Curriculum
Bachelor of Engineering
Civil Engineering: Buildings and Public Wor

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Civil Engineering: Buildings and Public Works

Summary

General Presentation and Objectives.

The Bachelor degree is a three-year undergraduate program that aims to prepare students for a successful career as professional site managers and designers in Civil Engineering.

The wide range of activities in this sector requires a multi-disciplinary education addressing multiple tasks: Design, cost analysis, planning, organizing and construction supervision a well as operation of civil engineering projects, construction materials and testing.

The students who will become specialists would also be able to perform their duties in structure and building rehabilitation, facilities maintenance, property development, building materials trade and manufacturing, building infrastructure, energy sources and energy saving.

The students receive sound theoretical education jointly with an advanced technical learning which would open wide career paths in the civil engineering domain. The curriculum also includes courses on cost analysis and project and enterprise management.

The initiation to the real professional world is ensured through several site and professional trainings.

Semester 1

	Code	Course	ECTS	MC	Ex	Lab	Total
L1	LS1ALGE	Algebra I (GC-GIM-GRIT-IG)	3	15	15		30
	LS1ANAL	Calculus I (GC-GIM-GRIT-IG)	4	18	27		45
	LS1DESS	Drafting	2			30	30
	LS1FRAN	English (GC GIM GRIT IG)	2	30	30		30
	LS1GEOL	Geology	3	15		15	30
	LS1INFB	Basic Computer Skills	4	12	15	18	45
	LS1MATE	Materials	5	24	18	18	60
	LS1MDFH	Fluid Mechanics Hydraulics	4	18	18	9	45
	LS16TUC	Structures 1	3	12	18		30
	Total	9	30	114	141	90	345

Semester 2

Code	Course	ECTS	MC	Ex	Lab	Total
LS2ALGE	Algebra II (GC-GIM-GRIT-IG)	3	15	15		30
LS2ANAL	Calculus II (GC-GIM-GRIT-IG)	4	18	27		45
LS2DAOR	Computer Aided Drafting 1	2			30	30
LS2DRHO	Human Rights (GC GIM-GRIT-IG)	2	30			30
LS2MESO	Soil Mechanics	3	12	16		30
LS2STRU	Structures 2	3	12	18		30
LS2STBA	Reinforced Concrete Structures 1	4	24	21		45
LS2TTTH	Thermodynamics and heat transfer	4	18	27		45
LS2TOPO	Surveying	5	18	18	24	60
Total	9	30	147	144	54	345

Semester 3

	Code	Course	ECTS	MC	Ex	Lab	Total
L2	LS3AEVE	Ventilation	2	12	18		30
	LS3ANG1	French (GC-GIM-GRIT IG)	2		30		30
	LS3DAOR	Computer Aided Drafting 2	2			30	30
	LS3ELEC	Electricity	4	15	21	9	45
	LS3ROUT	Roads Engineering	5	27	15	18	60
	LS35TPR	Statistics and Probability (GC-GIM)	4	18	27		45
	LS35TAV	Advanced Structures	4	12	15	18	45
	LS35TBA	Reinforced Concrete Structures 2	4	24	21		45
	LS3SET	Insulation and Waterproofing*	3	18	12		30
	LS3 MARK	Marketing (BC)*	3	18	12		30
	Total	8	30	126	159	75	360

Semester 4

Code	Course	ECTS	MC	Ex	Lab	Total
LS4ARCH	Architecture	2		12	18	30
LS4CHCL	Heating and air conditioning	5	21	27	12	60
LS4EXCO	Communication Skills (GC-GIM-GRIT-IG)	2		15	15	30
LS4FOND	Foundations	4	15	21	9	45
LS4HYDR	Urban Hydraulics	4	21	24		45
LS4PRGC	Construction Procedures	4	30		15	45
LS4SRAA	Advanced Reinforced Concrete Structures	4	15	21	9	45
LS4MENU	Numerical Analysis *	3	15	15		30
LS4PRSC	Scientific Programming *	2		12	18	30
LS4REPO	Operational Research (BC)*	5	18	21	21	60
Total	9	30	117	147	96	360

Semester 5

	Code	Course	ECTS	MC	Ex	Lab	Total
L3	LS5HYDU	Urban Hydrology	4	21	24	9	45
	LS5LEBA	Buildings Legislations	3	15	6		30
	LS5MARE	Maintenance and Rehabilitation	4	12	18	15	45
	LS5ORPC	Planning and Organization Site	3	9	12	9	30
	LS5OSSA	Frames	2	6	9	15	30
	LS5OSSP	Retaining Systems and Slope stability	3	12	12	6	30
	LS5STME	Steel Structures	3	15	15		30
	LS5LCGC	Civil Engineering software *	2			30	30
	LS5EEC	Networks and Lighting*	3	18	12		30
	LS5YSO	Solar System *	2	12	6	12	30
	LS5ENPR	Professional Environment (MIE)*	4	12	15	18	45
	LS5GEFI	Financial Management (BC)*	3	15	15		30
	Total	10	29	120	114	96	330

Semester 6

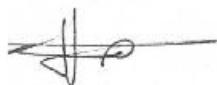| Code	Course	ECTS	MC	Ex	Lab	Total
LS6PRFE	Final Year Projet	12			180	180
LS6STAG	Internship (14 weeks) (6+8)	6				0
LS6DRGT	General and work Legislations (GC-GIM-GRIT-IG)	1	15			15
LS6MAPR	Projects Management	4	21	18	6	45
LS6COGA	General and Analytical Accounting *	3	12	18		30
LS6ENVI	Environment *	2	15	6	9	30
LS6SANI	Sanitary *	3	12	9	9	30
LS6CSEE	Calculation of Structures using the FE Method (MIE)*	3	9	12	9	30
LS6GEQU	Quality Management (MIE)*	3	9	12	9	30
Total	7	31	192	198	300	330

Total ECTS : 180

Total hours : 2070

ECTS : European Credits Transfer and accumulation System - MC : Main Course - Ex : Exercises - Lab : Laboratory

Semester 1

Code	Course	ECTS	COURSE	Exercises	LAB
LS1ALGE	Algebra 1 (GC-GIM-GRIT-IG)	3	15	15	
LS1ANAL	Calculus 1(GC-GIM-GRIT-IG)	4	18	27	
LS1DESS	Drafting	2			30
LS1FRAN	English (GC-GIM-GRIT-IG)	2		30	
LS1GEOL	Geology	3	15		15
LS1INFB	Basic Computer Skills	4	12	15	18
LS1MATE	Materials	5	24	18	18
LS1MDFH	Fluid Mechanics and Hydraulics	4	18	18	9
LS1STUC	Structures 1	3	12	18	
Total	9	30	114	141	90

Code	Title	Semester	ECTS	COURSE	Exercises	LAI
LS1ALGE	Algebra 1	1	3	15	15	0

Department: CE-MIE-CCNE-BC

Objectives:
Give the students the necessary mathematical tools for the follow-up of the basic courses o the specialization courses, in the context of the formation such as: the complex number: calculations on the polynomials and rational fractions, use of linear algebra concepts-matri calculation.

Content:

The complex numbers
Introduction
Definition of complex numbers and laws of composition
Algebraic form of a complex number
Conjugate of a complex number and properties
Trigonometric form of a complex number
Exponential form of a complex number
Fundamental theorem of algebra

Real polynomials and rational fractions
Definitions and notations
Operations on polynomials
The Euclidean division and the degree of multiplicity
Factorization of a real polynomial
Rational fractions
Irreducible and proper rational fractions
Decomposition of a rational fraction into partial fractions

Real vector space
Real vector space and examples
Real subspace
Linearly independent and generating families of vectors
Bases and dimension of a finite real vector space

The matrices 1
Definitions and special matrices
Square sub-matrices of a matrix

Code	Title	Semester	ECTS	COURSE	Exercises	LAI
LS1ANAL	Calculus I	1	4	18	27	0

Department: CE-MIE-CCNE-BC

Objectives:

Give the students basic mathematical tools such as the study of functions, Taylo series expansions of functions, calculating integrals and solving differential equations

Contents:

Real functions of real variable: Definitions, Operations on functions, Properties o functions, Limits of functions, Infinite branches – Asymptotes.

Continuity and derivability of real functions: Continuity, Monotony Differentiability, Rolle's Theorem, Mean Value Theorem.

Usual Real Functions: Circular Functions, Inverse circular Functions, Logarithmi Functions, Exponential functions, Power Functions, Hyperbolic functions, Invers hyperbolic functions.

Finite expansions: Definitions, Finite expansion of usual functions, properties c finite expansion, Applications of finite expansions.

Integrals: Primitive, Definite Integrals, Calculating integrals, Applications, Imprope Integrals.

Differential equations: Differential equations of first order, second order differentia equations, linear differential equations with constant coefficients.

Code	Title	Semester	ECTS	COURSE	Exercises	LAE
LS1DESS	Drafting	1	2	0	0	30

Department: Civil Engineering - BLAB (CE).

Objectives:

Gain knowledge and required capabilities to be able to use technical drawing as a mean o communication in the various civil engineering activities: know how to read and develo plans.

Content:

Initiation: introduction to the technical drawing language. Examples from various domains. Main types of drawing. Elements of technical drawing and of sketches. Tools of drawing.

Basic elements of drawing: standard scripture and standard lines.

Geometric construction and dimensioning: study of auxiliary views of first degree to fin a true listing and of dihedral angle. The realization of assembly drawings of simpl mechanisms including standard link elements and the realization of pieces definitio drawings. To read and interpret simple drawings including listing, annotations and genera notes.

Projections: different types of projection. The study of orthogonal projections (isometric an multiple views-drawings), sectional projection, axonometric projection (three-dimensio representation) and oblique projections.

Paper size and layout.

Code	Title	Semester	ECTS	COURSE	Exercises	LAB
LS1FRAN	English	1	2		30	0

Departments: GC-GIM-GRIT-IG

Objectives:

The course purpose is to allow the students to reach a level of 400-500 for Toffel Exam. The course is taught in a way to strengthen the listening & speaking skills to help the student communicate &express themselves easily. It also provides the students with the needed tool to improve their English skills in reading and writing.

The course allows the students to talk about himself in an interview, to give opinions & to discuss them with a counterparty, to negotiate using a good vocabulary & to improve hi performance in any technical or informal discussion. It also allows the student to write essay by using formal language and adopting the right tone & to write email letters, reports an proposals.

Code	Title	Semester	ECTS	COURSE	Exercises	LAI
LS1GEOL	Geology	1	3	15	0	15

Department: Civil Engineering - BLAB (CE).

Objectives:

Know the technical vocabulary of geology, learn the methodology for interpretin; geologic data and identify earth crust materials and stratigraphy and related hazards to consider while assessing buildings and infrastructure projects.

Content:

General geology

General: Geology and earth sciences – Mineralogy – Petrology – Dynamic geology - Structural and historical geology.

Petrography: The minerals, in amorphous and crystalline states, rocks (crystalline sedimentary and metamorphic), minerals and combustible rocks – The igneous sedimentary and metamorphic.

Mapping Technique: General data for the development of geological maps - Stereographic projection – Geological survey: Principle of map survey, importance of the quality of the topography (standard method).

Applied Geology:

Techniques and methods of reconnaissance: Recognition means and reconnaissance classification – Superficial means of survey – sampling mechanics – Geophysics Seismic – hydraulic and permeability tests.

Underground water: The water in the soil: water reservoir conditions, concept o aquifer – water in porous media: retention capacity, flow in porous media – confiner and unconfined aquifer – study methods.

Geology and civil engineering works: Earthworks – Identification of construction materials sources – Foundations – Slope stability underground excavations – Dams.

LAB Sessions:

Identification of igneous, sedimentary and metamorphic rocks
Application of Wulff net on a real case for determining the orientation and dip o geological layer
Components of a geological map and examples of the Lebanese geological map
Study of the relationship between topographic and geological maps (determination o outcrop contours and cross – sections)

Code	Title	Semester	ECTS	COURSE	Exercises	LAB
LS1INFB	Basic Computer Skills	1	4	12	15	18

Department: Civil Engineering - BLAB (CE).

Objective:

Introduction to computer systems. Acquire the basic information pertaining to algorithms. Understand the basics of structured programming.

Content:

Introduction, Architecture, components of a computer. Operating system. Concept o file (physical, logical, types, etc..).

Introduction to the concept and application of computer program. Concept of syntax semantics and compilation. Algorithmic concepts of structured programming: basics declarations, types, variables, operators, expressions, instructions, and conditiona control structures, syntax diagram, tables in one and several dimensions, differen sorting methods, structures, procedures and functions, recursion.

Application of algorithmic concepts in C language

LAB Sessions:

Architecture and components of a computer, Device Management and Installation Hardware and Software Base Functions, file management system. Processing an Spreadsheet

Switching elements. Types and variables. Procedures and functions. Passing by value Passing by Reference. Tables. Structures. Recursion.

Code	Title	Semester	ECTS	COURSE	Exercises	LAB
LS1MATE	Materials	1	5	24	18	18

Department: Civil Engineering - BLAB (CE).

Objective: Discuss major material types used in civil engineering; origin, procedures o fabrication, characterization, classification and use.

Content:

Geotechnical Material

Soil and Geology: Generality.

Characteristics and structure of soil

Sieve analysis: Sieves - Hydrometer.

Fine soil properties: Atterberg Limits, liquid limit, Plastic limit, Plasticity index consistence index, clay material sensitivity.

Sand Equivalent and value of Methylen Blue: Definition and test.

Compaction: Maximum Sec density – Compaction test.

Soil Classification: Methods - Conditions of using – Method Statement.

Hydraulic binders Materials

Hydraulic binders components and manufacturing

Granular material: Classification - Sieve analysis - Fineness modulus - Coefficient of Flatness - Properties - Absorption Coefficient - Tests.

Additives: Various types

Water: Characteristics of Mixing Waters.

Hardening cement paste: Consistency - Setting - Stability – Contraction.

Mortar: Consistency - Time of Setting - Tensile and compressive strengths, Hardening – Shrinkage and Swelling.

Classification of Cements: Methods.

Concretes: Manufacture - Control - Sampling - Resistances - Deformation – Shrinkage and Creep - Non-destructive tests - Durability.

Concrete Mix Design: Parameters - Formula of Féret.

Bitumen binders

General information: Tar and bitumen - Characteristics - Tests - - Emulsions - Road Tar - Special Binders.

Impregnation, Coats tack and surface dressings: Roles and Techniques of Installation.

Asphaltic concretes: Components and Tests.

LAB Sessions

Geotechnical Material: Water content, density, sieve, hydrometer, sand equivalent methylen blue, liquid and plastic limits, plasticity index, compaction, CBR test......

Hydraulic binders components: Cement density, specific surface, tensile tests, uniaxia tests. Non destructive tests......

Code	Title	Semester	ECTS	COURSE	Exercises	LAl
LS1MDFH	Fluid Mechanics and Hydraulics	1	4	18	18	9

Department: Civil Engineering - BLAB (CE).

Objectives: Knowing the basic laws of fluid mechanics; understanding the physical meaning of fluid mechanics and developing skills to analyze, model and solve various problems of fluid mechanics.

Content:

Mathematical basis

Overview of Fluid Mechanics: Viscosity and compressibility –Volume forces and surface forces – Tension in a point – flow states.

Fluid statics: Pressure in a point - Fundamental equation of hydrostatics - Absolute Pressure, effective pressure and piezometric pressure – Calculation of forces and pressures – Buoyancy and Archimedes principle

Fluid kinematics: Variables of Lagrange and Euler - Mass conservation theorem – Flow rate - Motion analysis of a fluid particle - Irrotational plane flow - Preliminary calculation of a section - Standards.

Fluid dynamics: Euler equation - Energy conservation theorem – Pressure drop - Generalized Bernoulli equation – hydraulic and mechanical powers of a pump – Momentum theorem - Flow through an orifice - Speed Profile - Venturi phenomenon - Reaction of a jet - static and dynamic pressures - Linear and singular pressure drop - geometrical representation of flows - Standards of flow rates and pressures - Calculation of a water main - Volume tank calculation.

Laminar flow: Experiment and Reynolds Number-Kinematic and dynamic viscosity - Steady Flow, Velocity profile.

Uniform free surface flow: Definition - General formula of flow - Hydraulic radius - Maximum flow rate- Cross sections.

LAB Sessions:

Pressure drop and flow rate: Experimental measurement and theoretical calculation of the flow rate - Measurement of linear and singular pressure drop.

Regular pressure drop as a function of the flow state: Flow rate measurement - Calculation of the experimental linear pressure drop in laminar and turbulent flows.

Reaction of a jet: Case of cylindrical and spherical plates.

Code	Title	Semester	ECTS	COURSE	Exercises	LAE
LS1STRUC	Structures 1	1	3	12	18	0

Department: Civil Engineering - BLAB (CE).

Objectives:

Understanding the fundamentals laws of equilibrium and the elastic behavior of solid and apply them to the study of structural elements subjected to normal forces and flexural moments.

Calculation of the internal forces, stresses and strains in a planar structure loaded in its plane.

Design of structures to ensure the best use of materials from structural safety serviceability and economy perspectives.

Content:

Principles and basic notations: review of vector analysis - basic Hypothesis – Study of forces and the equilibrium conditions - External and Internal Forces – Type o supports - Geometrical Characteristics of cross sectional areas - Definition of stresse - Definition of strains – Statically determinate and indeterminate Structures.

Uniaxial load (compression – Traction): Compression and tension test – stress and strain Relationship due to axial load (HOOKE' s Law) - Rod Thermal Dilation Trusses: Statically determinate and indeterminate Trusses.

Beam Flexural Analysis: Introduction - Study of Internal Forces - equilibrium **differential**

equations - Internal Forces Diagrams.

Stresses and Strains in Beams Subjected to Bending Moments: stresses due to pure bending moment - stress and strain Relationship - stresses due to simple bending moment - stresses due to composite or deviated bending moment.

Semester 2

Code	Course	ECTS	COURSE	Exercises	I
LS2ALGE	Algebra 2 (GC-GIM-GRIT-IG)	3	15	15	
LS2ANAL	Calculus 2 (GC-GIM-GRIT-IG)	4	18	27	
LS2DAOR	Computer Aided Drafting 1	2			
LS2DRHO	Human Rights (GC-GIM-GRIT-IG)	2	30		
LS2MESO	Soil Mechanics	3	12	18	
LS2STRU	Structures 2	3	12	18	
LS2STBA	Reinforced Concrete Structures 1	4	24	21	
LS2TTTH	Thermodynamics and Heat Transfer	4	18	27	
LS2TOPO	Surveying	5	18	18	
Total	9	30	147	144	

Code	Title	Semester	ECTS	COURSE	Exercises	LAB
LS2ALGE	Algebra 2	2	3	15	15	

Department: CE- MIE – CCNE - BC

Objectives:

Give to the students the mathematical tools necessary for the follow up of basic courses or specializing courses, in the frame of formation such as: use of the concept of linear algebra. -Matrices.

Contents:

Matrices 2:

Addition of matrix and properties

Scalar multiplication and properties

Transpose of a matrix and properties

Product of two matrices and properties

Elementary row operations

Determinants:

Definition of the determinant and properties

The inverse of a matrix and properties

Linear transformations and matrix:

Linear transformation

Matrix representation of a linear transformation

Kernel, image and rank of a linear transformation

Diagonal square matrix:

Characteristic polynomial of a square matrix or a linear transformation

Eigenvalues, eigenvectors and eigenspaces

Diagonalization

Solving a system of linear equations by the method of characteristic polynomials

Rank of a matrix

System of linear equations

Solving a system of linear equations

Solving a system of linear equations with parameters

Equivalent consequences of an invertible matrix

Code	Title	Semester	ECTS	COURSE	Exercises	LAE
LS2ANAL	Calculus 2	2	4	18	27	0

Department: CE- MIE – CCNE - BC

Objectives:

Give students the necessary mathematical tools such as: simple operational calculus calculating of multiple integrals, sequences and series.

Contents:

FUNCTIONS OF SEVERAL VARIABLES: Definitions, two variables functions three variables functions, Limit and continuity, Partial derivatives, Total differential.

OPERATORS FOR VECTOR ANALYSIS: Review of analytical geometry, Scala field and vector field, Gradient, Laplacian, Divergence and Curl.

Multiple Integrals: Definitions, Double Integrals, Calculation of the double integral Triple Integrals, Calculation of the triple integral, Applications.

Sequences: Definitions, Arithmetic sequences, geometric sequences, Global behavio of a sequence, Behavior of a sequence at infinity, adjacent sequences.

Series: Definitions, Convergence, Divergence, Fundamental series: Geometric Series Riemann series, Series with positive terms, Comparison theorem: Criterion o Alembert, Criterion of Cauchy, Alternated series, Laurent series.

Code	Title	Semester	ECTS	COURSE	Exercises	LAI
LS2DAOR	Computer Aided Drafting CAD 1	2	2	0	0	30

Department: Civil Engineering - BLAB (CE)

Objectives:

Use a vectorial drawing software. Learn the necessary tools for computer drawing. Develop a project pertaining to a structure or a simple building.

Content:

Overview of AutoCAD and its Graphical User Interface. 2D drafting and application to various examples.

Code	Title	Semester	ECTS	COURSE	Exercises	LAB
LS2DRHO	Human Rights حقوق الإنسان	2	2	30	0	0

Department: CE- MIE – CCNE - BC

Objectives: awareness of human rights and strengthening the links between humans.

Content:

First part: concept and context of human right
1. Human right concept
2. Intellectual context of human right
3. Historical review
4. Resources and references

Second part: human right content
1. Personal rights
2. Legal and juridical rights
3. Political rights
4. Right of free thought (belief, expression, education, cultural participation)
5. Social and economic rights.

قسم الأوّل: ماهية حقوق الإنسان
1. **مفهوم حقوق الانسان** (حصة واحدة) : تعريف حقوق الانسان، التمييز بين الحق والحريّة، دولة القانون، الديمقراطيّة.
2. **الإطار الفكري لحقوق الإنسان** (3 حصص): مدرسة القانون الطبيعي، نظرية العقد الإجتماعي، المذهب الفردي، المذهب الإجتماعي.
3. **لمحة تاريخيّة حول حقوق الإنسان** (حصتان): الوثائق الانكليزيّة، الإعلانات الأمريكيّة، الإعلان الفرنسي، حقوق الإنسان عند العرب.
4. **مصادر حقوق الإنسان** (3 حصص): المواثيق العالميّة، مواثيق دوليّة خاصّة، المواثيق الإقليميّة، المصادر الداخليّة.

قسم الثاني: مضمون حقوق الإنسان
1. **الحقوق الشخصيّة** (3 حصص): الحق في الحياة، الأمان من التعذيب، الحق في التنقّل.
2. **الحقوق القانونيّة والقضائيّة** (حصتان): الحق في الشخصيّة القانونيّة، في حماية القانون، في اللجوء إلى المحاكم.
3. **الحقوق السياسيّة** (حصتان): حرية الإجتماع، المشاركة في ادارة الشؤون العامّة، الإنتماء الى الدولة.
4. **الحقوق الفكريّة** (حصتان): حرية الإعتقاد، التعبير، التعليم، المشاركة الثقافيّة.
5. **الحقوق الإجتماعيّة والإقتصاديّة** (حصتان): الحق في الزواج وتكوين الأسرة، الملكيّة الخاصّة، مساواة المرأة مع الرجل، الضمان الإجتماعي، العمل، الأمومة، حقوق الطفل.

Code	Title	Semester	ECTS	COURSE	Exercises	LAE
LS2MESO	Soil Mechanics	2	3	12	18	0

Department: Civil Engineering - BLAB (CE).

Objectives:

Enhancing student's awareness of soil related problems in the study of structures implementing the knowledge acquired on the mechanical properties of soils and the role of water in the behavior of soil.

Content:

Soils – introduction and definitions: introduction, study of soil components granular soil, fine soil, soil parameters, relations between the parameters; effects o geology. Soil structure and behavior of granular and fin soils.

Stresses and strains: Basic stresses, concept of deformation, stress- strain relations rheological models of soil behavior, and laboratory tests for determining the soi stress – strain relationships.

Settlement and consolidation: stresses in soil: soil at rest, role of water, concepts o total stresses, effective stresses and Terzaghi relation. Calculation of stresses Settlement of fine soil – consolidation: definition of consolidation, theory o consolidation, settlement calculation.

Hydraulic of soil: Darcy's law: hydraulic head, hydraulic gradient, Darcy's law an permeability coefficient. Forces exerted by water: determination of flow forces critical gradient and Renard phenomenon. Measurement of soil permeability permeability measurement in the laboratory, permeability measurement in situ. Th capillary pressure- Underground flows: groundwater, flow in an isotropic o anisotropic medium, problem solving, thrust of flow. Notions on the steady flow pumping test, Dupuit formula, Le franc test, Lugeon test, drainage and draw downs.

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Code	Title	Semester	ECTS	COURSE	Exercises	LAF
LS2STRUC	Structures 2	2	3	12	18	0

Department: Civil Engineering - BLAB (CE).

Objectives: Knowledge of stress and strain Relationship. Beam Deflection Analysis. Determination of Displacements by Applying energy theorems in the statically determinate structures and in statically indeterminate structures having lowe degree of indeterminacy. Applied Loads Combinations on the Structure Stability of Structural elements.

Content:

Stresses: Introduction – Stresses and Equilibrium at a point - Plane Stresses at a point ii arbitrary directions.

Strains: Introduction –displacements and degree of freedom – plane Strains - plan Strains at a point in arbitrary directions.

Stress and Strain Relationship: Introduction – traction Test - stress and strai Relationship in the elastic Range- Equations of Elasticity – Strain Energy.

Beam Deflection: Introduction - basic differential Relations - Double integration metho - Superposition method - Conjugate beam method.

Energy Theorems: Introduction - Strain Energy in particular cases - *MAXWELL-BETTI* s Reciprocal Theorems – Castigliano's Theorems – Virtual Work.

Method of Displacement or Rigidity

Influence Lines

Elastic Instability

Plasticity

Limit Load Calculation for Hyperstatic Structres

Code	Title	Semester	ECTS	COURSE	Exercises	LAI
LS2STBA	Reinforced Concrete Structures 1	2	4	24	21	0

Department: Civil Engineering - BLAB (CE).

Objectives:

Introduce students to the basic knowledge of reinforced concrete. Understand th concepts of codes, limit states, loads, load combinations and essential characteristic of the constituting materials of reinforced concrete. Design of the structural element under concentric tension and simple bending using the theory of limit state.

Content:

General Introduction: Objectives of the course through general illustrations Definition and role of each material – Historical Review - Project Development Concepts of codes - Methodology of Study.

General Indications of the code: Definition of limit states - Loads: dead, variable and accidental - Load combinations with different limit states (application to buildings) – Calculation Units.

Characteristics of materials – Concrete and Steel: Calculation parameters for eac Limit State – stress-strain relationship.

Design of sections subjected to normal loads (simple bending): Ultimate Limi State (ULS): General Rules: Basic Principles, Calculation parameters (concrete an steel), Pivots assumption: Definition and scope - Design (Calculation of sections calculation of the necessary reinforcements and/or the geometric dimension: rectangular and T-sections with or without compression steel reinforcement.

Justification of sections subjected to normal load (simple bending): Serviceabilit Limit State (SLS): General Rules: Basic Principles, calculation parameter: methodology - Design (or verification of sections) quick and detailed verification c sections, Design at SLS: rectangular and T sections with or without compression stee reinforcement.

Pure tension: Definition, Methodology of calculation

Code	Title	Semester	ECTS	COURSE	Exercises	LAE
LS2TTTH	Thermodynamics and Heat Transfer	2	4	18	27	0

Department: Civil Engineering - BLAB (CE).

Objectives:

Acquire a solid basic of thermodynamics and to be familiar with the different relevan diagrams. Understand the mechanism of heat transfer and the relation between energy and temperature.

Heat and temperature: generalities: The Basic laws in thermodynamics- thermometer- the concept of heat quantity – Calorimeter: measure of heat quantity, fundamental formula o calorimeter – thermal capacity.

Heat transmission: generalities of heat transfer- transferring heat through conduction: The Fourier law (the case of a tube and a plate, thermal conductivity) – transferring heat through convection: Newton law (natural convection, forced convection) – transferring heat through radiation: Stephan-Boltzmen law (black body and grey body- phenomenon of transferring heat through conduction, convection and radiation- heat exchangers.

Perfect gas: effect of heat; phenomenon of dilatation/contraction (solid, liquid and gas) - characteristic equation – mixing law.

Transformation in closed system: Clapeyron diagram (PV diagram)– steps o transformation- first law of thermodynamic – Second law of thermodynamic: cycles.

LAB Sessions:

Calorimetry: Measurement of the thermal capacity.

Measurement of thermal conductivity.

Gas law: measurement of state parameters which are under transformations.

Solar collector.

Code	Title	Semester	ECTS	COURSE	Exercises	LAI
LS2TOPO	Surveying	2	5	18	18	24

Department: Civil Engineering - BLAB (CE).

Objectives and goals:
Master the topographic techniques for surveying and implementing of structures and /o
Infrastructures in civil engineering projects.

Content:

Basics and concepts: Definitions and purpose of surveying - Units of measurement - Map
and Plans - Errors – Instruments and tools: Classification and components
Methods and instruments: Methods, Instrument errors - Angular measurements - Direc
measurements of distances - Indirect measurements of distances.

Direct and indirect leveling: Direct leveling - Indirect leveling.

Coordinates and surfaces calculations: Bearing - Calculation of surface.

Implementation, general methods: Setting out by linear measurements – Setting out b
optical square – Setting out by theodolite - Materialization of points - Implementation o
altimetric benchmarks – Setting out by laser equipment.

Implementation of buildings and civil structures: Preparatory work – Staking-out in plan ·
Staking-out in leveling - Implementation of civil works – Inspection of structures.

Road alignment, profiles, and earthwork quantities: Successive phases of design of
highway alignment - Implementation of curves - Connection with progressive curvature ·
Staking-out of slopes - topographical control of earthworks – Longitudinal profiles and cros
sections - earthwork quantities.

Topography applied to urban surveying.
Photogrammetry applied to civil engineering.

Lab surveying:

Surveying instruments - Direct measurement of distances - Direct leveling and indirec
leveling (measuring the vertical angle) - Measurement of horizontal angle: Horizon tour an
surface calculation – Stake-out with optical squares - Implementations of civil structures an
curves connections - Preparation of longitudinal profiles and cross sections - Urban surveyin
and materialization of points - Establishment of longitudinal profiles

Semester 3

Code	Course	ECTS	COURSE	Exercises	
LS3AEVE	Ventilation	2	12	18	
LS3ANGL	French (GC-GIM-GRIT-IG)	2		30	
LS3-DAOR	Computer Aided Drafting CAD 2	2			
LS3ELEC	Electricity	4	15	21	
LSROUT	Roads	5	27	15	
LS3SLABR	Statistics and Probability (GC-GIM)	4	18	27	
LS3STAV	Advanced Structures	4	12	15	
LS3STBA	Reinforced Concrete Structures 2	4	24	21	
LS3ISET	Insulation and Waterproofing *	3	18	12	
LS3MARK	Marketing (BC) *	3	18	12	
Total	9	30	126	159	

Code	Title	Semester	ECTS	COURSE	Exercises	LAB
S3AEVE	Ventilation	3	2	12	18	0

epartment: Civil Engineering - BLAB (CE)

bjectives:
esign, implement and maintain ventilation to ensure acceptable conditions for humans, at
ork or at rest, for the breeding of animals and for products during manufacturing or storage.
eal with the theoretical aspects of ventilation and the technical components of aeraulic.

ontent:

Aeraulic
Overview: The aeraulic in a ventilation study - Notation, Units.
Theoretical basis: Air - The person - Sources of pollutants - Room.
Air movement: Active elements – passive elements – Air movement.
The vents: Features - Technology and air supply devices - Technology and suction
devices - Sustainability of vents.
Ductwork: Duct layout - Installation and maintenance of ducts - Thermal and
acoustic insulation of ductwork - Dampers, valves, diaphragms - The ductwork
calculation.
Fans: Overview - Various types - Selection criteria.
The air filtration in ventilation: Overview - Characterization of dust atmospheres -
Qualities of air filters and their types - Implementation and maintenance.

Ventilation
Ventilation
Types of facilities: Overview - Classification - Apparatus for treating air - Ventilation
system.
Design principle of a ventilation system: Basis of calculation - Requirements.
Installation of ventilation: Housing - School buildings - Hotels, offices - Industrial
Buildings - Roads and tunnels.

Code	Title	Semester	ECTS	COURSE	Exercises	LAE
LS3ANGL	French	3	2	0	30	0

Department: CE- MIE – CCNE - BC

Objectives:

Ce cours est conçu pour des étudiants ayant une formation générale ou technique. Ce cours développe les capacités de lecture, d'écriture et de conversation aussi bien que l'amélioration de la prononciation et l'augmentation du vocabulaire. Une attention particulière est portée à la lecture et à la compréhension. L'objectif principal de ce cours est d'enseigner la compétence communicative, qui est la capacité de communiquer en Français en fonction de la situation, de l'objet et du statut des participants

Content:

La première partie du cours est axée sur le vocabulaire essentiel, la lecture, la conversation et l'écriture : Portrait des étudiants, liste des détails des compétences personnelles, statut actuel, parcours et responsabilités.

La seconde partie est axée sur le vocabulaire technique, la discussion autour de sujets techniques, l'analyse de rapports techniques (articles, papiers de recherche, projets) e quelques activités de communication.

Objectives:

French is a course designed for students with basic and technical major. This course covers the skills of reading, writing and speaking as well as improving pronunciation and building vocabulary. Particular emphasis is placed on reading and comprehension The primary goal of this course is to teach communicative competence, that is, the ability to communicate in English according to the situation, purpose and roles of the participants.

Content:

In this course, the first focused on: key vocabulary, reading, speaking and writing Student Portrait, list all details of personal skills, present position, background and present responsibilities.
The second part focused on: technical words, discussion about technical topics analysis of technical reports (projects, articles, papers,...) and communication activities.

Code	Title	Semester	ECTS	COURSE	Exercises	LAB
LS3-DAOR	Computer Aided Drafting CAD 2	3	2	0	0	30

Department: Civil Engineering - BLAB (CE)

Prerequisite: Computer Aided Drafting 1 (Enrollment and Attendance).

Objectives:

Being able to develop projects using most of the software functions and tools.

Content:

3D design, drafting and application to various examples.

Use of Libraries.

Schematic Representations.

Data transfer between a drawing and a variety of applications (spreadsheets database).

Code	Title	Semester	ECTS	COURSE	Exercises	LAB
LS3ELEC	Electricity	3	4	15	21	9

Department: Civil Engineering - BLAB (CE)

Objectives:
Acquire the basic concepts of electricity in order to understand and apply the single phase and polyphase power systems.

Content:

Mathematical concepts
General information on Electrostatic: Field - Flux - Gauss - Electrostatic force, work potential, earth (ground).
General information on the electrical circuit: Current - Power, energy - resistance inductance, capacitance - Kirchhoff's Law.

Series and parallel Impedance Association, Complex Power, Power factor improvement, Boucherot Theorem.

Techniques of circuit Analyses (Principles and fundamental theories): Thevenin's Theorem, Norton, Principle of Superposition - Δ to Y Transformation
Sinusoidal Steady State circuits: RL, RC and RLC Circuit
Three phase systems: simple and compound voltages – Y or Δ circuits - balanced and unbalanced loads - Active, reactive and apparent power
Transformers: Self-inductance - Mutual Inductance - Transformer, role in electrical engineering (examples).

LAB Sessions:
Ohm's law in DC. Electrical Resistance Measurement using the Ammeter and the Ohmmeter methods
Applications: Thevenin circuits, voltage and current dividers, principle of superposition theorem.
Measure the effective value of a periodic signal.
Study of the RL circuit, RC and RLC.

Code	Title	Semester	ECTS	COURSE	Exercises	LA
LSROUT	Roads	3	5	27	15	18

Department: Civil Engineering - BLAB (CE)

Objectives: Introduction of traffic study and analysis of traffic, geometrics characteristics c roads, study of signs, roads construction, materials used in roads construction. study of road project.

Content:

Generalities: Notions of vehicular and traffic types.

Circulation analysis: Statistics, compaction, circulation investigation.

speed of car: isolated car: resistance of direction, convey insulated: resistances to th movement, adherence and braking, distance stopping. Movement in a group.

Capacity of the roads: Width of the lanes, capacity of a two-track road and with N way. factors reducing the capacity, concept of level of service, factors increasing the capacity.

Geometrical characteristics of the roads: Transversely normal profile, Alignmen raising of the turns, connection with progressive curve, visibility in plan, extra width i curve, rays of inscription. Profile longitudinally: water run-off, vehicle handling to th slopes, comfort, visibility.

Crossroads: Possible installations: plane installations, free crossroads, general principle of installation, geometrical characteristics, roundabout, crossroads ordered by signal Uneven crossroads.

Indication: protection, principles general, various forms: vertical and horizont: indication. Implementation.

Mechanical resistance of the roadways: Action of the vehicles on the roadways, actior vertical, tangential and dynamic and influences period of validity and repetition of th loads. Soil mechanics properties.

Construction of the roadways: Construction of the flexible pavements, sub-base, bas course, surfacing. Rigid pavements.

Pavement design: Flexible pavement design: Method of AASHTO, Method of Aspha Institute, Method of LCPC. Rigid pavement design;

LAB Sessions:

Study of complete road project. Laboratory works will contain: Marshal Test penetration test, etc...

Code	Title	Semester	ECTS	COURSE	Exercises	LAB
LS3SLABR	Statistics and Probability	3	4	18	27	0

Department: CE MIE.

Objectives:

Understand the elements of Statistics and Data Analysis.
Simple and conditional probabilities.
Random variables and associated distributions.
Basic tools of inferential statistics and their use.

Contents:

Descriptive Statistics: discrete and continuous variables statistics, characteristi values (Mean, Variance and Standard Deviation), Statistics with two-variabl series, linear regression and correlation.

Probability:

1°) **Combinatorial Analysis and Probability:** probability laws (Additive Rule: Multiplicative Rules), Counting Sample Points, Conditional probability, Baye: formula, total law probability.

2°) **Random Variables:** Discrete Probability Distributions, Continuou Probability Distributions, Mean of a Random Variable, Variance and Covarianc of Random Variables, Some Discrete Probability Distributions: Discrete Unifor Distribution, Binomial and Multinomial Distributions, Poisson Distributior Geometric Distributions, Some Continuous Probability Distributions: Continuou Uniform Distribution, Normal Distribution, Exponential Distributions.

Inferential Statistics: Random Sampling, Sampling Distributions, Estimatior Point Estimate, Confidence Interval Estimation. Statistical Hypotheses: Genera Concepts, Testing a Statistical Hypothesis, Tests on a Single Mean, Tests on Tw Means, Test on a Single Proportion, and Tests on Two Proportions.

Code	Title	Semester	ECTS	COURSE	Exercises	LAF
LS3STAV	Advanced Structures	3	4	12	15	18

Department: Civil Engineering - BLAB (CE)

Prerequisite: Structures 1 and Reinforced Concrete Structures I

Objectives:
To learn the methods of solving highly hyperstatic structures. Determine the combinations o
unfavorable loads on a structure. Check the stability of the support elements. Introduction t
the plasticity of the structures and to the calculation of the ultimate load on hyperstati
structures.

Content:

Method of displacement or stiffness: concept - rigidity Relation for a planar structur
loaded in its plane - simplifying hypotheses.
Lines of Influence: Introduction - Methods of resolution - lines of influence of suppor
reactions for a isostatic structure - lines of influence of internal forces for an isostati
structure - lines of influences of a Hyperstatic system.
Elastic instabilities: Introduction - stability of a rigid element-stability of an elastic elemen
in concentric Compression (column) - Euler formula.
Plasticity (3h C and 3h TD): Introduction - law of elastic-perfectly plastic behavior - plasti
Traction - flat plastic bending - case of composite materials – moment law – curvature
concept of plastic ball.

Code	Title	Semester	ECTS	COURSE	Exercises	LAE
LS3STBA	Reinforced Concrete Structures 2	3	4	24	21	0

Department: Civil Engineering - BLAB (CE).

Prerequisite: Reinforced concrete structures 1 (attendance and assimilation)

Objectives:

Design of elements subjected to simple compression. Shear. One-way and two-way Solid Slabs.
Continuous beams. Load transfer. Stairs.
Study of a real project based on architectural plans (for substructure).

Content:

Design of elements subjected to simple compression (columns): Definition - Buckling theory - Lump sum method of calculation according to Eurocode 2 - Quick design of column.

Design of elements subjected to shear:
Shear: definition and consequences - Transversal reinforcement - Design of transversa reinforcement – Shear reduction at supports –

Concrete-steel bond: Adherence - Anchoring - Fixing - Bars recovery - Overlap of bars.

Solid slabs: Definition and examples - One-way and two-way slabs – Isostatic and continuous slabs - Algorithm and method of calculation – Reinforcement.

Continuous beams: Lump sum and Caquot Methods: Domain of application and calculation for moments and shears in beams (with or without cantilever) - envelope curves: moment and shear.

Stairs: Definition - Calculation of the geometric dimensions of straight stairs - Design o reinforcement in straight stairs.

Supplements: Preliminary design of structural elements.

Code	Title	Semester	ECTS	COURSE	Exercises	LAE
LS3ISET	Insulation and Waterproofing	3	3	18	12	0

Department: Civil Engineering - BLAB (CE).

Objective:

Get the necessary knowledge to properly understand the thermal and acoustic insulations of buildings along with the waterproofing of the civil engineering structures. Students will be able to verify the abidance of the proposed insulations to the regulations and Codes of Practice.

Contents:

Thermal Insulation

Heat transfer and propagation.
Surface losses: Thermal resistance of heterogeneous materials - Superficial thermal resistance - Losses through carpentry - Insulation properties and techniques.
Linear losses.
Air permeability and heat losses through air renewal and circulation.
Application of thermal regulations.

Acoustic insulation

Generalities: Basic information on the physical and human acoustics - Arial and impact noises.
Arial noises: Transfer of noise between premises - Gross acoustic insulation and normalized acoustic insulation - Acoustic weakening index - Acoustic code and regulation.
Protection and calculation method of insulations against interior and exterior noises.

Waterproofing

Generalities:
Technical rules - Waterproofing of roofs and terraces and implementation.

Code	Title	Semester	ECTS	COURSE	Exercises	TP
LS3MARK	Marketing	3	3	18	12	

Department: IG – CE

Objective:
In this course, students will learn the most important features and problems in marketing moreover, the students will identify the modern concepts of marketing philosophies, strategic marketing and marketing planning, the marketing environment, Marketing Information systems, consumer behavior and organizational marketing and market segmentation positioning, targeting. The course will focus on strategic products and services, prices distribution, integrated marketing and communication strategies. In addition, students will learn online marketing, e-commerce and marketing using social media.

Outline:
- Introduction to marketing
- Definition of basic marketing concepts and terminology
- Marketing strategic planning
- Marketing environment
- Marketing Research
- Consumers and Organizational markets
- Marketing Segmentation, Targeting and Positioning
- Products and Services Strategies
- Pricing strategy
- Supply chain management and marketing channels
- Integrated Communication marketing strategy
- Online Marketing

Semester 4

Code	Course	ECTS	COURSE	Exercises	LAB
S4ARCH	Architecture	2		12	18
S4CHCL	Heating and air conditioning	5	21	27	12
S4EXCO	Communication Skills (GC-GIM-GRIT-IG)	2		15	15
S4FOND	Foundations	4	15	21	9
S4HYUR	Urban Hydraulics	4	21	24	
S4PRGC	Construction Procedures	4	30		15
S4SBAA	Advanced Reinforced Concrete Structures	4	15	21	9
S4MENU	Numerical Analysis *	3	15	15	
S4PRSC	Scientific Programming *	2		12	18
S4REPO	Operational Research (BC) *	5	18	21	21
Total	9	30	117	147	96

Code	Title	Semester	ECTS	COURSE	Exercises	LAB
LS4ARCH	Architecture	4	2	0	12	18

Department: Civil Engineering - BLAB (CE)

Pre-requisites: drawing (registration and assiduity)

Objectives:

Initiate the student to Architecture field: Explain the third dimension in the structural part o buildings.

Refine the complementarity of two concepts: Architect – Engineer and space – Function.

Content:

Directed work:

Rehabilitation exercises: two dimensions – plan – three dimensions – volume.

LAB Sessions:

Designing an architectural project.

Code	Title	Semester	ECTS	COURSE	Exercises	LAI
LS4CHCL	Heating and Air Conditioning	4	5	21	27	12

Department: Civil Engineering - BLAB (CE)

Prerequisites: Thermodynamics and heat transfer (registration and attendance).

Objectives:

Teach the students the principles of air conditioning and the operation of refrigeratio facilities. Students will become familiar with different types of facilities. Calculat losses and cooling loads for a given building.

Content:

Basic concepts: Comfort concepts, air properties and psychrometric chart.

External environment and indoor environment: Climatic factors and the basic external conditions. Comfort conditions and indoor climates.

Air distribution in air conditioning facilities: General study of an air conditionin facility, air distribution in rooms.

Loads due to internal and external environment.

Refrigeration machine: The main components of an air conditioning, refrigeratio cycle.

Air conditioning processes: equipment of an air conditioning system, dissociate systems.

Overview on heating: Role and classification of facilities - Central heating characteristics of central heating, heating by using hot water, vapor and hot air General problems of heating.

Central heating: calories generators, coolant and pipe, heat emitters, components c central heating, insulation, heating requirements, container and expansion colum control and adaptation of workplaces, electric heating.

Cold Room: Isothermal construction, refrigeration balance - Insulation – solid construction - ground, vertical walls, ceiling.

LAB Sessions:

Heat pumps (Refrigeration machines) - Operation of a central air conditioning –
Air conditioning (Air Conditioner bench) - room air conditioner (computer application) - Site Visit.

Code	Title	Semester	ECTS	COURSE	Exercises	LAB
LS4EXCO	Communication Skills	4	2	0	15	15

Department: GC- GRIT- IAG- GIM

Objectives:
Initiate students to different situations of communication which might be encountered in professional environments.
Use correctly and effectively written and oral expression
Using English as a necessary tool in expression and communication.

Content:
Generalities:
Definition of communication elements: transmitter- receptor-support.
The problems of expression and communication: situations and necessities.
Elements of communication: transmitter- receptor-support. Typology of people and it impact on communication: elements of psychology, adaptation of communication according to the interlocutor. Organization and preparation to a situation of communication (written or oral): documentary research, choosing and preparing the support, spatiotemporal definition.
Written expression:
The scientific report: types: training report, degree project, and report.
Steps to write a scientific report (subject, bibliography, plan...)
Objectivity/subjectivity: objective elements and personnel point of view.
The form of the scientific training.
The CV: objectives of CV, its relation with the LM.
Form and content of CV; balance between formalism and personalization.
Different situations: a candidacy to training, to a job, to a university.
Motivation and Cover Letter:
The LM objectives and its link with the CV.
Form and content of the LM; balance between formalism and personalization.
Different situations: a candidacy to training, to a job, to a university.
Others: press release, advertisement.
Oral expression:
The presentation: to present himself to the audience / to present himself to another person talk about himself/ to explain a real subject. **Types:** presentation of work experience presentation of degree project, presentation of a project, presentation of a report (activitie report, balance sheet)
Problems: report to the public, used support, specific knowledge of the tool PowerPoint.
Discussion / debate: characteristics of debate: to outline ideas, answer questions, to argue.
Interview: characteristics of the interview: types of interview: hiring, training.
Negotiation: characteristics of negotiation.

Code	Title	Semester	ECTS	COURSE	Exercises	LAE
LS4FOND	Foundations	4	4	15	21	9

Department: Civil Engineering - BLAB (CE).

Pre-requisite: Soil Mechanics (registration and attendance).

Objective:
Allow students to properly design shallow and deep foundations.

Contents:
Resistance against shearing of soils: Generalities: Internal friction angle, long term and short term behaviors, definition of soil failure. Various laboratory tests done for the study of shearing resistance of soils: direct shear test, triaxial tests.

Shallow foundations: classification of foundations, types of footings. Description and method of in situ tests: Pressuremeter (Menard) and Static Cone penetration test.
Determination of ultimate stress based on the shearing parameters, pressuremeter tests and penetration tests.
Estimation of total settlements using the pressuremeter and consolidation methods. Plate load test. Permissible settlements (total and differential).

Deep foundations: Behavior of deep foundations, Classification of deep foundations (piles drilled shafts, execution, etc.), pile testing.
Design of piles based on soil prevailing conditions and parameters at service and ultimate limit states.
Determination of ultimate capacity of isolated piles using the static method (using soil shear strength parameters), the pressuremeter and Penetrometer methods.
Pile group behavior and negative skin friction.

LAB Sessions:
Direct shear testing.
Consolidation test using the oedometer.
Flow in soils using electric analogy.
Constant head permeability.

Code	Title	Semester	ECTS	COURSE	Exercises	LAB
LS4HYUR	Urban Hydraulics	4	4	21	24	0

Department: Civil Engineering - BLAB (CE)

Pre-Requisite(s): Fluid Mechanics and Hydraulics (enrollment and attendance).

Objectives:

Design different types of drinking water supply networks as well as all its component (pump, hydraulic accessories, trench excavation, anchors and thrust blocks) and evaluate th theoretical and practical capacity of a reservoir/tank (Its location and level). Prepare plan and longitudinal profiles of the network.

Content:

Introduction and Standards: Theoretical concepts review.
Reservoirs: Functions - Different Types - Location - Typical curve of consumption an filling (24h/24h, 12h/24h) - theoretical and practical capacities – Reservoir Elevation.

Design of drinking water networks: Types of Networks - Firefighting and Emergenc condition - Definition of flow in route in pipe - Design of ramified, looped and mixe networks.

Design of pumps: Pumping mains (technical and economic conditions) – Power an standardized power of a Pump - Pump Characteristic curves - Operating point of a pum discharging in a pipe - Suction of a Centrifugal pump: Concept of NPSH (Net Positiv Suction Head) - Calculation of water hammer.

Fittings and pipes installation: Valve chamber, Tee, Pressure reducer, Elbow, Bend: valves, Air valve, washout. - Trench excavation quantities (cuts and fills) – Design of anchor and thrust blocks.

Code	Title	Semester	ECTS	COURSE	Exercises
LS4PRGC	Construction Procedures	4	4	30	0

Department: Civil Engineering - BLAB (CE).

Objectives:

To learn the main methods used in the Civil Engineering Construction industry, different methods in concrete bridges construction, and procedures of soil consolidation and support systems (piles, sheet piles, walls).

Content:

The concrete materials: Constituents, composition, properties manufacturing, fibe concrete.

The formwork: functions, cost, components, design, thrust of fresh concrete stripping, removal of formwork, controls.

Implementation of concrete: transport, employments delay, casting, curing shotcrete.

Stripping: Stripping delay time and methods.

Facades: definition and appearance.

Foundation and excavations: Shallow and deep foundations.

Various processes of consolidation: freezing, drainage, dynamic compaction.

Injections: process, grout.

Diaphragm walls: Execution and waterproofing.

Piers- supports: procedures – Technology and tools, controls- tests.

Sheet piles: structure – manufacturing, installation, applications

General background on bridges construction: classification according to th longitudinal and transverse scheme, according to the method of construction.

The construction of bridges by prefabricated beams: principle, domain o employment, advantages and disadvantages, Notion of design and dimensioning prefabrication of beams, transport and installation.

The construction of bridges by incremental launching method: principle, domain of use, advantages and disadvantages, construction schemes, pushing materials.
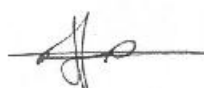
The construction of bridges on self- launching trusses: principle, domain o employment, advantages and disadvantages, concreting of slabs with truss bean below and above.

The construction of bridges by cantilever method: principle, domain o employment, advantages and disadvantage, cast in place cantilever bridge (segments) construction of cantilever bridges by assembling precast segments.

LAB Sessions:

Site visits to cement concrete and asphalt manufacturing plants.
Site visits to various construction sites.

Code	Title	Semester	ECTS	COURSE	Exercises	LAI
LS4SBAA	Advanced Reinforced Concrete Structures	4	4	15	21	9

Department: Civil Engineering - BLAB (CE)

Prerequisite: Structures 1 and Reinforced Concrete Structures I and II (Attendance an‹ assimilation)

Objectives:

Study the design of sections subjected to combined bending and axial load both at th ultimate and serviceability limit states and the design of different types of footings.

Content:

Design of sections subjected to combined bending and axial load:
Hypothesis general assumptions - Design of Fully tensioned sections - Sections wit combined
compression and bending: design at the Ultimate Limit State of sections with partial or full compression - Verification and design of partially or fully compressed sections at th Serviceability Limit State.

Foundations Design: General Introduction – design of footings (strip under wall, rectangula under rectangular column, circular under circular column, over two and four piles) subjecte‹ to a vertical concentrated load - Strip footings under rigid wall subjected to a normal load an‹ bending moment - Rectangular footings under rectangular column subjected to a normal loa and bending moment.

LAB Sessions:

Realization of a reinforced concrete structure elements and samples: Reinforcement of several elements: beams, columns, slabs, foundations, cylinders - Formwork - Concreting. Realization of destructive testing (compression, bending) and non-destructive tests (Schmidt hummer)

Code	Title	Semester	ECTS	COURSE	Exercises	LAI
LS4MENU	Numerical Analysis	4	3	15	15	0

Department: Civil Engineering - BLAB (CE).

Prerequisites: Analysis 1 - Analysis and Mathematical tools - Algebra (registration an attendance).

Objectives:
Student awareness to numerical methods for engineering calculations.
Content
Resolution of equation $f(x) = 0$: Roots separation method, experimental methods, graphical method. Approximation of a root: Substitution method, bisection method, Newton-Raphson method, fixed point method.
Resolution of linear systems: Introduction, direct methods: Cramer formulas, Gauss method. Iterative methods: Jacobi algorithm and Gauss–Seidel method.
Least square method: Introduction, regression line, general method, weighted least squares.
Numerical resolution of differential equations: Introduction, EULER's method, method using Taylor formulas, Runge–Kutta method.
Interpolation: Introduction, Interpolation and extrapolation, linear interpolation, quadratic interpolation, Lagrange interpolation.
Programming: Programming of various methods by using an appropriate programming language (C, Matlab or others)

LAB Sessions:
Using Matlab or equivalent software.

Code	Title	Semester	ECTS	COURSE	Exercises	LAI
LS4PRSC	Scientific Programming	4	2	0	12	18

Department: Civil Engineering - BLAB (CE)

Prerequisites: Introduction to Computers (enrollment and attendance).

Objective:

Develop computer programs related to numerical methods taught in numerica analysis or specialty courses.

Content:

Program complements. Solutions to various problems such as: solving simpl equations, solving linear systems, approximation (method of least squares, polynomia regression, etc..), Differential equations, calculus integrals, formulation of concrete potable water networks or waste, etc.

Tutorial Work:

Programming of relevant subjects in Civil Engineering.

LAB Sessions:

Development of computer programs and use of scientific software covering the main areas of civil engineering.

Code	Title	Semester	ECTS	COURSE	Exercises	LAB
LS2REOP	Operational Research *	4	5	18	21	21

Department: CE - BC

Objective:

The aim of this course is to provide students with quantitative resolution methods for decision making. The study of cost and optimization is a second objective.

Content:

- Linear algebra elements
- Formulation of linear program
- Graphical resolution of linear program
- Simplex method
- Minimization and irregular problems
- Duality and sensibility analysis
- Software for linear programs resolution: LINDO or Equivalent
- Introduction to dynamic programming

Lab sessions:

The lab sessions will focus on:
- Affectation and scheduling (Microsoft Project or equivalent)
- Simplex, sensitivity and duality with Excel-Solver

Semester 5

Code	Course	ECTS	COURSE	Exercises	
LS5HYDU	Urban Hydrology	4	21	24	
LS5LEBA	Buildings Legislations	3	15	6	
LS5MARE	Maintenance and Rehabilitation	4	12	18	
LS5ORPC	Planning and Site Organization	3	9	12	
LS5OSSA	Frames	2	6	9	
LS5OSSP	Retaining Systems and Slope Stability	3	12	12	
LS5STME	Steel Structures	3	15	15	
LS5LCGC	Civil Engineering Software *	2			
LS5REEC	Networks and Lighting *	3	18	12	
LS5SYSO	Solar System *	2	12	6	
LS5ENPR	Professional Environment (MIE)*	4	12	15	
LS5GEFI	Financial Management (BC)*	3	15	15	
Total	10	29	120	114	

Code	Title	Semester	ECTS	COURSE	Exercises	LAE
LS5HYDU	Urban Hydrology	5	4	21	24	0

Department: Civil Engineering - BLAB (CE)

Pre-Requisite(s): Fluid Mechanics (enrollment and attendance).

Objectives:

Analyze the different parameters related to the calculation of wastewater and storm-water networks. Distinguish between the different types of wet urban networks.
Learn concepts and basics on qualitative and quantitative aspects of wastewater and storm water.
Design of wastewater and storm-water networks (separate systems).

Content:

General: The sanitation problems in an urban area - The evolution of the sanitation system

Site analysis: Morphology and topography of the site, Soil and Geotechnical characteristics Hydrogeology and groundwater regime - Hydrography and tides - Climate and Rainfall Hydrology: analysis principles and IDF curves (Intensity, Duration, Frequency) - Urban and Industrial Context, land uses.

Waste water and storm water networks: Combined - Separate – Sub separate – mixed - Pumping mains (pressurized, vacuum) – Individual systems - Criteria for selecting a system.

Qualitative aspects of wastewater and storm water: Physico-chemical parameters Biological Parameters – Quality of Wastewater – Quality of Storm water - Quality of non domestic Wastewater.

Quantitative aspects of wastewater and storm water: Flow of Domestic Wastewate (current and future flow, peak flow, infiltration) - Flow of Non Domestic Wastewater – Storn water Flow (Transformation Rain-Flow) - Rational Method - Basics on Superficial metho (Caquot method) - Concepts on the method SOCOSE.

Design of networks, basics of hydraulic principles: Flow in open channels - Formula o Manning-Strikler.

Sizing of waste water network (separate system): Methods of calculation of flow Standards of diameters and velocities - Calculation of pipes section (formulas, graphs) Conditions of self-cleaning.

Sizing of Storm water network (separate system): Flow calculation by rational method standards of diameters and velocities, calculation of pipes section (formulas, graphs).

Code	Title	Semester	ECTS	COURSE	Exercises	LAF
LS5LEBA	Buildings Legislation	5	3	15	6	9

Department: Civil Engineering - BLAB (CE).

Objectives:
The students will be able to carry out a comprehensive directory (file) for building permit in line with the legislations and the regulations of the Town planning Authorities.

Content:
The code of town planning and executive decrees, Legislations of the building, Regulation and services of recording of a building permit, carparks, Combination and sorting of lots regulations and conditions for public safety.

LAB Sessions:
Preparation of a complete file for building permit (real project).

Code	Title	Semester	ECTS	COURSE	Exercises	LAI
LS5MARE	Maintenance and Rehabilitation	5	4	12	18	15

Department: Civil Engineering - BLAB (CE).

Objectives:
Acquire knowledge and skills in the fields of maintenance and rehabilitation of structures.

Knowing the history and current state of structure, the student will be able to address issue of maintenance and focus on its management.
Deal with rehabilitation methodologies through the type of intervention and diagnosi techniques for the evaluation of degradation and cost of works.

The acquisition of knowledge is supported by practical examples dealing with case studie and site visits.

Content:

Maintenance
Overview
The issues of building maintenance
Methods for the comprehensive evaluation of the condition of a building and its facilities.
Monitoring of buildings classified by lots: Overview - Structure - Building exterior and Facades - Roofing - Building interior - Air conditioning and plumbing Facilities - Electrical Facilities - Exterior spaces.

Rehabilitation
Overview
Past of structure (History)
Heritages: Landscaped - Archaeological - Architectural.
Methodology: Type of intervention: Rehabilitation, Restoration, Reconversion, Renovatior restitution, Reconstruction - Reading of Building - The cost of rehabilitation- Pathology o old buildings: Degradation, Technical diagnosis, strengthening of old buildings - Technica Inspection - Coating and mortars - Site management - Structures, disorder and remedia techniques: Foundations, Walls, Arch, Slabs, Frames cover, humidity, binders and mortars.

LAB Sessions:
Implementation of small projects of rehabilitation and writing of minutes and report:

Visit to sites and reports writing.

Code	Title	Semester	ECTS	COURSE	Exercises	LAE
LS5ORPC	Planning and Site Organization	5	3	9	12	9

Department: Civil Engineering - BLAB (CE).

Objectives:

Learn the basics of organizing and planning in civil engineering construction projects
Know the players in the construction process and the relationship between them, the
phases of construction and the principals of organization and the planning of building
and public works construction projects.

Content:

Introduction: the economic role of the construction and public work sector: complex
activity.

The players of the construction process: the owner, the role of the owner. The
consultant, the consultant missions, duties of the consultant. The contractor: duties o
Construction Company, modes of interventions of a company.

Project management: construction schedule, chronology of a construction operation
the components of the contractor's tender documents.

Site planning: definitions; (site yard, activities, joint work), the graph-planning

LAB Sessions:

Realize the graph-planning of a building and public works construction project and
learn the use of specific computer software in the planning domain.

Code	Title	Semester	ECTS	COURSE	Exercises	LAF
LS5OSSA	Frames	5	2	6	9	15

Department: Civil Engineering - BLAB (CE).

Objective:
To allow the student to analyze the different problems of reinforced concrete framing and to carry out a detailed design of a practical project

Content:
Actions on the structure: static actions, climatic actions, dynamic actions, shrinkage and temperatures
Foundations: Superficial and deep
Supports: retaining walls, diaphragm walls, Berlin or Parisian, strutted walls, underpinning
Water table: uplift of buildings, different levels of calculations, pumping and water table lowering
Floors: Composition (industrial, floor-slab, ribbed, DAP, solid slab), characteristics o materials, different support elements (columns, etc.), methods of calculation, drawings o reinforcement.
Braces: Different types of bracing, effects of wind, earthquake, and earth pressure, patterns o distribution of horizontal efforts
Miscellaneous: Classification of concrete, concrete cover and openings of cracks, acousti stresses and fire safety, distorted and permissible values, expansion joints, constructiv provisions

LAB Sessions:
Applications in the form of a building project (several levels and basements)
Pre-sizing of the various structural elements: loads, calculation of foundations, calculation o columns, calculation of beams, calculation of slabs, calculation of walls, calculation of stairs etc.

Code	Title	Semester	ECTS	COURSE	Exercises	LAI
LS5OSSP	Retaining Systems and Slope Stability	5	3	12	12	6

Department: Civil Engineering - BLAB (CE)

Pre-requisite: Soil Mechanics (registration and attendance).

Objective:
Allow students to properly design retaining systems and evaluate slope stability

Contents:
Active and Passive earth pressures: Limit equilibrium of active and passive pressures physical meaning of active and passive pressures, Rankine theory principle and graphica presentation. Cohesionless soils: inclined surface and lateral pressure on vertical surfaces normal pressure on random plane surface. Cohesive soils: normal limit pressures on vertica or random surface, critical height, variation of failure plane orientation with depth.
Retaining walls: Theory of limit equilibrium. Different wall types: gravity wall, T and I shaped walls, buttress, and pile wall, etc., construction and typical dimensions. Stabilit analysis of walls: overturning, sliding, bearing capacity and settlements.
Steel sheet piles: Areas of application, technology and system components, anchors, desig and verification. Presentation of classical methods (plasticity): Simply fixed walls, anchore walls, etc. Sheet pile walls and water problems: "Renard" conditions...
Slope Stability: Classification of soil movement, description of various types of so movement/sliding. Stability against circular failure with global safety factor: Fellenius slice method, Bishop slices method. Stability of slopes in plane failure.

LAB Sessions:
Study of real case of retaining system or slope stabilization.
Software use.

Code	Title	Semester	ECTS	LECTURE	Exercises	LAI
LS5STME	Steel Structures	5	3	15	15	0

Department: Civil Engineering - BLAB (CE).

Objective:
This course presents the fundamental concepts and design methods relative to a stee construction using the European code "EUROCODE 3".

Content:

Materials, Stresses: The Steel Material – Residual Stresses after manufacturing – Contro Tests of steel: Tension Test, Steel plasticity: reserve of security – Characteristics o normalized steel: Rolling tolerance, Mechanical characteristics of steel – Steel/Concrete Advantages, disadvantages.

Structural Joints: Generalities: Role of joints, joint functioning, Construction precautions joints Classification, bolted joints: construction precautions, design of ordinary bolts, desig of preloaded bolts – Welded joints: Welding process, constructional precautions, Weldin; design.

Elastic instabilities: Buckling: Theory, experiment, regulatory issue – Lateral torsiona buckling: theory, experiment, regulatory issue.

Design Basis in EC3: Security concept – Load and load combinations – Classification o cross sections – Cross section resistance: Tension force (T), normal force (N), Bendin; moment (M), Shear force (V), Bending moment + Shear force (M+V), bending moment · axial force (M+N), Bending moment + shear force + axial force (M+V+N) – Design Flov diagrams.

Design of beam in flexure: design of beam in elastic behavior – Design of beams in plasti behavior

Code	Title	Semester	ECTS	COURSE	Exercises	LAE
LS5LCGC	Civil Engineering Software	5	2	0	0	30

Department: Civil Engineering - BLAB (CE).

Prerequisite:
Structures – Advanced Structures – Reinforced Concrete Structures 2 (Enrollment and Attendance) ......

Objectives:
Apply theoretical knowledge in different courses to design a project using a specialized software.

Content:
Learn how to use Civil Engineering Software: theory, tools, output

LAB Sessions:

Carry out computer calculations in various fields in a project form.

Code	Title	Semester	ECTS	COURSE	Exercises	LAI
LS5REEC	Networks and Lighting	5	3	18	12	0

Department: Civil Engineering - BLAB (CE).

Prerequisites: Electricity (Registration and attendance).

Objectives:
Acquire the necessary knowledge to understand single and three phase power supply systems and to design and manage electrical installations inside buildings.

Content:
Electrical networks
Production of electricity , transmission and distribution of electricity: production methods - Power stations - Transport of electrical energy: interconnection and distribution networks: overhead and underground structures, Structures of a Low and medium network voltage.
Transformer stations, Low voltage distribution network, protection and cross-section criteria.
Electrical Cable: Properties - Classification and selection of materials - Dielectric properties of materials - Classification and selection of insulation materials.
Calculation and installation of domestic electrical networks: External influences - Choice of conductors and cables - Properties, classification and selection of conduits – cable cross-section.
Management and security of electricity networks: safety Problems and accident causes - Earthing - apparatus protection.

Lighting
Definitions, photometric quantities and units: Theory and decomposition of light - Photometric quantities - photometry and light intensities.
Natural and artificial lighting - Generation of Light: The incandescence, fluorescence.
General lighting scheme calculation : The illumination - Definition of photometric lighting - Installation of light sources.

Code	Title	Semester	ECTS	COURSE	Exercises	LAB
LS5SYSO	Solar System	5	2	12	6	12

Department: Civil Engineering - BLAB (CE).

Prerequisite: Thermodynamic and Heat transfer (enrollment and attendance).

Objectives:

Acquire a solid base for the use of solar energy to benefit from this free energy Include the mechanism of solar thermal installation and multiples solutions in residential and industrial projects.

Contents:

Generality

Reminders and formulas: Thermodynamics - Heat transfer (conduction, convection and radiation) – Heat exchangers.

Solar field: solar energy outside atmosphere - Couple Earth-Sun – Receiver of solar energy.

Flat plate Sensor: Construction element - characteristic equations - Conception (laminar and transitory regime).

Applying low temperature: direct and forced system – Space heating (Solar water heating, storage bed and stone wall sensor, solar Pool, solar drying, bioclimatic house solar climatization, etc.).

Code	Title	Semester	ECTS	COURSE	Exercises	
LS5ENPR	Professional Environment *	5	4	12	15	

Department: CE - MIE

Objectives:

To have, an overview of the concept of "environment" by combining scientific, technical and technological knowledge. Understand the themes: "Ecology, Pollution and treatment, waste and treatment, renewable energies, ISO 9000 and 14000 standards, environmenta Management system" and their interactions with the industrial environment, "sustainable development" policy . To learn the main technical factors that constitute the proper industria element of the Usinier complex, considering them in two aspects (technical and human).

Study the parameters likely to directly influence the physical, physiological or psychic behaviour of staff with the consequences that may result for the performance of the institution.

Content:

- Industrial environment, safety standards and ergonomics, safety and design.
- Technical Aspects in the industry: Production and distribution of fluids, handling and circulation, storage of materials.
- Human Aspects in the industry: ventilation and ventilation, light and colour workplace temperature, humidity, noise, noise control.
- The effects of work on man: occupational diseases, prevention. Types of fatigue Causes and remedies.
- Fight and protection against industry: prevention measures, classification of fires.
- Atmospheric pollution: Air pollution, ozone layer, greenhouse effect, water pollution waste water, wastewater treatment.
- Waste: Waste Cycle, waste treatment, recycling and design policy
- Environmental Management Systems: Audit and Observations, policies and pragmatism, strategic non-pollution Plan
- Energy: renewable energies, energy saving
- Standards: Quality and ISO 9000, environment and ISO 14000, Lebanes environmental legislation
- **Laboratory:** Site visits: The objective of the visits on industrial sites is to see the applications of the acquired knowledge and to create in the student an internal o external auditing approach of the entities visited. In addition, the student repor written by group of students will strengthen their ability to write scientific reports.
- As an example
- Drinking water Filtration Centre – Saida – Fawar
- Electricity of Lebanon – Zahrani desalination of water, toxic emission of generators
- Wastewater Treatment – Saida – Sinik
- Lebanon Cable

Code	Title	Semester	ECTS	COURSE	Exercises	LAI
LS5GEFI	Finance Management *	5	3	15	15	

Department: CE - BC

Objective:
This course aims to show how to use financial information in order to increase th effectiveness of organizations and management of firms.

Outline:
Capital budgeting
- Definition and classifications of investment projects
- Calculation of initial outlay
- Net operating cash-flows
- Capital budgeting techniques: Payback period (PP), Profitability index (PD Net present value (NPV), Internal rate of return (IRR), Crossover rate

Financing decisions
- Difference between internal and external financing
- Cost of equity
- Cost of debt
- Cost of preferred stocks
- Determining the cost of capital

Capital structure and value of a firm (Modigliani et Miller)
- Value of firm and cost of capital without taxes
- Value of firm and cost of capital with corporate taxes

LAB sessions:
The Lab focuses on using Microsoft Excel advanced spreadsheets to learn how to compos formulas and use the main functions in order to reinforce and extend students' understandin of topics covered in lectures. Above all, the Lab is intended to be practical, useful an interesting.

Semester 6

Code	Course	ECTS	COURSE	Exercises
LS6PRFE	**Final Year Project**	12		
LS6STAG	**Internship (14 weeks) (6+8)**	6		
LS6DRGT	**General and Labor Laws**	1	15	
LS6MAPR	**Project Management**	4	21	18
LS6COGA	**General and Analytical Accounting**	3	12	18
LS6ENVI	**Environment ***	2	15	6
LS6SANI	Sanitary *	3	12	9
LS6CSEF	Calculation of Structures using the FE Method (MIE)*	3	9	12
LS6GEQU	Quality Management (MIE)*	3	9	12
Total	**7**	**31**	**192**	**198**

Code	Title	Semester	ECTS	COURSE	Exercises	LAB
LS6PRFE	Final Year project	6	12	0	0	180

Department: CE

Objective:

To benefit from the acquired skills in various civil engineering specialities to implement in a simple project of a professional nature.

Content:

Projects topics characterized by their multi-disciplinary nature are proposed to the students. A project is assigned to small groups of Students and directed by professors. Students put into practice the different acquired techniques and knowledge to be complemented via extensive research to achieve the required duties. The work leads to the preparation of a final report and a presentation in front of a jury.

Code	Title	Semester	ECTS	COURSE	Exercises	LAI
LS6STAG	Internship	6	6	0	0	0

Department: Civil Engineering - BLAB (CE)

Two periods: Period1 (end semester IV) of 6 weeks (3 ECTS) and period2 (end semester VI of 8 weeks (5 ECTS)

Objective:

To initiate a first contact with the professional world by carrying out training in a civi engineering firm under the supervision of professional engineers.

Content:

Knowledge development in the buildings and public works domains.
Interference with professionals experienced in site and/or design works.
Apply acquired knowledge and skills on real projects.
The training outcome is a final report and a presentation in front of a jury.

Code	Title	Semester	ECTS	COURSE	Exercises	LAF
LS6DRGT	General and Labor Law	6	1	15	0	0

Department: GC-GIM-GRIT-IG

Objectives:

An introduction to law and to labor code so that future graduate knows his rights and duties during the various stages of his employment.

Content:

Introduction to the study of law

The juridical rule: Definition – characteristics – sources- principles – classification.

The juridical process: courts – arbitration – action – proof modalities.

The contract and the responsibility: form and content of contract – criminal responsibility – civic responsibility- contractual responsibility – responsibility of building.

Labor code:

Content and form conditions of labor contracts - Labor contract modalities - Obligations of employer and employee –Warning – Vacations- Risk theory- Abusive termination- The National Fund of Social Security (NFSS)

القسم الاول: مقدمة عن القانون
المبحث الاول: القاعدة القانونية ـ المبحث الثاني: العقد ـ المبحث الثالث: الدعوى ـ المبحث الرابع: تنظيم القضائي العام

القسم الثاني: قانون العمل
مبحث الاول: ماهية قانون العمل وتطوره ـ المطلب الاول: تعريف قانون العمل- المطلب الثاني: طور قانون العمل.

مبحث الثاني: نطاق قانون العمل ـ المطلب الاول: الاشخاص الخاضعون لأحكام قانون العمل ـ مطلب الثاني: الفئات المستثناة من الخضوع لأحكام قانون العمل

مبحث الثالث: علاقات العمل الفردية ـ المطلب الاول: تعريف عقد العمل الفردي وبيان خصائصه عناصره الاساسية ـ المطلب الثاني: إنعقاد عقد العمل الفردي ـ المطلب الثالث: الآثار المترتبة على عقد العمل الفردي ـ المطلب الرابع: تعليق وإنتهاء عقد العمل الفردي ـ المطلب الخامس: قضاء العمل فردي

المبحث الرابع: علاقات العمل الجماعية ـ المطلب الاول: التنظيم النقابي- المطلب الثاني: عقد العمل جماعي

القسم الثالث: الضمان الاجتماعي
المبحث الاول: الصندوق الوطني للضمان الاجتماعي وأجهزته
المبحث الثاني: فرع ضمان المرض والامومة
المبحث الثالث: فرع ضمان طوارئ العمل والامراض المهنية
المبحث الرابع: فرع التقديمات العائلية والتعليمية
المبحث الخامس: فرع تعويض نهاية الخدمة

Code	Title	Semester	ECTS	COURSE	Exercises	LAI
LS6MAPR	Project Management	6	4	21	18	6

Department: Civil Engineering - BLAB (CE)

Objectives:

To initiate the students to the management of projects in general. The techniques o price assessment and bill of quantities are approached in details.

Contents:

Project management

General information, concept of a project - Components of a project - th management of the project - Organization of project - Project management Communication of project - Project of Civil Engineering - Methods of problem solving.

Studies of Price and Bill of quantities

General information - prices: structure of a price - Cost of labors - Materials Expenses of building site - Expenses proportional to the selling price - Bill o quantities: General information - Earthwork - Masonry - reinforced Concrete technical Equipment - preliminary Study of the conditions for implementation - uni Price and estimated price – Method of Measurement.

Management of the building sites

Specificity of the financial management of the building sites - elements necessary to the establishment of a study: resources - the behavior of the resources by report/ratio to financial management - Determination of coefficient of sale - estimate management - the financial management of the building sites in the small companies the financial management of the building sites in the companies of public works.

List LAB Sessions:

Price and bill of quantities preparation of a project of civil engineering, using specific software.

Code	Title	Semester	ECTS	COURSE	Exercises	LAF
LS6COGA	General and Analytical Accounting	6	3	12	18	0

Department: Civil Engineering - BLAB (CE)

Objectives:

Introduction to general and cost accounting. This essential course represents a suppor tool and an introduction to the study of price and quantity assessment and to the management of sites and projects. It also facilitates the cooperation between the construction site manager, one of the potential job positions of our graduates, and the accountant.

Content:

Fundamentals of Accounting

Introduction: accounting and its role in the economy.
The balance sheet: variation of the balance sheet, the principle of double entry.
The Accounts: utility and operation of accounts.
The Results.
The organization of accounting process: Journal, balance, chart of accounts.

Cost Accounting: Basic Principles of the full costs method

Stocks sheet.
Incorporation and distribution of costs (direct costs and indirect costs).
Calculation of all costs.
Analytical results.

Code	Title	Semester	ECTS	COURSE	Exercises	LAI
LS6ENVI	Environment	6	2	15	6	9

Department: Civil Engineering - BLAB (CE)

Objective:
Know the different sources of pollution on water, land and air. Propose solutions for the treatment of each type of pollution. To study the environmental impact of the various types o civil

Content:
Fundamentals of Ecology: Definition of an ecosystem - Major components of an ecosystem biotic abiotic components - Normal operation of an ecosystem: matter cycles and biodiversity;

Air pollution: Sources of pollution - Consequences of pollution (greenhouse effect, ozone hole, ...) - Pollution prevention - Control of transport - Alternative sources of energy;

Water pollution: Sources of pollution – Effects of pollution - Pollution treatmen (wastewater treatment: application to sewage treatment, diagnosis and remediation of river diagnosis and remediation of groundwater, cost);

Soil pollution: Pollution Sources - Consequences of pollution - Diagnosis of a polluted site Pollution treatment (thermic treatment, incineration, physical treatment, containment biological treatments: bioremediation, phytoremediation) – cost;

Municipality Solid Waste and landfills: Composition - treatment (Sorting, Recycling o inorganic waste, organic waste composting);

Environmental impact of civil engineering projects: Construction material: (Environmental impact, Alternative Materials) - Projects related to water management (dams pipelines, flushing operations)

Pollution standards: Parameters involved - Standards Classification – Local and international Values ;

Field visits: Visits to waste storage areas, a landfill, cement factory, career site, recyclin; plants, natural reserve...

Code	Title	Semester	ECTS	COURSE	Exercises	LAF
LS6SANI	Sanitary	6	3	12	9	9

Department: Civil Engineering - BLAB (CE).

Prerequisite: Fluid Mechanics (enrolment and attendance).

Objective:
Learn how to design and implement water supply systems and sanitary sewage in building.

Content:
General review
Choice and installation of pipes in building
Different types of sanitary machineries
Pipes- diameter calculation
Drains

Code	Title	Semester	ECTS	COURSE	Exercises	LA[
LS6CSEF	Calculation of Structures using the FE Method *	6	3	9	12	9

Department: GIM

Prerequisite: General Mechanics, Resistance of Materials

Objective: To acquire the basic concepts necessary for the calculation of structures subjecte to mechanical loads by the finite element method. This course presents the essentia characteristics of the finite element method for the study of the behavior of uni an bidimensional structures in flat elasticity. It presents the theoretical and practical aspects c the method.

Content:
Notions of discretization-mesh, different types of finite elements, degrees of freedom.
Travel shape functions.
Elementary rigidity matrix, vector of nodal loads, vector of nodal movements.
Elemental matrix Assembly, the overall structure rigidity matrix.
Overall balance and linear system resolution.
Deformities and stresses.
One-dimensional finite element: Tensile bar.
One-dimensional finite element: bending beam.
Two-dimensional finite element triangle with 3 knots in flat elasticity.
Two-dimensional finite element quadrilateral with 4 knots in flat elasticity.

Laboratory:
Modeling and calculation of structures via the finite elements software by treating th following cases:
-Bar in traction.
-Bending beam.
-two-dimensional structure with a 3-knot finite element mesh in planar elasticity.
-two-dimensional structure with a discretization in finite elements quadrilateral at 4 knots i flat elasticity.

Code	Title	Semester	ECTS	COURSE	Exercises	LAB
LS6GEQU	Quality Management *	6	3	9	12	9

Department: GIM

Objective:
As a result of this course the student must be able to: • Understand and know the interdependencies of all factors affecting the quality of the product offered, hence the notion of integral quality;
• Make a decision about the quality of the product or service offered;
• Organizing and implementing policies leading to: o The maintenance and assurance of current quality;
o Improving the quality of the goods and services offered.
• Know and manipulate known software in the domain.

Content:
Introduction to Quality Assurance
• What is quality?
o The meanings of "quality" O customer needs and conformity to specifications O Quality control o quality Assurance o Quality Management o Total Quality • Quality costs • Approaches to quality management • Outi LS Quality
o Graphs o Pareto chart o cause-effect diagram O statement sheet o histogram
o dispersion diagram o control charts • The 7 quality enhancement tools o The Affinity diagram o The Relationship diagram o The Matrix diagram o the systematic diagram (ir shaft) o the arrow diagram o the Decisio diagram N o the priority matrix the control cards by variable
Control charts by attributes the family of Standards ISO 9000

References:
1. Product and Quality methods. J. M. Chatelet. Ellipses, 1996. ISBN: 2 7289 5681 1.
2. ISO standard 9001-2000, quality Management system. Requirements;
3. Maintenance and quality Assurance, Lavina – Paranjape, 1998;
4. Achieving quality of Service, Alain, 1998

Laboratory:
• Quality control 9h (6 sessions)

Head of department
Civil Engineering : Buildings and Public Works

Pr. Hayssam El Ghoche