review of Riemann integrals and calculate primitives.
1.2 Double and triple integrals.
1.3 Applications to calculate area, volume, etc.

Chapter 2: Improper Integrals — **2 weeks**

2.1 Integrals of functions defined over unbounded intervals.
2.2 Integrals of functions defined over bounded intervals, with infinite values at one endpoint.

Chapter 3: Differential Equations — **3 weeks**

3.1 Review of ordinary differential equations.
3.2 Partial differential equations.
3.3 Special functions.

Chapter 4: Series — **2 weeks**

4.1 Numerical series.
4.2 Sequences and series of functions.
4.3 Power series, Fourier series.

Chapter 5: Fourier Transform — **3 weeks**

5.1 Definition and properties.
5.2 Application to solving differential equations.

Chapter 6: Laplace Transform — **2 weeks**

6.1 Definition and properties.
6.2 Application to solving differential equations.

Evaluation Method:

Continuous assessment: 40%; Final exam: 60%.

BibliographicReferences:

1- F. Ayres Jr, Théorie et Applications du Calcul Différentiel et Intégral - 1175 exercices corrigés, McGraw-Hill.
2- F. Ayres Jr, Théorie et Applications des équations différentielles - 560 exercices corrigés, McGraw-Hill.
3- J. Lelong-Ferrand, J.M. Arnaudiès, Cours de Mathématiques - Equations différentielles, Intégrales multiples, Tome 4, Dunod Université.
4- M. Krasnov, Recueil de problèmes sur les équations différentielles ordinaires, Edition de Moscou
5- N. Piskounov, Calcul différentiel et intégral, Tome 1, Edition de Moscou
6- J. Quinet, Cours élémentaire de mathématiques supérieures 3- Calcul intégral et séries, Dunod.
7- J. Quinet, Cours élémentaire de mathématiques supérieures 4- Equations différentielles, Dunod.
8- M. R. Spiegel, Transformées de Laplace, Cours et problèmes, 450 Exercices corrigés, McGraw-Hill.

Semester: 3
Teaching Unit: UEF 2.1.1
Subject 2: Waves and Vibrations
Total Hours: 45h00 (Lectures: 1h30, Tutorials: 1h30)
Credits: 4
Coefficient: 2

Course Objectives

Introduce students to mechanical vibration phenomena, limited to small-amplitude oscillations for systems with one or two degrees of freedom, and the study of mechanical wave propagation.

Recommended Prerequisite Knowledge

Mathematics 2, Physics 1, and Physics 2

Course Content

Chapter 1: Introduction to Lagrange Equations(2 weeks)

1.1 Lagrange Equations for a Particle

- 1.1.1 Lagrange Equations
- 1.1.2 Conservative Systems
- 1.1.3 Friction Forces Depending on Velocity
- 1.1.4 Time-Dependent External Forces

1.2 Systems with Multiple Degrees of Freedom

Chapter 2: Free Oscillations of Single Degree of Freedom Systems **(2 weeks)**
2.1 Undamped Oscillations
2.2 Free Oscillations of Damped Systems

Chapter 3: Forced Oscillations of Single Degree of Freedom Systems (1 week)
3.1 Differential Equation
3.2 Mass-Spring-Damper System
3.3 Solution to the Differential Equation

- 3.3.1 Harmonic Excitation
- 3.3.2 Periodic Excitation

3.4 Mechanical Impedance

Chapter 4: Free Oscillations of Two Degree of Freedom Systems(1 week)

4.1 Introduction
4.2 Two-Degree-of-Freedom Systems

Chapter 5: Forced Oscillations of Two Degree of Freedom Systems(2 weeks)

5.1 Lagrange Equations
5.2 Mass-Spring-Damper Systems
5.3 Impedance
5.4 Applications
5.5 Generalization to n-Degree-of-Freedom Systems

Chapter 6: One-Dimensional Wave Propagation Phenomena(2 weeks)

6.1 General Concepts and Basic Definitions

6.2 Wave Equation
6.3 Solution of the Wave Equation
6.4 Sinusoidal Progressive Wave
6.5 Superposition of Two Sinusoidal Progressive Waves

Chapter 7: Vibrating Strings (2 weeks)

7.1 Wave Equation
7.2 Harmonic Progressive Waves
7.3 Free Oscillations of a Finite-Length String
7.4 Reflection and Transmission

Chapter 8: Acoustic Waves in Fluids(1 week)

8.1 Wave Equation
8.2 Speed of Sound
8.3 Sinusoidal Progressive Wave
8.4 Reflection and Transmission

Chapter 9: Electromagnetic Waves(2 weeks)

9.1 Wave Equation
9.2 Reflection and Transmission
9.3 Different Types of Electromagnetic Waves

Assessment Method

Continuous Assessment: 40% ;Final Exam: 60%

BibliographicReferences:

1.T.Becherrawy;Vibrations,ondesetoptique;HermesscienceLavoisier,2007
2.T.Becherrawy;Vibrations,ondesetoptique;HermesscienceLavoisier,2010
3.J.Brac;Propagationd'ondesacoustiquesetélastiques;Hermèssciencepubl.Lavoisier,2003.
4.J.Bruneaux;Vibrations,ondes;Ellipses,2008.

Semester: 3
Teaching Unit: UEF 2.1.2
Subject 1: Fluid Mechanics
Total Hours: 45h00 (Lectures: 1h30, Tutorials: 1h30)
Credits: 4
Coefficient: 2

Course Objective

Introduce students to the field of fluid mechanics. The first part of the course focuses on fluid statics. The second part covers the motion of ideal (non-viscous) fluids, and the course concludes with the study of real fluid flow.

Recommended Prerequisite Knowledge

Course Content

Chapter 1: Fluid Properties(3 weeks)

Physical definition of a fluid: States of matter, dispersed matter (suspensions, emulsions)
Ideal fluid, real fluid, compressible and incompressible fluids
Density, specific gravity
Fluid rheology, fluid viscosity, surface tension

Chapter 2: Fluid Statics(4 weeks)

Definition of pressure, pressure at a point in a fluid
Fundamental law of fluid statics
Equipotential surfaces
Pascal's theorem
Calculation of pressure forces: Flat plates (horizontal, vertical, inclined), center of pressure
Instruments for measuring static pressure, atmospheric pressure measurement, barometer
Torricelli's law
Pressure in immiscible superimposed fluids

Chapter 3: Dynamics of Ideal Incompressible Fluids(4 weeks)

Steady flow
Continuity equation
Mass flow rate and volumetric flow rate
Bernoulli's theorem (without and with work exchange)
Applications in flow and velocity measurement: Venturi meter, orifice plates, Pitot tubes, etc.
Euler's theorem

Chapter 4: Dynamics of Real Incompressible Fluids(4 weeks)

Flow regimes, Reynolds experiment
Dimensional analysis, Vaschy-Buckingham theorem, Reynolds number
Head losses: linear and singular losses, Moody diagram
Generalization of Bernoulli's theorem for real fluids

Mode d'évaluation :
Contrôle continu : 40 % ; Examen final : 60 %.

BibliographicReferences:

1-R.Comolet,'Mécaniquedesfluidesexpérimentale',Tome1,2et3,Ed.MassonetCie.
2-R.Ouziaux,'Mécaniquedesfluidesappliquée',Ed.Dunod,1978
3-B.R.Munson,D.F.Young,T.H.Okiishi,'Fundamentalsoffluidmechanics',Wiley&sons.
4-R.V.Gilles,'Mécaniquedesfluidesethydraulique:Coursetproblèmes',SérieSchaum,McGrawHill,1975.
5-C.T.Crow,D.F.Elger,J.A.Roberson,'Engineeringfluidmechanics',Wiley&sons
6-R.W.Fox,A.T.McDonald,'Introductiontofluidmechanics',fluidmechanics'
7-V.L.Streeter,B.E.Wylie,'Fluidmechanics',McGrawHill
8-F.M.White,''Fluidmechanics',McGrawHill
9-S.Amiroudine,J.L.Battaglia,'MécaniquedesfluidesCoursetexercicescorrigés',Ed.Dunod.

Semester: 3
Teaching Unit: UEF 2.1.2
Course Title: Rational Mechanics
Workload: 45h00 (Lecture: 1h30, TD: 1h30)
Credits: 4
Coefficient: 2

Learning outcomes:

Students will be able to distinguish between static, kinematic, and dynamic problems in solid mechanics by the end of the course. They will have the resources necessary to work through these issues using the principles of classical mechanics such as Strength of Materials (RDM) and Analytical Mechanics.

Recommended prerequisites:

Physics 1 and Mathematics 2

Course Contents:

Chapter 1.Mathematical reminders (elements calculation vector) (1 week)
Chapter 2.Generalities and basic definitions (2 weeks)
2.1 Definition and physical meaning of force
2.2 Mathematical representation of the force
2.3 Operations on the forces (composition, decomposition, Force projections)
2.4 Type offorces:Localized, distributed, surface and Volumetric
2.5 Classification of forces: Internal forces, external forces.
2.6 Mechanical models: Material point, Non-deformable solid
Chapter 3.static (3 weeks)
3.1 The axioms of statics
3.2 connections, supportsand reactions
3.3 axioms of connections
3.4 Equilibrium conditions:
3.4.1 System of concurrent forces
3.4.2 Parallel forces
3.4.3 Plane forces
Chapter 4.kinematics of the solid body. (3 weeks)
4.1 Brief reminders on the kinematic quantitiesof the material point.
4.2 Kinematics of the solid body
4.2.1 Pure Translational Movement
4.2.2 Rotation around a fixed axis
4.2.3 Planar movement
4.2.4 Compound movement.
Chapter 5.Mass geometry. (3 weeks)
5.1 Mass of a material system
5.1.1 Continuous system
5.1.2. Discreet system
5.2 Integral formulation of center of mass
5.2.1. Definitions (linear, surface and Volumetric)
5.2.2 Discreet formulation of center of mass
5.2.3 GULDIN's Theorems
5.3. Moment of inertia of solids
5.4. Inertia tensor of solids
5.4.1 Special cases
5.42 Main axes of inertia
5.5. Huygens Theorem
5.6. Moment of inertia of a solid with respect to an arbitrary axis.
Chapter 6.Dynamicsof solidbody.(3 weeks)
6.1 Brief reminders on the dynamic quantitiesof the material point
6.2 Elements of kineticsof solid body:
6.2.1 quantitiesof movement

6.2.2 kineticsMoment
6.2.3 Kineticenergy
6.3 Dynamicequation of solid body
6.4 kineticsMomenttheorem
6.5 Kineticenergytheorem
6.6 Applications :
6.6.1 Case of pure translation
6.6.2 Case of rotation around a fixed axis
6.6.3 Combined case of translation and rotation

Assessment Method:

Continuous Assessment: 40% : Final Exam: 60%

BibliographicReferences

1. Éléments de Mécanique rationnelle. S. Targ. Editions Mir Moscou
2. Mécanique à l'usage des ingénieurs. STATIQUE.Edition Russell. Ferdinand P. Beer
3. Mécanique générale. Cours et exercices corrigés. Sylvie Pommier. Yves Berthaud. DUNOD.
4. Mécanique générale - Théorie et application, Editions série. MURAY R. SPIEGEL schaum, 367p.
5. Mécanique générale – Exercices et problèmes résolus avec rappels de cours, Office des publications Universitaires, Tahar HANI 1983, 386p.

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Semester: 3
Teaching Unit: Fundamental Teaching Unit 2.1
Course 1: Probability & Statistics
VHS: 45h00 (Course: 1h30, Tutorials: 1h30)
Credits: 4
Coefficient: 2

Course Objectives: This module allows students to learn the essential concepts of probability and statistics, namely: statistical series with one and two variables, probability on a finite universe, and random variables.

Recommended Prior Knowledge: Programming basics acquired in Math 1 and Math 2

Course Content:

Part A: Statistics

Chapter 1. Basic Definitions **(1 week)**

Concepts of population, sample, variables, modalities

Different types of statistical variables: qualitative, quantitative, discrete, continuous.

Chapter 2. Statistical Series with One Variable **(3 weeks)**

Frequency, Percentage.

Cumulative counts, cumulative frequency.

Graphical representations: band diagram, pie chart, bar chart. Frequency polygon.Histogram. Cumulative curves.

Position characteristics

Dispersion characteristics: range, variance and standard deviation, coefficient of variation.

Shape characteristics.

Chapter 3. Statistical Series with Two Variables **(3 weeks)**

Data tables (contingency table). Scatter plot.

Marginal and conditional distributions.Covariance.

Linear correlation coefficient.Regression line and Mayer's line.

Regression curves, regression corridor and correlation ratio.

Functional adjustment.

Part B: Probabilities

Chapter 1. Combinatorial Analysis **(1 Week)**

Arrangements, Combinations, Permutations.

Chapter 2. Introduction to Probabilities **(2 weeks)**

Algebra of events, Definitions, Probability spaces, General theorems of probabilities

Chapter 3: Conditioning and Independence **(1 week)**

Conditioning, Independence, Bayes' formula.

Chapter 4. Random Variables **(1 Week)**

Definitions and properties, Distribution function, Mathematical expectation, Covariance and moments.

Chapter 5. Common Discrete Probability Distributions **(1 Week)**

Bernoulli, binomial, Poisson.

Chapter 6. Common Continuous Probability Distributions **(2 Weeks)**

Uniform, normal, exponential

Evaluation Method: Continuous assessment: 40%; Final exam: 60%.

BibliographicReferences:

[1] D. Dacunha-Castelle and M. Duflo. Probabilités et statistiques : Problèmes à temps fixe. Masson, 1982.

[2] J.-F. Delmas. Introduction au calcul des probabilités et à la statistique. Polycopié ENSTA, 2008.
[3] W. Feller. An introduction to probability theory and its applications, volume 1.Wiley and Sons, Inc., 3rd edition, 1968.
[4] G. Grimmett and D. Stirzaker.Probability and random processes. Oxford University Press, 2nd edition, 1992.
[5] J. Jacod and P. Protter.Probability essentials.Springer, 2000.
[6] A. Montfort. Cours de statistique mathématique. Economica, 1988.
[7] A. Montfort. Introduction à la statistique. Ecole Polytechnique, 1991[7] A. Montfort. Introduction à la statistique. Ecole Polytechnique, 1991[7] A. Montfort. Introduction à la statistique. Ecole Polytechnique, 1991

Teaching unit: UEM 2.1
Subject 2: Computing3
VHS: 22h30 (Practical work: 1h30)
Credits: 2
Coefficient:1

Objectives of the subject:

To teach students programming using easy-to-use software (mainly Matlab, Scilab, Maple, etc.).This subject will be a tool for carrying out numerical methods practical work in S4.

Recommended prior knowledge:

Programming basics acquired in Computer Science 1 and 2.

Contents:

TP 1: Presentation of a scientific programming environment (1 week)
TP 2: Script files and Data and variable types (2 weeks)
TP 3: Reading, displaying and saving data (2 weeks)
TP 4: Vectors and matrices (2 weeks)
TP 5: Control instructions (For and While buckles, If and Repeat (2 weeks)
instructions)
TP 6: Function files (2 weeks)
TP 7: Graphics (Managing graphic windows, plotting (2 weeks)
TP 8:Using Toolbox(2 weeks)

Evaluation method:

Continuous Assessment: 100%

BibliographicReferences:

1. ebuter en algorithmique avec MATLAB et SCILAB / Jean-Pierre Grenier, . - Paris :Ellipses,2007 . - 160 p.
2. Scilab de la theorie a la pratique / Laurent Berger, . - Paris : D. Booker, 2014.
3. Programmation et simulation en Scilab / Begyn Arnaud, Gras Herve, Grenier Jean-Pierre, -Paris : Ellipses,2014 . - 160 p.
4. Informatique : programmation et calcul scientifique en Python et Scilabclassespreparatoiresscientifiques 1er et 2e annees / Thierry Audibert, ; Amar Oussalah ; MauriceNivat, . - Paris :Ellipses, 2010 . - 520 p

Semester: 3
Teaching Unit: UEM 2.1
Subject 3: Technical Drawing
Total Hours: 22h30 (Practical Work: 1h30)
Credits: 2
Coefficient: 1

Course Objectives

This course will enable students to acquire the basic principles of part representation in industrial drawing. Furthermore, it will train students to both create and interpret technical drawings.

Recommended Prerequisite Knowledge

(Not specified)

Course Content

Chapter 1: Generalities(2 weeks)

1.1 Purpose of technical drawings and different types of drawings
1.2 Drawing tools and materials
1.3 Standardization (Line types, Lettering, Scale, Drawing formats and folding, Title block, etc.)

Chapter 2: Elements of Descriptive Geometry(6 weeks)

2.1 Fundamentals of descriptive geometry
2.2 Orthographic projections of a point – Point layout – Orthographic projections of a line (general and specific cases) – Line layout – Line traces – Projections of a plane (general and specific positions) – Plane traces
2.3 Views: Selection and layout of views – Dimensioning – Slope and taper – Determining the third view from two given views
2.4 Drawing execution method (layout, 45° line, etc.) – Application exercises and assessment (lab sessions)

Chapter 3: Perspectives(2 weeks)

Different types of perspectives (definitions and purpose) – Application exercises and assessment (lab sessions)

Chapter 4: Sections and Cutaways(2 weeks)

4.1 Sections and standardized representation rules (hatching)
4.2 Projections and sections of simple solids (e.g., cylinder, prism, pyramid, cone, sphere, etc.)
4.3 Half-sections, partial sections, broken sections, technical sections, etc.
4.4 Technical vocabulary (terminology of machined parts, profiles, piping, etc.) – Application exercises and assessment (lab sessions)

Chapter 5: Dimensioning(2 weeks)

5.1 General principles
5.2 Dimensioning, tolerancing, and fits – Application exercises and assessment (lab sessions)

Chapter 6: Introduction to Detail and Assembly Drawings and Bill of Materials(1 week)

Application exercises and assessment (lab sessions)

Assessment Method

Continuous Assessment: 100%

BibliographicReferences:

GuidedudessinateurindustrielChevalierA.EditionHachetteTechnique;
2.Ledessintechnique1erpartiegéométriedescriptiveFelliachid.etBensaadas.EditionOPUAlger;
3.Ledessintechnique2erpartieledessinindustrielFelliachid.etbensaadas.EditionOPUAlger;
4.PremièresnotionsdedessintechniqueAndreRicordeauEditionAndreCasteilla;

Semester: 3
Teaching Unit: UED 2.1
Subject 1: Basic Technology
VHS: 22h30, (course 1h30)
Credits: 1
Coefficient: 1
Semester: 3

Teaching Objectives

This course will enable students to acquire knowledge about the processes for obtaining and manufacturing parts, as well as techniques for their assembly.

Recommended Prior Knowledge

Course Content

Chapter 1: Materials (3 Weeks)
1.1 Metals and alloys and their designations
1.2 Plastics (polymers)
1.3 Composite materials
1.4 Other materials

Chapter 2: Processes for Obtaining Parts Without Material Removal (4 Weeks)
2.1 Casting, Forging, Stamping, Rolling, Drawing, Extrusion, etc.
2.2 Cutting, Bending, and Deep Drawing, etc.
2.3 Sintering and Powder Metallurgy
2.4 Profiles and Pipes (steel, aluminum);
- Workshop visits.

Chapter 3: Processes for Obtaining Parts by Material Removal (4 Weeks)
Turning, Milling, Drilling; Fitting, etc.
Workshop visits and demonstrations.

Chapter 4: Assembly Techniques (4 Weeks)
Bolting, Riveting, Welding, etc.

Assessment Method:

Final Exam: 100%.

BibliographicReferences:

1. Manuel de technologie mécanique, Guillaume SABATIER, et al Ed. Dunod.
2. MemoTech : productique matériaux et usinage BARLIER C. Ed. Casteilla
3. Sciences industrielles MILLET N. ed. Casteilla
4. MemoTech : Technologies industrielles BAUR D. et al , Ed. Casteilla
5. Métrologie dimensionnelle CHEVALIER A. Ed. Delagrave
6. Perçage, fraisage JOLYS R et LABELL R. Ed. Delagrave
7. Guide des fabrications mécaniques PADELLA P. Ed. Dunod
8. Technologie : première partie, Ben Saada S et FELIACHI d. Ed. OPU Alger

Semester: 3
Teaching Unit: UED 2.1
Course Title: Metrology
Total Semester Hours (VHS): 22h30 (Lecture: 1h30 per session)
Credits: 1
Coefficient: 1

Course Objectives:
Teach students the precision criteria for manufacturing and assembling mechanical parts; provide knowledge on selecting appropriate methods and tools for controlling and measuring the dimensions and manufacturing defects of mechanical components.

Recommended Prerequisite Knowledge:
Trigonometry, Optics, and others.

Course Content:
Chapter 1: Introduction to Metrology (2 Weeks)
1.1 Definition of different types of metrology (Scientific (Laboratory), Legal, Industrial)
1.2 Metrological vocabulary, definitions
1.3 National and international metrology institutions

Chapter 2: The International System of Units (SI) (3 Weeks)
2.1 Fundamental quantities and their units of measurement
2.2 Supplementary quantities
2.3 Derived quantities

Chapter 3: Metrological Characteristics of Measuring Instruments (6 Weeks)
3.1 Error and uncertainty (Accuracy, precision, reliability, reproducibility of a measuring instrument)
3.2 Classification of measurement errors: (Raw value; Systematic errors; Corrected raw value)
3.3 Random errors: (Random errors; Parasitic errors; Estimated systematic errors)
3.4 Confidence interval; Technical uncertainty; Total measurement uncertainty
3.7 Complete measurement result
3.8 Identification and interpretation of specifications in a technical drawing for inspection
3.9 Basic concepts on gauges, tools, and simple measuring instruments

Chapter 4: Measurement and Control (4 Weeks)
4.1 Direct measurement of lengths and angles (using rulers, calipers, micrometers, and protractors)
4.2 Indirect measurement (using comparators, calibration blocks)
4.3 Dimensional control (using plugs, jaws)
4.4 Measuring and control machines used in mechanical workshops (using pneumatic comparators, profile projectors, and roughness meters)

Assessment Method:
Final exam: 100%

Bibliographical References:

Semester: 3
Teaching Unit: UET 2.1
Subject 1: Technical English
Total Hours (VHS): 22h30 (Lecture: 1h30)
Credits: 1
Coefficient: 1

Course Objectives:
This course is designed to enable students to attain a level of English proficiency that allows them to use scientific documents and speak about their field and specialization with at least ease and clarity.

Recommended Prerequisites:
English 1 and English 2

Course Content:
Oral comprehension and expression, vocabulary acquisition, grammar, etc. – nouns and adjectives, comparatives, following and giving instructions, identifying things.
Use of numbers, symbols, and equations. Measurements: length, area, volume, power, etc.
Describing scientific experiments.Characteristics of scientific texts.
Note: Courses are taught mostly or entirely in English.

Assessment Method:
Continuous assessment: 40%
Final exam: 60%

BibliographicReferences:

Semester: 4
Teaching Unit: UEF 2.2.1
Subject 1: Soil Mechanics
Total Hours (VHS): 45h00 (Lecture: 1h30, Tutorial: 1h30)
Credits: 4
Coefficient: 2

Course Objectives:
The student will be able to characterize the physical parameters of soils, classify them based on laboratory and in-situ identification tests, and become familiar with water flow in soils.

Recommended Prerequisite Knowledge:
Basic subjects from Semesters 1 and 2

Course Content:

Chapter 1: Introduction to Soil Mechanics (2 weeks)
Purpose of soil mechanics (History and application domains), Definitions of soils, Origin and formation of soils, Soil structure (Granular soils and fine soils).

Chapter 2: Soil Identification and Classification (4 weeks)
Physical characteristics, Particle size analysis, Consistency of fine soils (Atterberg limits), Soil classification.

Chapter 3: Soil Compaction (4 weeks)
Compaction theory, Laboratory compaction tests (Standard and Modified Proctor tests), In-situ compaction equipment and processes, Compaction specifications and control.

Chapter 4: Water in Soil (5 weeks)
Water flow in soils: velocity, gradient, flow rate, Darcy's law, permeability,
Measurement of permeability in laboratory and in-situ, Principle of effective stress,
Study of flow networks.

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

References:

1. COSTET J. and SANGLERAT G, Practical Course of Soil Mechanics, Vol. 1, Dunod, 1981.
2. SANGLERAT G., CAMBOU B., OLIVARI G., Practical Problems in Soil Mechanics, Vol. 1, Dunod, 1983.
3. AMAR S. and MAGNAN J.P., Soil Mechanics Tests in Laboratory and In-Situ, LCPC, 1980.
4. SCHLOSSER F., Elements of Soil Mechanics, 2nd Ed., Presses of E.N.P.C., 1997.

Semester: 4
Teaching Unit: UEF 2.2.1
Subject 1: Building Materials
Total Hours (VHS): 22h30 (Lecture: 1h30)
Credits: 2
Coefficient: 1

Teaching Objectives:
The studentwillbe able to characterize the physical and mechanicalparameters of construction materials.

RecommendedPrerequisiteKnowledge:
All fundamentalsubjectsfrom the commoncore of semesters S1 and S2.

Course Content:

Chapter 1: Generalities (2 weeks)

- History of construction materials
- Classification of construction materials
- Properties of construction materials

Chapter 2: Aggregates (4 weeks)

- Granulometry
- Classification of aggregates
- Characteristics of aggregates
- Different types of aggregates

Chapter 3: Binders (6 weeks)

- Classification
- Air binders (air lime)
- Hydraulic binders (Portland cements)
- Main components and additives

Chapter 4: Mortars (3 weeks)

- Composition
- Different types of mortars (lime mortar, cementmortar)
- Main characteristics

AssessmentMethod:
Exam: 100%

References:

1. MatériauxVolume1,Propriétés,applicationsetconception:coursetexercices:Licence3,master,écoles d'ingénieurs, Edition Dunod,2013.
2. Adjuvantsdubéton,Afnor,2012.
3. Granulats,sols,ciments et bétons : caractérisation des matériauxdegénie civil par les essais delaboratoire: terminaleSTIgéniecivil,BTSbâtiment,BTStravauxpublics,DUTgéniecivil,masterprogéosciencesgéniecivil, écoles d'ingénieurs, Casteilla, 2009.
4. Lespropriétésphysico-chimiquesdesmatériauxdeconstruction:matière&matériaux,propriétésrhéologiques & mécaniques, sécurité & réglementation, comportement thermique, hygroscopique, acoustique et optique, Eyrolles,2012.

Semester: 4
Teaching Unit: UEF 2.2.2
Subject 1: Mathematics 4
Total Hours (VHS): 45h00 (Lecture: 1h30, Tutorial: 1h30)
Credits: 4
Coefficient: 2

Teaching Objectives:
This course focuses on differential and integral calculus of complex-valued functions of a complex variable. The student is expected to master various techniques for solving complex and special functions and integrals.

Recommended Prerequisite Knowledge:
Mathematics 1, Mathematics 2, and Mathematics 3.

Course Content:
Functions of a Complex Variable and SpecialFunctions

Chapter 1: HolomorphicFunctions. Cauchy-Riemann Conditions (3 weeks)

Chapter 2: Power Series (3 weeks)

- Radius of convergence
- Domain of convergence
- Power series expansion
- Analytic functions

Chapter 3: Cauchy'sTheory (3 weeks)

- Cauchy's Theorem
- Cauchy's Formulas

Chapter 4: Applications (4 weeks)

- Equivalence between holomorphy and analyticity
- Maximum Modulus Theorem
- Liouville's Theorem
- Rouché's Theorem
- ResidueTheorem
- Integral calculation using the residue method

Chapter 5: Harmonic Functions (2 weeks)

Assessment Method:
Continuous assessment: 40%; Final exam: 60%

References:

1- HenriCATAN.Théorieélémentairedesfonctionsanalytiquesd'uneouplusieursvariablescomplexes.Editeur Hermann, Paris 1985.
2- JeanKuntzmann.Variablecomplexe.Hermann,Paris,1967.Manueldepremiercycle.3-HerbertRobbinsRichard Courant. WhatisMathematics ? Oxford UniversityPress, Toronto, 1978. Ouvrage classique de vulgarisation.
4-WalterRudin.Analyseréelleetcomplexe.Masson,Paris,1975.Manueldedeuxièmecycle.

Semester: 4
Teaching Unit: UEF 2.2.2
Subject 1: Numerical methods
Total Hours (VHS): 45h00 (Lecture: 1h30, Tutorial: 1h30)
Credits: 4
Coefficient: 2

Teaching Objectives:
Familiarization with numerical methods and their applications in the field of mathematical computations.
Recommended Prerequisite Knowledge:
Mathematics 1, Mathematics 2, Computer Science 1, and Computer Science 2.
Course Content:
Chapter 1: Solving Nonlinear Equations f(x)=0f(x) = 0f(x)=0 (3 weeks)
- Introduction to calculation errors and approximations ; Introduction to methods for solving non linear equations, Bisection method, Method of successive approximations (fixed point),Newton-Raphsonmethod

Chapter 2: Polynomial Interpolation (2 weeks)
- General introduction, Lagrange polynomial, Newton polynomials

Chapter 3: Function Approximation (2 weeks)
- Approximation methods and least squares, Orthogonal and pseudo-orthogonal systems, Approximation using orthogonal polynomials ,Trigonometric approximation

Chapter 4: Numerical Integration (2 weeks)
- General introduction, Trapezoidal rule, Simpson'srule
- Quadrature formulas

Chapter 5: Solving Ordinary Differential Equations (Initial Value Problems or Cauchy Problems) (2 weeks)
- General introduction,Euler'smethod,ImprovedEuler'smethod,Runge-Kuttamethod

Chapter 6: Direct Methods for Solving Systems of Linear Equations (2 weeks)
- Introduction and definitions, Gaussian elimination and pivoting, LU factorization method
- Cholesky decomposition Choeleski MM^t , Thomas algorithm (TDMA) for tridiagonal systems

Chapter 7: Iterative Methods for Solving Systems of Linear Equations (2 weeks)
- Introduction and definitions, Jacobi method, Gauss-Seidel method, Use of relaxation

Assessment Method:
Continuous assessment: 40%; Final exam: 60%
References:

1- C.Brezinski,Introductionàlapratiqueducalculnumérique,Dunod,Paris1988.
2- G.AllaireetS.M.Kaber,Algèbrelinéairenumérique,Ellipses,2002.
3- G.AllaireetS.M.Kaber,IntroductionàScilab.Exercicespratiquescorrigésd'algèbrelinéaire,Ellipses,2002.
4- G.Christol,A.CotetC.-M.Marle,Calculdifférentiel,Ellipses,1996.
5- M.CrouzeixetA.-L.Mignot,Analyse numériquedeséquationsdifférentielles,Masson,1983.
6- S.DelabrièreetM.Postel,Méthodesd'approximation.ÉquationsdifférentielleS.ApplicationsScilab,Ellipses, 2004.
7- J.-P.Demailly,Analysenumériqueetéquationsdifférentielles.PressesUniversitaires deGrenoble,1996.
8- E.Hairer,S.P.NorsettetG.Wanner,SolvingOrdinaryDifferentialEquations,Springer,1993.
9- P.G.Ciarlet,Introductionàl'analysenumériquematricielleetàl'optimisation,Masson,Paris,1982.

Semester: 4
Teaching Unit: UEF 2.2.3
Subject 1: Resistance of Materials
Total Hours (VHS): 45h00 (Lecture: 1h30, Tutorial: 1h30)
Credits: 4
Coefficient: 2

Teaching Objectives:

To learn the fundamental concepts of strength of materials, including the objectives and assumptions of the subject, the concept of internal forces, geometric properties of cross-sections, material behavior laws, the concept of allowable stresses, and the design of components under simple loading conditions.

Recommended Prerequisite Knowledge:

Rational mechanics and function analysis.

Course Content:

Chapter 1: Introduction and General Concepts (2 weeks)

- Objectives and assumptions of strength of materials, Different types of loading, Supports (fixed, hinged, pinned),General principle of equilibrium – Equilibrium equations ,Section method – Concept of internal forces: Normal force (N),Shear force (T),Bending moment (M),Definitions, sign conventions, and units

Chapter 2: Geometric Properties of Cross-Sections (2 weeks)

- Center of gravity, Static moments, Moments of inertia of a cross-section, Transformation of moments of inertia, Principal central axes and principal moments of inertia

Chapter 3: Simple Tension and Compression (3 weeks)

- Definitions, Axial tensile and compressive forces, Normal stress, Elastic deformation, Hooke's Law
- Young's modulus, Stress-strain diagram, Strength condition and concept of allowable stress

Chapter 4: Simple Bending (4 weeks)

- Definitions and assumptions, Shear forces, bending moments, Differential relationship between load, shear force, and bending moment, Shear force and bending moment diagrams, Bending stress in simple bending
- Concept of neutral axis and design, Deflection of a beam under simple bending (concept of deflection)
- Calculation of shear stress

Chapter 5: Shear (2 weeks)

- Definitions,Simpleshear,Pureshear,Shearstress,Elasticsheardeformation,Shearstrength condition

Chapter 6: Torsion (2 weeks)

- Definitions, Tangential or shear stress, Elastic torsional deformation, Torsional strength condition

Assessment Method:

Continuous assessment: 40%; Final exam: 60%

Bibliographic References:

1. F.Beer,Mécaniqueàl'usagedesingénieurs–statique,McGraw-Hill,1981.
2. G.Pissarenkoetall,Aide-mémoirederésistancedesmatériaux.
3. I.Mirolioubovetcoll,"Problèmesderésistancedesmatériaux",EditionsdeMoscou.
4. L.Aleinik&J.Durler,"Résistancedesmatériaux",Ed.Spes,Dunod.
5. M.Kerguignas&G.Caignaert,"Résistancedesmatériaux",Ed.DunodUniversité.
6. P.Stepine,Résistancedesmatériaux,EditionsMIR;Moscou,1986.
7. S.Timoshenko,Résistancedesmatériaux,Dunod,1986.
8. WilliametNash,Résistancedesmatériaux,coursetproblème,sérieSchaum,1983.

Semester: 4
Course Unit: UEM 2.2
Subject1:Practical work Soil Mechanics VHS: 22:30 (Practical work: 1.5 hours)
Credits:2
Coefficient:1

CourseObjectives:

Students will be able to characterize the physical parameters of soils, classify them based on in-situ and laboratory identification tests, and control their compaction.

Recommended prior knowledge:

Soil mechanics course.

Subject content:

- **Measurement of weight characteristics (density–water content)**
- **Measurement of consistency parameters (Atterberglimits)**
- **Particle size analysis (by sieving and sedimentometry)**
- **Measurement of compaction and bearing characteristics (Proctor and CBR tests)**
- **In-situ density measurement (membrane densitometer test)**

Assessment method:
Continuous assessment: 100%.

BibliographicReferences

Semester: 4
Teaching Unit: UEM 2.2
Subject 2: Construction Materials Lab Work
Total Semester Hours: 22h30 (Lab: 1h30 per week)
Credits: 2
Coefficient: 1

Teaching Objectives:
The student will be able to characterize the physical and mechanical parameters of construction materials.

Recommended Prior Knowledge:
Construction materials course.

Course Content:

- ✓ **TP1:**Bulkdensities of cement, sand, and gravel
- ✓ **TP2:**Sieveanalysis of sand and gravel
- ✓ **TP3:** Water content and bulking of sand
- ✓ **TP4:**Porosity of sand and gravel
- ✓ **TP5:**Volumetric coefficient of gravel
- ✓ **TP6:** Sand equivalent test
- ✓ **TP7:**Consistency and setting time test for cement

Evaluation Method:
Continuous assessment: 100%.

Semester: 4
Teaching Unit: UEM 2.2
Subject 3: Computer-Aided Design (CAD)
Total Hours: 22 hours 30 minutes *(Lab: 1h30)*
Credits: 2
Coefficient: 1

Teaching Objectives:

This course will enable students to acquire the fundamental principles of component representation in technical drawing. Moreover, it will allow students to represent and interpret engineering drawings and blueprints.

Recommended Prerequisite Knowledge:

Technical Drawing.

Course Content:

Chapter 1: Introduction to the Chosen Software (4 weeks)

(Solid Works, AutoCAD, CATIA, Inventor, etc.), Introduction and history of CAD, Software configuration (interface, shortcut bars, options, etc.), Reference tools in the software (help resources, tutorials, etc.) ; File saving (part file, assembly file, drawing file, saveprocedures for submission), Communication and interdependence between files

Chapter 2: Sketching Concepts (3 weeks)

- Sketch tools (point, line segment, arc, circle, ellipse, polygon, etc.), Sketch relations (horizontal, vertical, equal, parallel, collinear, fixed, etc.), Sketch dimensioning and geometricconstraints

Chapter 3: 3D Modeling (3 weeks)

- Reference planes (front, right, top planes), Basic features (extrude, cut, revolve), Display tools (zoom, multiple views, multiple windows, etc.), Modification tools (Erase, Offset, Copy, Mirror, Trim, Extend, Move), Creating sectional views of models

Chapter 4: 3D Model Drawing Layout (3 weeks)

- Drawing sheet and title block setup, View selection and layout, Annotations and object properties (hatching, dimensioning, text, tables, etc.)

Chapter 5: Assemblies (2 weeks)

- Assembly constraints (parallel, coincidence, coaxial, fixed, etc.), Creation of assembly drawings
- Drawing layout of assemblies and parts list (bill of materials), Exploded views

Assessment Method:

Continuous assessment: 100%

BibliographicReferences:

1. M.LombardSolidworksbible,EditionWiley,2013
2. Saint-LaurentGiesecke,Dessintechnique,ÉditionsdurenouveaupédagogiqueInc.,1982.

Semester: S4
Teaching Unit: UEM 2.2
Subject 4: Numerical Methods Lab
Total Hours: 22 hours 30 minutes *(Lab: 1h30)*
Credits: 1
Coefficient: 1

Teaching Objectives:
Programming various numerical methods for their application in mathematical computations using a scientific programming language.

Recommended Prerequisite Knowledge:
Numerical Methods, Computer Science 2, and Computer Science 3.

Course Content:

Chapter 1: Solving Nonlinear Equations (3 weeks)

Bisection Method, Fixed-Point Method, Newton-Raphson Method

Chapter 2: Interpolation and Approximation (3 weeks)

Newton Interpolation, Chebyshev Approximation

Chapter 3: Numerical Integration (3 weeks)

Rectangle Method ؛Trapezoidal Method, Simpson's Method

Chapter 4: Differential Equations (2 weeks)

Euler'sMethod,Runge-KuttaMethods

Chapter 5: Systems of Linear Equations (4 weeks)

Gauss-Jordan Method, Crout Decomposition and LU Factorization, Jacobi Method ; Gauss-Seidel Method

Assessment Method:
Continuous assessment: 100%

References:

1. Algorithmiqueetcalculnumérique:travauxpratiquesrésolusetprogrammationavecles logicielsScilab et Python /José Ouin,. -Paris :Ellipses, 2013. -189p.
2. MathématiquesavecScilab:guidedecalculprogrammationreprésentationsgraphiques; conformeaunouveauprogrammeMPSI/BouchaibRadi,;AbdelkhalakElHami.-Paris: Ellipses, 2015 . - 180 p.
3. Méthodesnumériquesappliquées:pourle scientifiqueetl'ingénieur/Jean-PhilippeGrivet,

.-Paris:EDPsciences,2009.-371p.

Semester: 4
Teaching Unit: UEM 2.2
Subject 5: Lab – Materials Strength and Fluid Mechanics (TP MDF & RDM)
Total Lab Hours: 22 hours 30 minutes *(Lab: 1h30)*
Total Course Hours: 45 hours *(Lecture: 1h30, Tutorial: 1h00)*
Credits: 1
Coefficient: 1

Teaching Objectives:
To apply the various concepts studied in the subjects *Fluid Mechanics* (taught in Semester 3) and *Strength of Materials* (taught in the current semester).

Recommended Prerequisite Knowledge:

- **Part I:**FluidMechanics
- **Part II:** Strength of Materials

Course Content:

Part I: Practical Work – Fluid Mechanics

- **Lab 1:**Measurement of the mass density and specific gravity of liquids
- **Lab 2:**Measurement of liquid viscosity
- **Lab 3:**Measurement of liquid pressure and calibration of a manometer
- **Lab 4:**Measurement of hydrostatic force and determination of the center of pressure
- **Lab 5:**Measurement of liquid flow rate

Part II: Practical Work – Strength of Materials

- **Lab 1:**Tensile and compressive testing
- **Lab 2:** Torsion test
- **Lab 3:** Simple bending test
- **Lab 4:** Impact test (resilience)
- **Lab 5:**Hardness test

Assessment Method:
Continuous assessment: 100%

Semester: 4
Teaching Unit: UED2.2
Subject 1: Geology
Total Hours: 22 hours 30 minutes *(Lecture: 1h30)*
Credits: 1
Coefficient: 1

Teaching Objectives:
The student will be able to read and interpret a geological map and understand geotechnical issues. The student will also learn about geophysical methods used in geology.

Recommended Prerequisite Knowledge:
Fundamental subjects from S1, S2, and S3.

Course Content:

Chapter 1: Introduction to Geology (2 weeks)

- Definition of geology, Paleontology, Origin of the Earth, Division of geology

Chapter 2: Minerals and Rocks (4 weeks)

- Basics of mineralogy, Loose rocks, Igneous rocks, Sedimentary rocks, Metamorphic rocks

Chapter 3: Effects of Various Elements on Rocks (3 weeks)

- Action of air on rocks, Action of water on rocks, Action of glaciers on rocks

Chapter 4: Geodynamics (3 weeks)

- Internal geodynamics (earthquakes, volcanoes, etc.) ; External geodynamics (weathering, erosion, landslides, etc.)

Chapter 5: Adaptation of Geological Techniques to Civil Engineering Needs (3 weeks)

- Geological mapping, Use of graphic constructions, Geological survey of discontinuity surfaces, Use of stereographic projection

Assessment Method:
Final exam: 100%

BibliographicReferences:

1. G. BOGOMOLOV,Hydrogéologieetnotionsdegéologied'ingénieur,
2. AurèleParriauxetMarcelArnouldGéologie:Basespourl'ingénieur,2009

1.Roger Cojean et Martine Audiguier, Géologie de l'ingénieur : Engineering geology.. Bilingue français/anglais, 2011

3. Hydrogéologie,géologiede l'ingénieur,ÉditionsduBRGM,1984.
4. FoucaultA.RaoultJ-F(1995)–Dictionnairedegéologie,4édition.EditionsMasson,325p6-PomerolC.,La Gabrielle Y., Renard M. (2005) – Eléments De Géologie, 13e édition. Editions Dunod.

Semester: 4
Teaching Unit: UED 2.2
Subject 2: Topography
Total Hours: 22h30 (Course: 1h30)
Credits: 1
Coefficient: 1

Course Objectives:

The student will be able to understand the fundamentals of topography, enabling them to carry out and subsequently control construction layout, leveling, angle and coordinate measurement, and the drafting of topographic maps.

Recommended Prerequisite Knowledge:

Mathematics; Physics 1; Technical Drawing

Course Content:

Chapter 1: Generalities(3 weeks)

Topography in the construction process, various topographic measuring instruments, scales (plans, maps), faults and errors.

Chapter 2: Distance Measurement(3 weeks)

Direct distance measurement, alignment methods and accuracy, practical measurement, indirect distance measurement.

Chapter 3: Angle Measurement(3 weeks)

Operating principle of a theodolite, setting up a theodolite (adjustment, reading), reading horizontal angles, reading vertical angles.

Chapter 4. Area Determination(3 weeks)

Calculation of the area of a polygon, Determination of the areas of boundaries represented on the plan, Planimeter and area measurement.

Chapter 5. Direct and Indirect Levelling(3 weeks)

Direct Levelling, Indirect Levelling.

Assessment Method:

Exam: 100%.

References:

1.Antoine,P.,Fabre,D.,Topographieettopométriemodernes(Tome1et2)–SergeMillesetJeanLagofun,1999.
2.Bouquillard,CoursDeTopographieBepTech.geoT1,2006
3.Dubois,F.etDupont,G.(1998)précisdetopographie,Principesetméthodes,EditionsEyrollesParis
4.Herman,T.(1997a)Paramètrespourl'ellipsoïde.EditionHermès,Paris
5.Herman,T.(1997b)Paramètrespourlasphère.EditionDujardin,Toulouse
6.Meica(1997),Niveauxnumériques,MiecaGeosystems,Paris

7.Tchin,M.(1976)Topographieappliquée,Coursàl'écoleNationaleSupérieuredesArtsetIndustriesde Strasbourg,SpécialitéTopographie.

Semester: S4
Teaching Unit: UET 2.2
Subject 1: Expression and Communication Techniques
Total Hours: 22h30 (Lectures: 1h30)
Credit: 1
Coe□cient: 1

Teaching Objectives:

This course aims to develop students' skills, both personally and professionally, in the field of communication and expression techniques.

Recommended Prerequisites:

Languages (Arabic, French, English).

Course Content:

Chapter 1: Researching, Analyzing, and Organizing Information

- Identify and use documentation sources, tools, and resources.
- Understand and analyze documents.
- Build and update documentation.

Chapter 2: Improving Expression Skills

- Consider the communication context.
- Produce written messages.
- Communicate orally.
- Produce visual and audiovisual messages.

Chapter 3: Enhancing Communication Skills in Interactive Situations (3 Weeks)

- Analyze interpersonal communication processes.
- Improve face-to-face communication.
- Enhance group communication skills.

Chapter 4: Developing Autonomy, Organization, and Communication Skills in Project-Based Work

- Position oneself in a project and communication approach.
- Anticipate actions.
- Implement a project: Presentation of a practical work report (Homework assignment).

Assessment Method:

Final exam: 100%.

References:

1- Jean-Denis Commeignes 12 méthodes de communications écrites et orale – 4éme édition, Michelle Fayet et Dunod 2013.
2- DenisBaril;Sirey,Techniquesdel'expressionécriteetorale;2008.3-MatthieuDubost Améliorer son expression écrite et orale toutes les clés ; Edition Ellipses 2014.

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.