ULT Civil Engineering

Subjects Modules for S2

Semester 2 Year 1

U2.1: Engineering Tools 2

Calculus

Module designation	**Engineering Tools 2**
Module level, if applicable	1st year
Code, if applicable	U2.1
Subtitle, if applicable	-
Courses, if applicable	Calculus
Semester (s) in which the module is taught	Semester 2 (S2)
Person responsible for the module	Dr Issam Khezami
Lecturer	Slim HOUIMLI
Language	French
Relation to curriculum	Scientific Subject (compulsory), To introduce Numerical Analysis to students that can be used to solve problems in their field of study subjects.
Type of teaching, contact hours	21 hours, of Practical Workshop
Workload	Total 42Hrs/Semester (21 hours of Self Study)
Credit points	1.5 credits
Requirements according to the examination regulations	- Minimum attendance rate: 80% of the total contact hours >20 % of nonattendance = elimination for exams
Recommended prerequisites	-Preparatory Programme (Calculus & Algebra) -Mathematic 1 (Semester 1)
Module objectives/intended learning outcomes	***The objectives of the course*** are to make the students able: 1. To develop the mathematical skills of the students in the areas of numerical methods. 2. To teach theory and applications of numerical methods in a large number of engineering subjects which require solutions of linear systems, finding Eigen values, Eigen vectors, interpolation and applications, solving differential equations. 3. To lay foundation of computational mathematics for post-graduate courses, specialized studies and research. ***Course Outcomes*** 1. Apply numerical methods to find out solution of algebraic equations 2. Apply various interpolation methods and finite difference concepts. 3. Work out numerical differentiation and integration. 4. Work numerically on the ordinary differential equations

Content	**Chapter 1. Direct methods for solving linear systems.** **Chapter 2. Iterative methods for solving linear systems.** **Chapter 3. Polynomial interpolation** **Chapter 4. Digital integration** **Chapter 5. Numerical resolution of differential equations.**
Study and examination requirements and forms of examination	Format: Written Mid-term Exam (40%) + Final Exam (60%)
Media employed	Course Material (Hard/ Soft copy) for Classroom & Online (Moodle ULT)
Reading list	Méthodes d'analyse numérique élémentaire; J. G. Dion, R. Gaudet;

U2.1: Engineering Tools 2
Numerical Analysis

Module designation	**Engineering Tools 2**
Module level, if applicable	1st year
Code, if applicable	U.2.1
Subtitle, if applicable	-
Courses, if applicable	Numerical Analysis
Semester (s) in which the module is taught	-Semester 2 (S2)
Person responsible for the module	Dr Issam Khezami
Lecturer	Phd. Khalil ZAGHDOUDI
Language	French
Relation to curriculum	Professional module (compulsory), (S2)
Type of teaching, contact hours	9 hours of practical Workshop (Computing Laboratory), 12 hours of practical Project (Computing Laboratory),
Workload	Total 42 hours/semester (21 hours of Self-Study/semester)
Credit points	1.5 credits
Requirements according to the examination regulations	- Minimum attendance rate: 80% of the total contact hours >20 % of nonattendance = elimination for exams
Recommended prerequisites	Numerical Analysis, Matrix and linear algebra, Excel
Module objectives/intended learning outcomes	**Objectives:** 1. Students will gain a broad perspective about the uses of computers in engineering. 2. Develops basic understanding of the concept of algorithm and algorithmic thinking. Develops the ability to analyze a problem, develop an algorithm to solve it. **Learning Outcomes:** Students will be able to : 1. To solve problems responding to a specification using Matllab programming based on several examples from practical calculation cases. 2. Learn basics of MATLAB programing 3. Use MATLAB to solve computational problems

Content	**Classroom Lecture and Guide Work-Applied computing II** Session 1 : (9 hours of practical Workshop in Laboratory) **Chapter 1:** Simple Calculations with MATLAB **Chapter 2:** Writing Scripts and Functions **Chapter 3:** Loops and Conditional Statements **Chapter 4:** Root Finding **Chapter 5:** Interpolation and Extrapolation **Chapter 6:** Matrices **Chapter 7:** Numerical Integration **Chapter 8:** Solving Differential Equations **Chapter 9:** Simulations and Random Numbers **Projects : 12 hours of practical Project (Computing Laboratory)** Students are divided into groups of 3 . A project will be assigned to each students group early in the semester. The students will be asked to develop a project plan and will work on project throughout the course. Students groups will work on a given project from the list below. **Proposal 1 :** Polynomial fitting interpolation of an experimental curve by a polynomial model **Proposal 2 :** Solving the equations of transfer, transport and mass phenomena in a continuous medium **Proposal 3 :** Simulation of chemical kinetics conducted in batch, reactor
Study and examination requirements and forms of examination	Format: Oral Presentation Project (100%)
Media employed	Course Material (Hard/ Soft copy) for Laboratory& Online (Moodle ULT) Practical Workshop in Computer Laboratory Video projection
Reading list	Books and handouts, websites,

U2.1: Engineering Tools 2
Operational Research

Module designation	Engineering Tools 2
Module level, if applicable	1st year
Code, if applicable	U2.1
Subtitle, if applicable	
Courses, if applicable	Operational Research
Semester (s) in which the module is taught	Semester 2 (S2)
Person responsible for the module	Dr Issam Khezami
Lecturer	Afef HIDRI
Language	French
Relation to curriculum	Scientific Subject (compulsory), To introduce Operational Research method to students and its applications in several sector.
Type of teaching, contact hours	21 hours, of Integrated Course (Classroom Lecture)
Workload	Total 42Hrs/Semester (21 hours of Self Study)
Credit points	1.5 credits
Requirements according to the examination regulations	- Minimum attendance rate: 80% of the total contact hours >20 % of nonattendance = elimination for exams
Recommended prerequisites	Basic courses in Calculus, Discrete Mathematics, Linear Algebra, Theory of Probability and Statistics
Module objectives/intended learning outcomes	**Objectives:** 1. Introduce students to optimization theory and decision support. 2. Build mathematical models for complex decision problems 3. Solve mathematical models using an algebraic technique **Outcomes:** Students will be able to: 1. Model of the concrete case, 2. Validate the linear program proposed, 3. Solve the linear program in an exact way and recommend certain decisions favoring an improvement of the operations, 4. Analyze the sensitivity of the decisions proposed in relation to certain parameters of the problem.

Content	**CHAPTER 1: Mathematical and modelling preliminaries.** I. Mathematical preliminaries: I-1. the matrices I-2. matrix calculation I-3. convexity II. Modelling. II-1. Define a linear program. II-2. To put in the form of a linear program some problems of economy and management. III. General theorems: convexity of the domain of feasible solutions of a linear program and optimality theorem. III-1. Convexity of the domain of feasible solutions of a linear program. III-2. Optimality theorem. **CHAPTER 2: Graphic resolution of a Linear Program with two decision variables.** I. Solving a linear maximization program. II. Solving a linear minimization program. Graphical sensitivity analysis.
Study and examination requirements and forms of examination	Format: Written Mid-term Exam (40%) + Final Exam (60%)
Media employed	Course Material (Hard/ Soft copy) for Classroom & Online (Moodle ULT)
Reading list	https://www.cours-et-exercices.com/2016/03/cours-de-la-recherche-operationnelle.html

U2.2: Mechanics 2
Continuum Mechanics

Module designation	Mechanics 2
Module level, if applicable	1st year
Code, if applicable	U2.2
Subtitle, if applicable	-
Courses, if applicable	Continuum Mechanics
Semester (s) in which the module is taught	Semester 2 (S2)
Person responsible for the module	Dr Issam Khezami
Lecturer	Belgacem JALLALI
Language	French
Relation to curriculum	Scientific Subject (compulsory), To introduce Continuum mechanics theory and applications to students.
Type of teaching, contact hours	21 hours, of Integrated Course (Classroom Lecture)
Workload	Total 42Hrs/Semester (21 hours of Self Study)
Credit points	1.5 credits
Requirements according to the examination regulations	- Minimum attendance rate: 80% of the total contact hours >20 % of nonattendance = elimination for exams
Recommended prerequisites	Mathematics
Module objectives/intended learning outcomes	**Course objectives:** 1- Understand a Continuum 2- Learn about deformation & displacement **3-** Understand Internal Efforts in a Continuum environment 4- Master calculation methodology through applications **Course Outcomes** After completing this Course, Students should 1. Be familiar with linear vector spaces relevant to continuum mechanics and able to perform vector and tensor manipulations 2. Be able to describe motion, deformation and forces in a continuum; 3. Be able to derive equations of motion and conservation laws for a continuum ; 4. Be able to solve simple boundary value problems

Content	**Chap1: Upgrade in mathematics:** 1. Linear algebra 2. Differential calculus. Partial differential equations 3. Integral calculus 4. Fourier and Laplace transformation 5. Scalar and vector operators 6. Matrix calculation elements 7. Diagonalization of a matrix, eigenvalues, eigenvectors **Chap2: Tensors of the second order** 1. Tensor product of 2 vectors 2. Notions on second order tensors 3. Symmetric tensor, antisymmetric tensor **Chap3: Tensor analysis** 1. Different operators (gradient, divergence, rotational, Laplacian). 2. Transformation of integrals (Gaussian, Ampere, Stokes formulas) **Chap4: Kinematics of continuous media** 1. Lagrangian description (trajectory, speed, acceleration) 2. Eulerian description (particle derivative, conversation equation of mass). **Chap5: Constraints** 1. Volume forces, surface forces 2. Fundamental relation of the Dynamics (Torsor, stress) 3. Stress tensor (directions and principal stresses, symmetry, Mohr circles) **Chap6: Deformation** 1. Strain rate tensor 2. Study of the instantaneous local strain 3. Rate of dilations **Chap7: Linear constitutive laws** 1. General 2. Isotropic homogeneous linear constitutive law (Elasticity)
Study and examination requirements and forms of examination	Format: Written Mid-term Exam (40%) + Final Exam (60%)
Media employed	Course Material (Hard⁄ Soft copy) for Classroom & Online (Moodle ULT)
Reading list	1- P. Germain « Introduction à la mécanique des milieux continus » 1995 2- G. Duvet « Mécanique des milieux continus » 1990 3- J. Obala « Exercices et problèmes de mécanique des milieux continus » 1988 4- H Dumontet « Exercices de mécanique des milieux continus » 1994

U2.2: Mechanics 2
Resistance Of Material ROM

Module designation	Mechanics 2
Module level, if applicable	1st year
Code, if applicable	U2.2
Subtitle, if applicable	
Courses, if applicable	Resistance of Material ROM
Semester (s) in which the module is taught	Semester 2 (S2)
Person responsible for the module	Dr Issam Khezami
Lecturer	Moez SELMI
Language	French
Relation to curriculum	Scientific Subject (compulsory), To introduce Resistance of material ROM theory and applications to students.
Type of teaching, contact hours	42 hours, of Integrated Course (Classroom Lecture)
Workload	Total 84Hrs/Semester (42 hours of Self Study)
Credit points	3 credits
Requirements according to the examination regulations	- Minimum attendance rate: 80% of the total contact hours >20 % of nonattendance = elimination for exams
Recommended prerequisites	Mathematics, General Mechanics
Module objectives/intended learning outcomes	**Course Objectives:** The objective of this Course is to: 1. Explain the nature of stresses developed in simple geometries for various types of simple loads. 2. Calculate the elastic deformation occurring for different types of loading. 3. Study the different failure theories adopted in designing of structural members ***Course Outcomes*** Upon completion of the course student should be able to: 1. Model and define the internal forces in isostatic structures 2. Analyze and design structural parts subjected to tension, compression, and torsion, bending and combined stresses using the fundamental concepts of stress, strain and elastic behavior of materials. 3. Perform engineering work related to the design of structures.

Content	**Chapter 1: Introduction to Strength of Materials** 1. Introductions and assumptions 2. Units 3. Axis sign convention **Chapter 2: Internal forces in an isostatic structure** 1. Normal effort 2. Shearing effort 3. Bending moment 4. Section method 5. Diagrams of forces and moments **Chapter 3: Plane Sections geometric characteristics** Cartesian characteristics 1. Moment of inertia transformation formulas 2. Main moments of inertia 3. Geometric representation of moments of inertia **Chapter 4: Study of a beam subjected to a normal force** 1. Deformation of bars in tension and compression 2. Stresses due to temperature variation 3. Isostatic bar systems **Chapter 5: Study of a beam subjected to simple bending** 1. Normal bending stresses 2. Calculation of flexural strength 3. Tangential bending stresses 4. Simple flexural strength calculation **Chapter 6: Study of a beam subjected to compound bending** 1. Deflection 2. Compound flexion **Chapter 7: Simple Twist** 1. Stresses and strains of a cylindrical bar 2. Twisting of rectangular section bars 3. Calculation of resistance to torsion
Study and examination requirements and forms of examination	Format: Written Mid-term Exam (40%) + Final Exam (60%)
Media employed	Course Material (Hard/ Soft copy) for Classroom & Online (Moodle ULT)
Reading list	[1] Analyse et calcul des structures/ Aram Samikian. Paris : Gaëtan Morin Editeur, 1994. 580 pages ; 20cm x 25cm. [2] Calcul des structures : cours avec problèmes résolus/Kaouther Ben Kaddour Machta, Samir Ellouz.-Tunis : éditions centre de publication universitaire, 2007. 192 pages ; [3] Comprendre simplement la résistance des matériaux : la structure, principes et enjeux pour la conception / Rémy Mouterde et François Fleury Paris : éditions du Moniteur, 2007, 320 pages.

U2.3: Technical Science
Hydraulic & Hydrology

Module designation	Technical Science
Module level, if applicable	1st year
Code, if applicable	U2.3
Subtitle, if applicable	-
Courses, if applicable	Hydraulic & Hydrology
Semester (s) in which the module is taught	Semester 2 (S2)
Person responsible for the module	Dr Issam Khezami
Lecturer	Ismail YOUSFI
Language	French
Relation to curriculum	Scientific Subject (compulsory), To introduce Hydraulics & Hydrology theory and applications to students.
Type of teaching, contact hours	42 hours, of Integrated Course (Classroom Lecture)
Workload	Total 84Hrs/Semester (42 hours of Self Study)
Credit points	3 credits
Requirements according to the examination regulations	- Minimum attendance rate: 80% of the total contact hours >20 % of nonattendance = elimination for exams
Recommended prerequisites	Fluid Mechanics
Module objectives/intended learning outcomes	**Objectives:** Students will understand and be able to apply fundamental concepts and techniques of hydraulics and hydrology in the analysis, design, and operation of water resources systems. **Outcomes:** Students will be able to: 1. Become familiar with different water resources terminology like hydrology, ground water, hydraulics of pipelines and open channel. 2. Analyze flow in closed pipes, and understand pumps classification 3. Design and select pumps for different hydraulic applications. 4. Determine water surface profiles for gradually varied flow in open channels. 5. Be familiar with pipe networks, drainage systems and wastewater sources and flow rates. 6. Be familiar with contemporary issues related to water resources.

Content	**PART 1: GENERAL HYDRAULICS** I. Pipe networks 1.Branched networks 2. Mesh networks 3. Networks comprising a pump 4. Supply from a tank system II. Free surface flow 1. Introduction - Definitions - Basic assumptions - Types of flow 2. Flow regimes - Uniform Flow - Gradually Varied Flow - Rapidly Varied Flow RVF **PART 2: GENERAL HYDROLOGY** 1. Hydrological balance 2. Precipitation 3. Evaporation, Evapotranspiration and flow deficit 5. The gauging stations
Study and examination requirements and forms of examination	Format: Written Mid-term Exam (40%) + Final Exam (60%)
Media employed	Course Material (Hard/ Soft copy) for Classroom & Online (Moodle ULT)
Reading list	Polycopie de cours préparé par l'enseignant M. CARLIER « Hydraulique générale et appliquée » Eyrolles J. BONNIN « Hydraulique urbaine » Eyrolles J. BONNIN « Aide mémoire d'hydraulique urbaine » Eyrolles W, H, GRAF « Hydraulique fluviale » Eyrolles Y. Zech « Cours des écoulements à surface libre » U. C. L

U2.3: Technical science
Topography

Module designation	Technical Science
Module level, if applicable	1st year
Code, if applicable	U2.3
Subtitle, if applicable	-
Courses, if applicable	Topography
Semester (s) in which the module is taught	semester 2 (S2)
Person responsible for the module	Dr Issam Khezami
Lecturer	Abdelmajid BOUABEN
Language	French
Relation to curriculum	Scientific Subject (compulsory), To introduce Topography theory and applications to students.
Type of teaching, contact hours	30 hours, of Integrated Course (Classroom Lecture) 12 hours of Practical Workshop
Workload	Total 84Hrs/Semester (42 hours of Self Study)
Credit points	3 credits
Requirements according to the examination regulations	- Minimum attendance rate: 80% of the total contact hours >20 % of nonattendance = elimination for exams
Recommended prerequisites	Mathematics

Module objectives/intended learning outcomes	**Course Objectives**: 1. Understand how positions (horizontal & vertical) are determined. 2. Solve basic topography problems using Math (geometry and trigonometry). 3. Describe how we measure and visualize terrain 4. Identify errors on observations, eliminate their effects, correct and/or compensate them. 5. Construct and interpret various types of data visualization including Planimetric maps, topographic maps and site plans. 6. Understand geographic reference systems & common coordinate systems. 7. Gain hands on experience using surveying equipment such as Total Station, automatic levels and GPS to perform basic data measurement & collection. 8. Introduction to basic application of GIS and computer-aided drafting (CAD) software to visualize spatial data. **Course Outcomes**: 1. Know and describe the elementary topographic quantities; 2. Correctly describe the measuring equipment; 3. Identify different methods of topographical observation; 4. Interpret maps presented in hardcopy or digital support; 5. Identify the errors in measurements; 6. Evaluate the magnitudes of the land topographic descriptors.

Content	**CHAPTER 1: General information on topography** 1. Basic definitions 2. The applications of topography. 3. Mission of the Topography & Cadastral Organism (OTC) 4. Elements of geodesy 5. Projection systems **CHAPTER 2: Measuring angles** 1. Measurement of horizontal angles. 2. Measurement of vertical angles. 3. Orientations and bearing. **CHAPTER 3: Measuring distances** 1. Direct measurement of distances. 2. Indirect measurement of distances. 3. Distance measurement with inaccessible point. **CHAPTER 4: Planimetric survey procedures** 1. General principles. 2. Survey methods. 3. Planimetric calculation: a- Principle of calculating Planimetric coordinates b- Polygonation c- Determination of surfaces **CHAPTER 5: Leveling** 1. Leveling principle 2. Types of leveling and their field of use 3. Direct leveling 4. Indirect leveling. **CHAPTER 6: Elementary forms of the earth and calculation of cubatures** 1. The shapes of the earth (level curve,) 2. Long profile 3. Cross section 4. Different volume calculation methods **CHAPTER 7: G.P.S and IT Tools** 1. Presentation of the G.P.S system 2. Presentation of the IT tool
Study and examination requirements and forms of examination	Format: Written Mid-term Exam (40%) + Final Exam (60%)
Media employed	Course Material (Hard/ Soft copy) for Classroom/ Lab workshop & Online (Moodle ULT)
Reading list	*-Lucien LAPOINTE et Gilles MEYER , Topographie appliquée aux travaux public bâtiments et levers urbains : Quatrième édition 1997 EYROLLES* *-Ernest P.LAUZON et Roger DUQUETTE, « Topométrie générale » deuxième édition : Les Editions de l'école polytechnique de Montréal (E.E. P.M)* *-Ernest P.LAUZON et Roger DUQUETTE , « Topométrie générale » troisième édition : Les Editions de l'école polytechnique de Montréal (E.E. P.M)* *-Michel Brabant , Maîtriser la topographie des observations au plan première édition : 2001.EYROLLES* *-Guide technique des instruments topographiques* *Serge Milles ,Jean Lagofun « Topographie et Topométrie modernes : Techniques de mesure et de représentation 1 » édition .EYROLLES* *-Teacher printed course materials*

U2.3 Technical Science
Building Information Modeling BIM 1

Module designation	Technical Science
Module level, if applicable	1st year
Code, if applicable	U2.3
Subtitle, if applicable	-
Courses, if applicable	Building Information Modeling BIM1
Semester (s) in which the module is taught	Semester 2 (S2)
Person responsible for the module	Dr Issam Khezami
Lecturer	Ramadhane RIGUEN
Language	French
Relation to curriculum	Professional Subject (Compulsory) To introduce BIM concept and modelling techniques with application using computer Tools
Type of teaching, contact hours	21 hours of Practical Workshop
Workload	Total 42Hrs/Semester (21 hours of Self Study)
Credit points	1.5 credits
Requirements according to the examination regulations	Final Practical exam at the end of semester without elimination Manuel d'utilisation du logiciel autorisé
Recommended prerequisites	Computer Aided Drawing CAD 1 & CAD 2
Module objectives/intended learning outcomes	**Objectives:** 1. Master the main modelling functions of Revit software 2. Understand the BIM concept and modelling methodology **Learning Outcomes:** Student will be able to: 1. Run Revit Tools and go through different menu and commands to implement design tutorials 2. Understand how information is interrelated throughout the Revit (BIM) model, design 3D building models that simultaneously document the project in schedules and in 2D construction documents.

Content	**Chapter 1 Building Information Modeling BIM** 1.1 BIM introduction 1.2 The advantages of BIM **Chapter 2 Introduction to Revit Architecture and Structure** 2.1 Revit interface and options 2.2 View control tools 2.3 Starting a project with a template 2.4 Basic principles of Revit input. **Chapter 3 Managing Basic Parameters in Revit** 3.1 Unit parameters 3.2 Project settings 3.3 The different types of parameters: Text, Number, Area, Currency **Chapter 4 Managing views** 4.1 Definition areas 4.2 dependent views 4.3 view templates 4.4 organization of the tree structure
Study and examination requirements and forms of examination	-Report for each project, exercise to be submitted and evaluated. -Final assessment at the end of the semester
Media employed	Video Projector, Demo & Tutorials in Computer Lab
Reading list	Autodesk Guides and Tutorials for Revit Tools

U2.4 Computer & Material Sciences
Computer Aided Drawing CAD 2

Module designation	**Computer & Material Sciences**
Module level, if applicable	**1st year**
Code, if applicable	**U2.4**
Subtitle, if applicable	
Courses, if applicable	**Computer Aided Drawing CAD 2**
Semester (s) in which the module is taught	**semester 2 (S2)**
Person responsible for the module	Dr Issam Khezami
Lecturer	Khalil FRADI
Language	French
Relation to curriculum	CAD Tools (Autocad) compulsory Project-oriented course
Type of teaching, contact hours	21 hours of Practical Workshop/ semester
Workload	Total 42Hrs/Semester (21 hours of Self Study)
Credit points	1.5 credits
Requirements according to the examination regulations	Final Practical exam at the end of semester without elimination Autodesk User Guide for AutoCAD
Recommended prerequisites	Computer Aided Drawing CAD 1
Module objectives/intended learning outcomes	**Learning Objectives** 1. Create titleblock and titleblock/drawing label components 2. Create floor plan, enlarged plan, roof plan and building elevation 3. Successfully integrate referenced files to create construction documents. Demonstrate layer and file management, use of model/layout environments and multi-scale drawing presentation. 4. Apply intermediate-level skills to create sheet layout environments and plotting. 5. Organize deliverable sheet set
Content	Familiarization with the graphical interface; - Description of methods and techniques of graphic representations in civil engineering (sketch, working drawing, etc.) - Graphic interface of drawing software; - Types and formats of graphic media (paper space, workspace.); - Handling of scales - Graphic components (definition of layers, colors.) - Installation of posts and production of a small formwork plan
Study and examination requirements and forms of examination	-Report for each project, exercise to be submitted and evaluated. -Final assessment at the end of the semester
Media employed	Video Projector, Demo & Tutorials in Computer Lab
Reading list	Autodesk User Manual and Tutorials for AutoCAD

U2.4 Computer & Material Sciences
Concrete & Material Technology

Module designation	Computer & Material Sciences
Module level, if applicable	1st year
Code, if applicable	U2.4
Subtitle, if applicable	-
Courses, if applicable	Concrete & Material Technology
Semester (s) in which the module is taught	Semester 2 (S2)
Person responsible for the module	Dr Issam Khezami
Lecturer	Dr Issam Khezami
Language	French
Relation to curriculum	Scientific Subject (compulsory), To introduce types of materials for construction, their characteristics, and applications to students.
Type of teaching, contact hours	21 hours, of Integrated Course (Classroom Lecture) 21 hours of Practical Workshop
Workload	Total 84Hrs/Semester (42 hours of Self Study)
Credit points	3 credits
Requirements according to the examination regulations	- Minimum attendance rate: 80% of the total contact hours >20 % of nonattendance = elimination for exams
Recommended prerequisites	Fluid Mechanics, Material Sciences, General Coordination Plan GCP

Module objectives/intended learning outcomes	**Course Objectives:** 1. Understand concepts related to Concrete technology which involves types and property of concrete and different materials and its vital use for buildings. 2. Present the foundations of many basic Engineering tools and concepts related to Concrete technology and Civil Engineering. 3. To give an experience in the implementation of concepts which are applied in field of Civil Engineering. **Course Outcomes:** At the end of the course the students should be able to: 1. Characterize construction materials in order to formulate a reference concrete 2. Apply fundamental knowledge in the fresh and hardened properties of concrete 3. Simulate the effect of the environment on performance, properties and failure modes of structural concrete and demonstrate techniques of measuring the Non Destructive Testing of concrete structure

Content	**Chapter I - Physical and mechanical properties of materials:** 1. Physical properties : 2. Water properties: permeability, porosity, compactness, capillarity; 3. Thermal properties; 4. Acoustic properties; 5. Mechanical properties: Stresses and strains, Characterization of tests, compression, traction, bending **Chapter II - Rocks and aggregates:** 1. natural rocks, 2. crushed and rolled aggregates, 3. particle size analysis, 4. particle size curve, 5. modulus of fineness, 6. sand equivalent **Chapter III Mineral binders:** 1. aerial binders, 2. hydraulic binders **Chapter IV Mortars and concrete:** 1. constituents, 2. classification, 3. composition parameters, 4. tests on fresh concrete, 5. tests on hardened concrete, 6. formulation methods **Chapter V Hydraulic concretes** 1. Fresh concrete, 2. hardened concrete, 3. basis of formulation, 4. Baron-Olivier method **Chapter VI Admixtures for mortars and concrete (Standard EN 934)** 1. Concrete rheology modifying admixtures • Plasticizers - Water reducers • Superplasticizers - High water reducers 2. Concrete setting and hardening modifying admixtures • Setting accelerators • Hardening accelerators • Setting retarders 3. Other standardized categories of adjuvants • Mass water repellents • Air trainers • Water retainers **The Practical Workshops** outline to be carried out throughout the semester are: 1. Particle size analysis test (Dry screening) 2. Test for the determination of apparent and absolute densities 3. Permeability test at variable load 4. Mortar consistency test with the **Vicat** apparatus 5. Abrams cone sagging test 6. Formulation of concrete
Study and examination requirements and forms of examination	Mid-term Exam (50%) + Final Exam (50%)

Media employed	Course Material (Hard/ Soft copy) for Classroom /Lab Workshop & Online (Moodle ULT)
Reading list	1- Granulats, sols ciments et bétons – R. DUPAIN – Edition Casteilla - 2009 2- Le béton hydraulique – J.Barron – Presses de l'ENPC - 1995 3-Nouveau guide du béton et de ses constituants – Georges Dreux, Jean Fiesta – Edition Eyrolles 4-Propriétés des bétons – Adam M. Neville– Edition Eyrolles 5-La pratique des ciments et béton - Michel Venuat - Edition le Moniteur 6-Le béton hydraulique - Jacques Baron , Raymond Sauterey – Presses de l'ENPC

U2.4 Computer & Material Sciences
Geology & Geophysics

Module designation	Computer & Material Sciences
Module level, if applicable	1st year
Code, if applicable	U2.4
Subtitle, if applicable	-
Courses, if applicable	Geology & Geophysics
Semester (s) in which the module is taught	semester 2 (S2)
Person responsible for the module	Dr Issam Khezami
Lecturer	Moez SELMI
Language	French
Relation to curriculum	Scientific Subject (compulsory), To introduce Geology & Geophysics, minerals & rocks exploration methods and applications to students.
Type of teaching, contact hours	32 hours, of Integrated Course (Classroom Lecture) 10 hours for Project
Workload	Total 63Hrs/Semester (21 hours of Self Study)
Credit points	2.5 credits
Requirements according to the examination regulations	- Minimum attendance rate: 80% of the total contact hours >20 % of nonattendance = elimination for exams
Recommended prerequisites	Material Sciences

Module objectives/intended learning outcomes	**Course Objectives:** 1. Recognize, characterize and analyse natural geological structures: Applications to geotechnical studies to understand: - Geological risks, - Chronology of geological events. 2. Familiarization with different equipment's: -Topography (Theodolite, Level, Total Station), -Geophysics (electrical sounding, seismic refraction,…) 3. Conduct petrographic studies -Natural materials -Valuation of terrestrial materials 4. Familiarization with onsite work and use the main techniques in various geological contexts 5. Read and analyse cartographic documents, survey sections **Learning Outcomes:** Student will be able to: 1. Identify and interpret common rock-forming minerals and rock-forming processes 2. Distinguish between various structural features and determine the types of stress responsible for their formation 3. Understand the formation and distribution of geological natural resources as well as issues surrounding their utilization 4. Interpret terrain models, topographic and geologic maps 5. Interpret geophysical measurements of subsurface properties 6. Collect and evaluate three-dimensional geologic data needed to create geologic maps
Content	**Part A Lecture** **Chapter 1: The role of geology in civil engineering** 1. Prospecting of materials for Civil Engineering 2. Evolution of materials during service life 3. Analyse natural risks 4. Carry out underground works (Tunnel, drilling, etc.) **Chapter 2: Minerals and Rocks** 1. Characteristics of minerals 2. Classification of minerals 3. Classification of rocks 4. Rock cycle **Chapter 3: Seismic study: refraction and reflection** 1. Seismic Reflection 2. Seismic Refraction 3. The propagation of seismic waves 4. Measurement technique **Chapter 4: Electrical methods** 1. Electrical method1 2. Electrical method2 3. Electrical method3 4. **Chapter 5: Drilling, Completion and Logging** **Chapter 6: Reservoir geophysical exploration** **Chapter 7: Field session allowing the practical use of seismic and electric tools.** **Part B:** **Group Projects**

Study and examination requirements and forms of examination	Format: Written Mid-term Exam (40%) + Final Exam (60%)
Media employed	Course Material (Hard/ Soft copy) for Classroom/ Workshop & Online (Moodle ULT)
Reading list	1. Bouchardon J.-L. (2005) La terre est ronde, cours de l'Ecole nationale supérieure des mines de Saint-Etienne. Dubois J. et Diament M. (2001) 2. Géophysique, cours et exercices corrigés, Dunod, 2001, 211 p. Mari J.L., Arens G., Chapellier D. et Gaudiani P. (1998) 3. Géophysique de gisement et de génie civil, Technip, 468 p. Mari J.L., Glangeaud F. et Coppens F. (1997)

U2.5: Languages & Soft Skills
Engineering Ethics

Module designation	Languages & Soft Skills
Module level, if applicable	1st year of engineering Cycle
Code, if applicable	U2.5
Subtitle, if applicable	-
Courses, if applicable	Engineering Ethics
Semester (s) in which the module is taught	Semester 2 (S2)
Person responsible for the module	Dept. Head
Lecturer	xxxxxxxxxx
Language	English
Relation to curriculum	Professional Module, Compulsory
Type of teaching, contact hours	21 hours Seminar/ Projects
Workload	Total 42 Hours (21 Hours of Self Study)
Credit points	1.5
Requirements according to the examination regulations	-Minimum Attendance rate : 80% >20% of non-attendance= elimination for exams
Recommended prerequisites	English language skill
Module objectives/intended learning outcomes	**Objectives:** To provide Engineering students with: 1. An understanding of their duties and responsibilities as engineers. 2. Basic knowledge in decision making when confronted with problems during their professional career. 3. Improved awareness of potential ethical issues within an engineering context. 4. Team skills through working in groups on assignments and in-class assignments. **Learning Outcomes:** Students will be able to : 1. Identify and describe ethical dilemmas in the context of historical and developing technology and engineering practice, 2. Follow a structured, iterative decision-making process for moral reasoning to reach a supported conclusion regarding ethical dilemmas, 3. Use their own reflection on the moral reasoning process within multiple case studies to re-evaluate the coherence between the principles, codes, and theories involved in any given case.

Content	**Seminar/ Group projects** Chapter 1. Introduction Chapter 2. Ethics in Engineering Chapter 3. Important Skills for Ethical Reasoning Chapter 4. Engineering Ethics - Moral Dilemmas Chapter 5. Engineering Ethics - Moral Autonomy Chapter 6. Professions and Professionalism Chapter 7. Engineering Ethics - Social Experimentation Chapter 8. Engineering Ethics - Global Issues Chapter 9. Responsibilities of Engineers Chapter 10. Engineering Ethics - Moral Leadership
Study and examination requirements and forms of examination	Evaluation & Oral Presentation (100%)
Media employed	Course Material (Hard/ Soft copy) for Classroom & Online (Moodle ULT) Group discussion, Video projection
Reading list	1. UC Berkeley Student Learning Center https://slc.berkeley.edu/writing-worksheets-and-other-writing-resources 2. Innovation process and ethics in technology: an approach to ethical (responsible) innovation governance. G. Nathan. Journal on Chain and Network Science 2015; 15(2): 119-134 3. Responsabilité éthique de l'ingénieur dans les systèmes complexes, **IESF** –Société des Ingénieurs et Scientifiques de France

U2.5: Languages & Soft Skills
Communication Techniques

Module designation	Languages & Soft Skills
Module level, if applicable	1st year
Code, if applicable	U2.5
Subtitle, if applicable	-
Courses, if applicable	Communication Techniques
Semester (s) in which the module is taught	Semester 2 (S2)
Person responsible for the module	Dr Issam Khezami
Lecturer	Lamia KHARRAT
Language	French
Relation to curriculum	Transversal Subject (Soft Skills-Compulsory), To teach students communication techniques that can be used during the curriculum and help them prepare for their professional life.
Type of teaching, contact hours	21 hours, of Integrated Course (Classroom Lecture)
Workload	Total 42Hrs/Semester (21 hours of Self Study)
Credit points	1.5 credits
Requirements according to the examination regulations	- Minimum attendance rate: 80% of the total contact hours >20 % of nonattendance = elimination for exams
Recommended prerequisites	Know the elements of a communication situation as well as the basic concepts of the act of communication.
Module objectives/intended learning outcomes	**Objectives & Learning Outcomes** Students will 1. Improve communication and optimize relationship with others. 2. Develop emotional intelligence to gain efficiency. 3. Increase confidence and self-esteem to be comfortable in the professional environment. 4. Discuss strategies that have been shown by research to be more beneficial in terms of personal development, as well as explore techniques and exercises that increase well-being. 5. Will be able to conduct job interviews

Content	**Chapter 1: Take into account the communication situation** - Define the informative or argumentative aim of the message to be produced - Gather and organize the pieces of information according to the message - Choose the appropriate means of expression **Chapter 2: Written communication** 1- Writing the CV and the cover letter 2- Writing a professional email **Chapter 3: Group communication** 1- Meeting facilitation and collaboration 2- Debates **Chapter 4: the job interview** 1- Candidate profile 2- Recruiter's profile • *Applications: the NASA game, the dove clinic, the collegial decision*
Study and examination requirements and forms of examination	Format: Written Mid-term Exam (40%) + Final Exam (60%)
Media employed	-Course Material (Hard/ Soft copy) for Classroom & Online (Moodle ULT) -Conferences & Seminars
Reading list	- DELMOTTE Axel, DUHAME Sabine, *Le grand livre du CV*, Studyrama, 2010. - DUTERME Claude, *La communication interne en entreprise : l'approche de Palo Alto et l'analyse des organisations,* Deboeck, Bruxelles, 2002 - GUITTET André, *L'entretien : techniques et pratiques*, Armand Colin, Paris, 2008.

U2.5: Languages & Soft Skills
English II

Module designation	Languages & Soft Skills
Module level, if applicable	1st year
Code, if applicable	U2.5
Subtitle, if applicable	-
Courses, if applicable	English II
Semester (s) in which the module is taught	Semester 2 (S2)
Person responsible for the module	Dr Issam Khezami
Lecturer	Nadia ZARDI
Language	English
Relation to curriculum	Transversal Subject (Soft Skills-Compulsory), Continue teaching students English as Foreign Language and help them prepare for their professional life.
Type of teaching, contact hours	21 hours, of Integrated Course (Classroom Lecture)
Workload	Total 42Hrs/Semester (21 hours of Self Study)
Credit points	1.5 credits
Requirements according to the examination regulations	- Minimum attendance rate: 80% of the total contact hours >20 % of nonattendance = elimination for exams
Recommended prerequisites	English 1
Module objectives/intended learning outcomes	**Objectives:** 1. This module seeks to develop the students' abilities in oral skills, reading, writing and study skills 2. Learn to reuse structures and vocabulary in new contexts. 3. Focus mainly in reading and writing. **Learning Outcomes:** Students will be able to : 1. Improve comprehension of scientific texts 2. Enhance their conversational skills in professional contexts 3. Develop Business English skills by writing e-mails, memos and business letters, participating in simulated meetings and role-plays, and discussing case studies.

Content	**Chapter 1. Process Management'** 1. Describing processes, cause and effect 2. Criticizing, recommending 3. Quality assurance, continuous improvement **Chapter 2. Negotiating** 1. Key negotiating language, framing your argument 2. Negotiating with suppliers 3. Negotiating with customers **Chapter 3. Reports** 1. Skim reading reports and news feeds 2. How to report information and ideas 3. Writing reports– style, register, conventions **Chapter 4. Social English** 1. The first five minutes 2. Speed networking – the elevator pitch 3. Small talk, turn-taking 4. Business conventions The content will be supported by systematic work on core grammatical structures, vocabulary patterns and pronunciation.
Study and examination requirements and forms of examination	Format: Written Mid-term Exam (40%) + Final Exam (60%)
Media employed	Course Material (Hard⁄ Soft copy) for Classroom & Online (Moodle ULT)
Reading list	General English web sites, Youtube Tutorials

U2.6: Projects
Mini Project

Module designation	**Projects**
Module level, if applicable	1st year
Code, if applicable	U2.6
Subtitle, if applicable	-
Courses, if applicable	Mini Project
Semester (s) in which the module is taught	Annual
Person responsible for the module	Dr Issam Khezami
Lecturer	Nessrine GABSI
Language	French
Relation to curriculum	Professional project (compulsory)
Type of teaching, contact hours	21h Project Supervision Tutorial guidance throughout the academic year that follows the work of project/traineeship
Workload	Total 51Hrs/Semester (30 hours of Self Study)
Credit points	2 credits
Requirements according to the examination regulations	Defence session of the project -Appreciation given by the Jury
Recommended prerequisites	Computer Aided Drawing CAD 1 General Coordination Plan GCP
Module objectives/intended learning outcomes	This is an exercise that will help student to apply knowledge's & Skills to present a basic project.
Content	The project will be proposed by the teacher and validated at the end of the semester by the Jury. The scoop & and axes of projects proposals are: - Introduction to civil engineering - Bibliographic research on the basic elements of the project - Do an architectural reading - Discuss the choice of the design to be planned - Learn about the Roads and Miscellaneous Network RMN part - Estimate the cost of the project
Study and examination requirements and forms of examination	Projects - 100% (Evaluation of the final report of project)
Media employed	Video projection – Remote Supervision
Reading list	References to be provided by supervisor depending on each project.