

# University of Mosul جامعة الموصل



## *First Cycle – Bachelor's Degree (B.Sc.) – Civil Engineering*

بكالوريوس - هندسة مدنية



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## 1. Overview

This catalogue is about the courses (modules) given by the program of Civil Engineering to gain the Bachelor of Science degree. The program delivers (48) Modules with (6000) total student workload hours and 240 total ECTS. The module delivery is based on the Bologna Process.

## 2. Undergraduate Courses 2023-2024

### Module 1

Code	Course/Module Title	ECTS	Semester
CE101	Mathematics I	6	1
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
3	2	78	72
Description			
Introduction to basics in Mathematics, to start learning calculus. The emphasis is on functions and graphs, also we study the trigonometric functions. the main building blocks of calculus. Calculus is built on the notion of limit. The rules for calculating limits are studied. we study also Derivatives, slopes, Tangent lines and derivatives Differentiations Rules, Derivatives of Trigonometric functions. The chain rule, implicit differentiation and fractional powers. Applications of derivatives, Related rates of change. Maxima, minima, curve sketching with $y'$ and $y''$ . Graphing Rational functions, Asymptotes, Optimization. Types of Matrices, operations sum, multiplication by scalar, multiplication between two matrices. Determinants, the adjoin of Matrix, inverse of Matrix, solving systems of linear equation using Matrices.			

### Module 2

Code	Course/Module Title	ECTS	Semester
CE102	Engineering Mechanics I	6	1
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
3	2	78	97
Description			
It is a theoretical material that is considered a precursor to strength of material, the principles of structure theory and design of steel structures. Through this course, the student will be able to identify forces and their types, how to calculate the resultant and moments of forces, and to analyze and identify the types of structures such as beams, trusses and frames. In addition, the student will be able to calculate the centroid for areas, lines, and volumes, as well as find the moment of inertia. Also, friction and dynamics engineering mechanics as fundamentals approach are given to the students.			

### Module 3

Code	Course/Module Title	ECTS	Semester
CE103	Engineering drawing I	6	1

Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	2	63	87
<b>Description</b>			
<p>Engineering drawing is a graphical representation of an object, system, or structure that is created by engineers to communicate design information clearly and accurately. It serves as a universal language for engineers, architects, and technicians involved in the design, manufacturing, and construction processes. An engineering drawing typically includes precise dimensions, geometric shapes, symbols, and annotations to convey important details about the object or system being depicted.</p> <p>These drawings are created using specialized drafting tools or computer-aided design (CAD) software, ensuring precise measurements and accurate representations. They provide a comprehensive view of the object from different perspectives, such as top, front, and side views, enabling engineers to visualize and analyze the design effectively. Engineering drawings are crucial in facilitating communication between various stakeholders involved in the manufacturing or construction process, ensuring that the final product meets the required specifications and standards.</p>			

#### Module 4

Code	Course/Module Title	ECTS	Semester
CE104	Geology	7	1
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
3	2	78	97
<b>Description</b>			
<p>Engineering geology deals Introduce students to rocks and soils, their types and engineering properties, and how to draw topographic and geological maps. This course describes Geology of the Earth and its related minerals and rocks with Structural phenomena. Study of topographic and geological maps. the course consists from the following topics: Definition of engineering geology, the relationship between geology and civil engineering, definition of natural minerals and their engineering properties Clay Mineralogy, Introduction to rocks and their types in the Earth's crust, Definition of sedimentary, igneous and metamorphic rocks, their types and geological characteristics, Weathering, erosion and soil formation, Geological structures - folds, faults and joints in rocks and their impact on engineering structures Ground water - storage and movement of ground water, factors affecting groundwater movement and ground water quality</p>			

#### Module 5

Code	Course/Module Title	ECTS	Semester
CE105	Democracy and Human Rights	2	1
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	-	33	17
<b>Description</b>			
<p>Origins of human rights and their progress in human history, Human rights – Limitation Definition and guarantee, General freedoms, General theory for general freedoms, Law system for general freedoms, Guarantee for general freedom, Concept of equality, classification of general freedoms, Basic of</p>			

personal freedoms and democracy, Freedom of free travel (movement), Personal freedom, Work freedom, Possession freedom, Trade & Commercial freedom.

#### Module 6

Code	Course/Module Title	ECTS	Semester
CE106	English language I	2	1
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	-	33	17
Description			
<p>This course deals with variety subjects that help students to learn more about the English language. The course includes learning academic vocabulary that are mostly related in Civil Engineering field. The course focuses on English grammar such as verb tenses, question words, adverb and adjectives, articles, quantity, phrasal verbs, and comparative &amp; superlatives. Working on comprehensive reading is another objective in this course. Besides, practicing on listening and speaking within the class and watching videos. At the of the course, students learn how to write an academic paragraph using all vocabulary and grammar that they learned within the semester.</p>			

#### Module 7

Code	Course/Module Title	ECTS	Semester
CE107	Mathematics II	6	2
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
3	2	78	72
Description			
<p>Introduction to second main branch of calculus, it is the integration, integral is the mathematics way use to find the area between curve and x-axis. Also we studied Application of definite integrals, Areas between Curves, Volumes of solids of revolution, Disks and Washers. Cylindrical shells, length of curves in the plane, Areas of surfaces of Revolution. The calculus of transcended functions, inverse functions, <math>\ln x</math>, <math>e^x</math> and logarithmic differentiation, General exponential and logarithmic function. Indeterminate forms and l'Hopital's Rules, The inverse of trigonometric functions. Techniques of integration, basic integration formulas, Integration by parts, Trigonometric integrals, Trigonometric substitution, Rational functions and partial fractions.</p>			

#### Module 8

Code	Course/Module Title	ECTS	Semester
CE108	Engineering Mechanics II	7	2
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
3	2	78	97
Description			

It is a theoretical material that is considered a precursor to strength of material, the principles of structure theory and design of steel structures. Through this course, the student will be able to identify forces and their types, how to calculate the resultant and moments of forces, and to analyze and identify the types of structures such as beams, trusses and frames. In addition, the student will be able to calculate the centroid for areas, lines, and volumes, as well as find the moment of inertia. Also, friction and dynamics engineering mechanics as fundamentals approach are given to the students.

#### Module 9

Code	Course/Module Title	ECTS	Semester
CE109	Computer science	4	2
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	2	63	37
Description			
<p>Computing Fundamentals and Microsoft Office applications will be covered during this course. The course includes activities and exercises that guide students to explore the Windows operating system, change settings, and customize the desktop. Students also learn how to manage files and folders. On the other hand, the Key Applications focuses on two of the Microsoft Office applications: Word and Excel. The course explains the purpose of commonly used software features and step-by-step demonstrations on how to use those features. It includes an introduction to the computer, operating systems, hardware and software parts of the computer, and the Microsoft office software package. Word program, Home menu, printing and formatting in Word program, tables in Word program, layout, view menu. And the Excel program, the Home menu, the functions in the Excel program, the insert list, drawing curves in Excel, the power point program, dealing with the Transitions list and the list.</p>			

#### Module 10

Code	Course/Module Title	ECTS	Semester
CE110	Engineering drawing II	6	2
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	2	63	87
Description			
<p>Engineering drawing is a graphical representation of an object, system, or structure that is created by engineers to communicate design information clearly and accurately. It serves as a universal language for engineers, architects, and technicians involved in the design, manufacturing, and construction processes. An engineering drawing typically includes precise dimensions, geometric shapes, symbols, and annotations to convey important details about the object or system being depicted. These drawings are created using specialized drafting tools or computer-aided design (CAD) software, ensuring precise measurements and accurate representations. They provide a comprehensive view of the object from different perspectives, such as top, front, and side views, enabling engineers to visualize and analyze the design effectively. Engineering drawings are crucial in facilitating communication between various stakeholders involved in the manufacturing or construction process, ensuring that the final product meets the required specifications and standards.</p>			

**Module 11**

Code	Course/Module Title	ECTS	Semester
CE111	Statistics	4	2
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	1	48	52
Description			
<p>The field of <b>statistics</b> deals with the collection, presentation, analysis, and use of data to make decisions, solve problems, and design products and processes. Because many aspects of engineering practices involve working with data, and obviously some knowledge of statistics is important to any engineer. Specifically, statistical techniques can be a powerful aid in designing new products and systems, improving existing designs, and designing, developing, and improving production processes. In this course a special topic related to the engineering statistics like measures on central tendency, measures of variability, probability, probability distributions, estimations, hypothesis testing, Analysis of variance, and regression analysis are included and described clearly with the aid of software.</p>			

**Module 12**

Code	Course/Module Title	ECTS	Semester
CE112	Electrical engineering	3	2
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	-	33	42
Description			
This section includes a description of the module, 100-150 words			

**Module 13**

Code	Course/Module Title	ECTS	Semester
CE201	Engineering Mathematics I	5	3
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	2	63	62
Description			
<p>Provide the fundamental base for elementary mathematics for functions in more than one variable. Partial Derivative. Second Order Partial Derivative, Higher Order Partial Derivative, Chain Rule, Total Derivative, Maximum and Minimum &amp; Saddle Point, t, Lagrange Multipliers. Introduction to Multiple Integration. Multiple Integrals, Double and Iterated Integrals over Rectangles, Double Integrals over General Regions, Area by Double Integration, Double Integrals in Polar Form, and Moments and Centres of Mass. Introduction to Hyperbolic Functions. Identities of Hyperbolic Functions. Graphs of Hyperbolic Functions. Derivative and Integral of hyperbolic Functions Graphs of Inverse Hyperbolic Functions. Identities of Inverse Hyperbolic Functions. Derivative of Inverse Hyperbolic Functions. The integral of Inverse Hyperbolic Functions. Relationship between Inverse Hyperbolic Functions and</p>			



Logarithm Formula. Application of Hyperbolic Functions: Catenary.

#### Module 14

Code	Course/Module Title	ECTS	Semester
CE202	Mechanics of Materials I	6	3
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	3	78	72
Description			
<p>Mechanics of materials I is one of the fundamental modules in the Civil Engineering. The aims of studying this module are teaching students the developed stresses, strains, and the effects of Poisson's ratio in various types of structural elements, teaching students the developed stresses due to changes in temperature or torsion, and teaching students in detail drawings of the shear and moment diagrams and the calculation of deflection and rotation in beams and drawing of the elastic curve. At the end of the course students will be able to calculate the developed stresses in various structural elements, calculate the developed strains in various structural elements, calculate the developed thermal stresses in various structural elements, calculate the developed stresses in various structural elements due to torsion, draw the shear and moment diagram and find maximum shear and moments in beams, draw the elastic curve of loaded beams, and calculate the developed deflections and the angle of rotation in beams.</p>			

#### Module 15

Code	Course/Module Title	ECTS	Semester
CE203	Computer programming	5	3
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
1	3	63	62
Description			
<p>The student with knowledge and development environment and basic windows of MATLAB Programming. Learn programming using MATLAB. Introduction to the MATLAB program, the menus in the program. Variables and constants, mathematical expressions and symbols used in MATLAB, arithmetic relations, logical relations, and stored functions in MATLAB. Matrices and vectors, functions defined on them, mathematical operations on them, dot and cross multiplication, matrix transpose, matrix inverse. Programming using MATLAB Input and output, if conditionals, if else, recurrence statements in MATLAB. Also, Solution of Equations by Iteration, fixed point iteration method, Newton Raphson method and Secant method by MATLAB. Solve some engineering problems using MATLAB.</p>			

#### Module 16

Code	Course/Module Title	ECTS	Semester
CE204	Concrete technology I	6	3

<b>Class (hr/w)</b>	<b>Lect/Lab./Prac./Tutor</b>	<b>SSWL (hr/sem)</b>	<b>USWL (hr/w)</b>
2	3	78	72
<b>Description</b>			
<p>This course deals with construction materials, specifically cement and aggregate. The course finds cement components and their effect on cement types and properties, explains all tests that conducted in a concrete lab to determine the physical properties of cement. This course also studies the properties of aggregate and the tests that conducted in the lab to find them and identifies how these properties affect on concrete based on workability, strength, and durability. The course then shows how to calculate the actual volume of aggregate in site based on its bulking factor and humidity conditions. The course additionally focuses on sustainable materials (friendly environmental materials) that can be used as a replacement of construction materials including supplementary cementitious materials and recycling aggregate.</p>			

### Module 17

<b>Code</b>	<b>Course/Module Title</b>	<b>ECTS</b>	<b>Semester</b>
CE205	Engineering Surveying I	6	3
<b>Class (hr/w)</b>	<b>Lect/Lab./Prac./Tutor</b>	<b>SSWL (hr/sem)</b>	<b>USWL (hr/w)</b>
2	3	78	72
<b>Description</b>			
<p>The B.Sc. Program in Civil Engineering is designed to meet the needs of all students in the program. The Engineering Surveying subject will fulfill the communication skills, lifelong learning attitude, and the knowledge of basic science to attain advancement within the surveying profession. The graduates will exhibit creativity, leadership and team-building abilities, cultural appreciation and an understanding of global, societal, and environmental context consistent with the principles of sustainable development. The graduates will be engaged in the professional practice of surveying engineering with high ethical and professional responsibilities. The program provides the ability to identify, formulate, and solve surveying engineering problems, particularly the planning, design, establishing horizontal and vertical control, land use design, boundary determination, mapping and field layout of infrastructure that meet standards of accuracy and precision, keeping in mind cost, time, safety and quality needs, and objectives.</p>			

### Module 18

<b>Code</b>	<b>Course/Module Title</b>	<b>ECTS</b>	<b>Semester</b>
CE206	English language II	2	3
<b>Class (hr/w)</b>	<b>Lect/Lab./Prac./Tutor</b>	<b>SSWL (hr/sem)</b>	<b>USWL (hr/w)</b>
2	-	33	17
<b>Description</b>			
<p>This course deals with variety subjects that help students to learn more about the English language. The course includes learning academic vocabulary that are mostly related in Civil Engineering field. The course focuses on English grammar such as verb tenses, question words, adverb and adjectives, articles, quantity, phrasal verbs, and comparative &amp; superlatives. Working on comprehensive reading is another</p>			



objective in this course. Besides, practicing on listening and speaking within the class and watching videos. At the of the course, students learn how to write an academic paragraph using all vocabulary and grammar that they learned within the semester.

### Module 19

Code	Course/Module Title	ECTS	Semester
CE207	Engineering Mathematics II	5	4
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	2	63	62
Description			
Provide the fundamental base for elementary mathematics for Vectors and differential equations. Three-Dimensional Coordinate Systems, The Distance Between two points, Vectors, Component Form, Vector Algebra Operations, Properties of Vector Operations, Midpoint of a Line Segment, The Dot Product, Angle Between Vectors. The Angle Between Two Nonzero Vectors $u$ and $v$ , Orthogonal Vectors, Dot Product Properties and Vector Projections. The Cross Product, The Cross Product of Two Vectors in Space, Parallel Vectors. Properties of the Cross Product, Area of a Parallelogram, Calculating the Cross Product as a Determinant Lines and Planes in Space. Lines and Line Segments in Space. Parametric Equations for a Line, The Distance from a Point to a Line in Space. An Equation for a Plane in Space, Equation for a Plane, Lines of Intersection, The Distance from a Point to a Plane, Angles Between Planes. Differential Equations: Definition, Classification, order and degree of Des. Homogeneity and linearity of the DEs, Generation of the DEs. Solution of DEs (First order First degree DEs by Separable method). Homogenous and non-homogenous DEs method). Solution of DEs (First order First degree DEs by Linear and nonlinear method). Exact and non-exact method. Second order DEs for X-is missing, y-missing. Solution of DEs (higher order DEs – Complementary solution + Particular solution).			

### Module 20

Code	Course/Module Title	ECTS	Semester
CE208	Mechanics of Materials II	6	4
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	3	78	72
Description			
Mechanics of Materials II is one of the core units in Civil Engineering. The study of this unit aims to teach students the bending stresses in the beams, in addition to the shear stresses generated in the beams as a result of the loads placed on them. The axial compound stresses and the torsional stresses imposed on the beams are also studied, and the representation of the axial stresses and torsional stresses in the elements is studied by the Mohr circle method. At the end of the course, students will be able to calculate the flexural stresses and shear stresses applied to the beams, calculate the compound stresses in the beams, as well as represent the stresses in various structural elements on the axes of the Mohr circle.			

### Module 21

Code	Course/Module Title	ECTS	Semester
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CE209	Fluid mechanics	4	4
<b>Class (hr/w)</b>	<b>Lect/Lab./Prac./Tutor</b>	<b>SSWL (hr/sem)</b>	<b>USWL (hr/w)</b>
2	2	63	37
<b>Description</b>			
<p>Fluid mechanics is a branch of civil engineering that deals with the behavior and flow of fluids, including liquids and gases, in various engineering applications. It focuses on understanding the fundamental principles and equations governing fluid motion to analyze and design hydraulic systems such as water supply networks, drainage systems, and stormwater management. In civil engineering, fluid mechanics plays a vital role in designing and optimizing structures like dams, bridges, and pipelines that interact with fluids. It involves studying fluid properties, such as density, viscosity, and pressure, as well as the forces acting on fluids, such as gravity and fluid friction. Key concepts in fluid mechanics for civil engineering include Bernoulli's principle, Reynolds number, flow equations, and hydraulic modeling techniques. By applying fluid mechanics principles, civil engineers can accurately predict fluid behavior, ensure efficient system performance, prevent flooding and erosion issues, and create sustainable and resilient infrastructure that meets the needs of society.</p>			

#### Module 22

<b>Code</b>	<b>Course/Module Title</b>	<b>ECTS</b>	<b>Semester</b>
CE210	Concrete technology II	6	4
<b>Class (hr/w)</b>	<b>Lect/Lab./Prac./Tutor</b>	<b>SSWL (hr/sem)</b>	<b>USWL (hr/w)</b>
2	3	78	72
<b>Description</b>			
<p>This course deals with the properties of plastic and hardened concrete. The course firstly shows how to find bleeding of plastic concrete and how its effect later on the hardened concrete. The course also identifies the properties of hardened concrete and all factors affecting on these properties. The course also shows the effect of w/c ratio on concrete strength and durability; and the effect of test conditions on concrete strength. Besides, the course identifies the effect of cement type and aggregate nature on concrete strength. The course states all methods that used to measure tensile strength of hardened concrete and its relation with compressive strength. The course also explains how to calculate the modulus of elasticity of concrete according to different international codes and drying shrinkage in concrete and its effect on durability. Finally, the course learns in details how to design the concrete mix based on ACI Method, and to accept the compressive strength results respect to Iraqi Code.</p>			

#### Module 23

<b>Code</b>	<b>Course/Module Title</b>	<b>ECTS</b>	<b>Semester</b>
CE211	Engineering Surveying II	6	4
<b>Class (hr/w)</b>	<b>Lect/Lab./Prac./Tutor</b>	<b>SSWL (hr/sem)</b>	<b>USWL (hr/w)</b>
2	3	78	72
<b>Description</b>			
<p>The B.Sc. Program in Civil Engineering is designed to meet the needs of all students in the program.</p>			

The Engineering Surveying subject will fulfill the communication skills, lifelong learning attitude, and the knowledge of basic science to attain advancement within the surveying profession. The graduates will exhibit creativity, leadership and team-building abilities, cultural appreciation and an understanding of global, societal, and environmental context consistent with the principles of sustainable development.

The graduates will be engaged in the professional practice of surveying engineering with high ethical and professional responsibilities. The program provides the ability to identify, formulate, and solve surveying engineering problems, particularly the planning, design, establishing horizontal and vertical control, land use design, boundary determination, mapping and field layout of infrastructure that meet standards of accuracy and precision, keeping in mind cost, time, safety and quality needs, and objectives.

#### Module 24

Code	Course/Module Title	ECTS	Semester
CE212	Building construction and damages assessment	3	4
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	1	48	27
Description			
This course provides details of building construction of different types, methods, and stages of building construction of all kinds. It aims to develop students' knowledge of the construction method and the method of carrying out work for the various items as an important part of civil engineering work. And an explanation of how to erect frameworks of different types, wooden ones in particular, being the most widespread, and how to follow the methods of pouring concrete in a manner suitable for each case to make the concrete sound good.			

#### Module 25

Code	Course/Module Title	ECTS	Semester
CE301	Engineering and numerical analysis	5	5
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	3	78	47
Description			
To make students familiar with second order differential equation, higher order linear differential equation, differential equation system, characteristic values, characteristic vectors, Fourier series, half-range expansions of odd and even functions, simultaneous solving of differential equations using the D operator, find the general solution for some partial differential equations to make the student able to understand and start use of mathematical equations. Also to make the student familiar with the use of numerical methods to solve equations, including iterative methods, how to find the interpolation in different ways, as well as numerical integration and numerical derivative and the use of matrices to solve the system of equation in different ways, system of linear equations, Gauss elimination, LU factorization, solution by iteration as well as the method of least square with applications in MATLAB program.			

**Module 26**

Code	Course/Module Title	ECTS	Semester
CE302	Theory of structures I	6	5
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	3	78	72
Description			
<p>Through the study of the design and many types of structures, students are introduced to the engineering components of structures. The expertise of the students as future civil engineers is then steadily increased so that they can evaluate fixed structures and determine whether or not these structures are stable. When reactions and internal forces can be calculated only from free-body diagrams and equations of equilibrium, a structure is said to be statically determinate. This course will cover the conjugate beam method, the virtual work approach, and Castigliano's first theorem calculations of the deformations of determinate structures. Finally, this course will address sketching the influence lines of fixed structures (beams, trusses, and girders).</p>			

**Module 27**

Code	Course/Module Title	ECTS	Semester
CE303	Soil mechanics I	6	5
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	3	78	72
Description			
<p>The course is designed to furnish the student with knowledge on the basic geotechnical principles. It starts with introduction to soil engineering, Physico-mechanical properties of soil, Hydraulic properties of soil, Soil improvement Hydro-mechanical properties of soil, Hydro-mechanical properties of soil, Earth pressure of soils, Stability of slopes. This supposed to give the students the basics that will be useful in the course of foundation design in the fourth class.</p> <p>On completion of the course the student will be able to</p> <ul style="list-style-type: none"> <li>• Demonstrate understanding of the formation of soils through processes of weathering.</li> <li>• Classify soils according to various international classifications and determine the suitability of soils for civil engineering purposes.</li> <li>• Solve problems based on phase relationships.</li> <li>• Understand the principles of: <ul style="list-style-type: none"> <li>- compaction, carry out relevant laboratory tests, be familiar with methods and equipment of compaction.</li> <li>- Flow of water in soil, permeability, seepage.</li> <li>- The principle of effective stress and its implications.</li> </ul> </li> </ul>			

**Module 28**

Code	Course/Module Title	ECTS	Semester
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CE304	Reinforced concrete I	6	5
<b>Class (hr/w)</b>	<b>Lect/Lab./Prac./Tutor</b>	<b>SSWL (hr/sem)</b>	<b>USWL (hr/w)</b>
2	3	78	72
<b>Description</b>			
<p>Designing and analyzing reinforced concrete beams involves a comprehensive understanding of materials, design methods, and critical considerations such as shear and torsion. Concrete, with its compressive strength, is combined with steel reinforcement to provide the necessary tensile strength. The design methods outlined in the ACI 318-19 standard, including the Allowable Stress Method (ASM) and Ultimate Strength Method (USM), guide engineers in determining the required reinforcement and ensuring structural integrity. Additionally, considering shear strength and designing for torsion is essential to prevent failure and maintain stability. By incorporating these principles, engineers can create robust and efficient reinforced concrete beams that meet the required strength, safety, and performance criteria. This knowledge and application enable the successful design and analysis of reinforced concrete beams, contributing to the construction of durable and resilient structures.</p>			

#### Module 29

<b>Code</b>	<b>Course/Module Title</b>	<b>ECTS</b>	<b>Semester</b>
CE305	Highway engineering I	5	5
<b>Class (hr/w)</b>	<b>Lect/Lab./Prac./Tutor</b>	<b>SSWL (hr/sem)</b>	<b>USWL (hr/w)</b>
2	2	63	62
<b>Description</b>			
<p><b>Highway Engineering-I</b> is an engineering discipline branching from civil engineering that involves the planning, design, operation, of roads to ensure safe and effective transportation of people and goods. Standards of highway engineering are continuously being improved. Highway engineers must take into account future traffic flows, design of highway intersections/interchanges, geometric alignment and design. The most appropriate location, alignment, and shape of a highway are selected during the design stage. Highway design involves the consideration of three major factors (human, vehicular, and roadway) and how these factors interact to provide a safe highway. Human factors include reaction time for braking and steering, visual acuity for traffic signs and signals, and car-following behavior. Vehicle considerations include vehicle size and dynamics that are essential for determining lane width and maximum slopes, and for the selection of design vehicles. Highway engineers design road geometry to ensure stability of vehicles when negotiating curves and grades and to provide adequate sight distances for undertaking passing maneuvers along curves on the roadway.</p>			

#### Module 30

<b>Code</b>	<b>Course/Module Title</b>	<b>ECTS</b>	<b>Semester</b>
CE306	English language III	2	5
<b>Class (hr/w)</b>	<b>Lect/Lab./Prac./Tutor</b>	<b>SSWL (hr/sem)</b>	<b>USWL (hr/w)</b>
2	-	33	17
<b>Description</b>			

The English class offers a comprehensive curriculum to enhance students' language skills and academic abilities. It covers various topics and language competencies, including reading, writing, research, speaking, and professional communication. Students explore areas such as education and learning, innovation in health and medicine, urban planning, water-food-energy interconnections, communication technology, and CV writing. Throughout the course, students develop good study habits, comparing and contrasting skills, rephrasing techniques, research proficiency, effective writing of introductions and conclusions, language for presentations, and punctuation rules. The class aims to equip students with the necessary language proficiency, critical thinking skills, and professional communication abilities to excel academically and in their future careers. By the end of the course, students will have strengthened their overall language proficiency and acquired valuable academic and professional skills.

### Module 31

Code	Course/Module Title	ECTS	Semester
CE307	Engineering Management	3	6
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	1	48	27
Description			
This course covers the fundamental concepts and applied techniques to manage project resources effectively and deliver on schedule. Course content addresses fundamental methods for planning, scheduling, organizing, controlling projects. Though project management is universally applicable. Student will learn project management principles and methods with special focus on planning, controlling, and managing projects. Course topics will primarily be the technical aspects of project management Examples include developing the project plan; schedules, and the critical path, resources and resources levelling, MS Project software, S-Curve and cash flow & Evaluating Project cost and schedule performance (Earned Value).			

### Module 32

Code	Course/Module Title	ECTS	Semester
CE308	Theory of structures II	6	6
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	3	78	72
Description			
Studying various structures and their designs introduces students to structural engineering. After that, future civil engineers learn to evaluate fixed and indeterminate structures. Students will analyze statically indeterminate beams, trusses, rigid frames, and composite structures using consistent deformations, least work, slope-deflection, and moment distribution methods. This semester introduces the slope deflection method, degrees of freedom, derivation of the slope deflection equation, equilibrium conditions for joint and shear, and solved beam and frame examples. An introduction to the moment distribution method, fixed end moments, flexural stiffness, distribution factors, carry over factors, sign convention and correctness, a description of the moment distribution, and solved beams and frames are also given. Students will sketch indeterminate structure beam influence lines in the final section of this course.			



**Module 33**

Code	Course/Module Title	ECTS	Semester
CE309	Soil mechanics II	6	1
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	3	78	72
Description			
<p>This course aims to teach students to understand shear strength calculations, methods of measuring its parameters, and factors affecting soil shear strength and shear stress calculation. Representation of failure level on Mohr circle, properties derived from Moore circle, failure theory and Mohr envelope of stresses, factors affecting shear strength. Also, the topic of soil lateral pressure and their calculations is explained, which covers the way for the design of the supporting structures, types of lateral pressure of soil, lateral pressure coefficients also, calculations of lateral pressure of soil, distribution of lateral pressure of soil on the supporting structures. Compaction and mechanical soil improvement methods (basic principles, compaction theory, compaction mechanics and role Water in it, the main variables affecting the compaction process, the relationship between density and the percentage of water, Curve compaction, laboratory compaction, saturation curve, change of cohesive soil structure during compaction, Effect of compaction on cohesive soil properties, in-situ compaction, control of compaction operations Location. Introduction to the stability of slopes. The safety coefficient is the factor affecting the stability of the slope</p>			

**Module 34**

Code	Course/Module Title	ECTS	Semester
CE310	Reinforced concrete II	6	6
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	3	78	72
Description			
<p>Designing and analyzing reinforced concrete columns involves a comprehensive understanding of materials, column types (short columns and slender columns, and critical considerations such as development length and lap splice of steel bars under tension and compression. Concrete, with its compressive strength, is combined with steel reinforcement to provide the necessary tensile strength. The design methods outlined in the ACI 318-19 standard, guide engineers in determining the required reinforcement and ensuring structural integrity. Additionally, considering designing and strengthening for compression and tension failure is essential to prevent failure and maintain stability. By incorporating these principles, engineers can create robust and efficient reinforced concrete columns that meet the required strength, safety, and performance criteria. This knowledge and application enable the successful design and analysis of reinforced concrete columns, contributing to the construction of durable and resilient structures.</p>			

**Module 35**

Code	Course/Module Title	ECTS	Semester
CE311	Highway engineering II	5	6

Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	2	63	62
<b>Description</b>			
<p><b>Highway Engineering-II</b> is an engineering discipline branching from civil engineering that involves the planning, design, construction, operation, and maintenance of roads to ensure safe and effective transportation of people and goods. Standards of highway engineering are continuously being improved. Highway engineers must take into account future traffic flows, design of highway pavement materials and design, structural design of pavement thickness, and pavement maintenance. The materials used for roadway construction have progressed with time. There are two major types of pavement surfaces - Hot-Mix Asphalt (HMA) pavement, and Portland Cement Concrete (PCC). Underneath this wearing course are material layers that give structural support for the pavement system. These underlying surfaces may include either the aggregate base and subbase layers, or treated base and subbase layers, and additionally the underlying natural or treated subgrade. These treated layers may be cement-treated, asphalt-treated, or lime-treated.</p>			

#### Module 36

Code	Course/Module Title	ECTS	Semester
CE312	Hydraulic Structures	4	6
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	1	48	52
<b>Description</b>			
<p>A hydraulic structure are devices used in natural or man-made waterways to impound, direct, control, or measure the flow of water and can be built where there is a need for a change in the natural flow of water, such as dams and barrages, spillways, culverts, cross drainage works, sluice gates, weirs, and flumes. Some are fixed geometrical forms, while others may be mechanically adjusted. Hydraulic structures are also referred to a structures submerged or partially submerged in any body of water, which disrupts the natural flow of water. Hydraulic design procedures sometimes include hydraulic model testing when a proposed design requires a configuration that differs significantly from known documented guidelines.</p>			

#### Module 37

Code	Course/Module Title	ECTS	Semester
CE401	Reinforced concrete design I	7	7
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	3	78	97
<b>Description</b>			
<p>The students will be familiar with the fundamentals for reinforced concrete design floors, beams, and stairs considering the international codes in design as ACI-Code. It also uses the yield line theory for slab analysis. To make the student understand and start working in the design field.</p>			

#### Module 38

Code	Course/Module Title	ECTS	Semester
CE402	Foundation engineering I	7	7
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	3	78	97
Description			
<p>Foundation engineering is the fascinating subject that deals with the safe and economical transfer to the ground of loads from super structures of various types, sizes and functions. In foundation Engineering I, lectures have been organized into four parts: the first part has covered the site investigation which help students understand the soil report that including soil properties and soil profile for a site. The second part has covered that bearing capacity of shallow foundations (theory, equations and applications). The third part has covered the immediate and consolidations settlements of shallow foundation which a topic that as important as the bearing capacity. Finally, the fourth topic has covered the geotechnical design of foundations where the footing size and depth can be specified.</p>			

#### Module 39

Code	Course/Module Title	ECTS	Semester
CE403	Steel design	6	7
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	3	78	72
Description			
<p>This module aims to introduce students to the fundamental design process of steel as a structural member. The emphasis is on the general theory and performance of structural steel and the design and analysis of structural members subjected to different loading conditions based on the Load and Resistance Factor Design (LRFD) method. The design methodology follows the AISC360-16 standard and AISC Manual 14 edition. The module contains; Analysis and design of tension members under different modes of failure; The simple connection of steel members; Analysis and design of columns, Euler's buckling load in columns; columns in the frame; design of columns; Built-up columns analysis; Analysis and design the built-up columns connections; Base plate design; Analysis and design of beams, compact, non-compact and slender sections, lateral torsional buckling; shear in beams; Serviceability of steel beams.</p>			

#### Module 40

Code	Course/Module Title	ECTS	Semester
CE404	Traffic engineering I	6	7
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	3	78	72
Description			
<p>This module is dealing with the description of Traffic Engineering Science which is a part of the TRANSPORTATION ENGINEERING. Traffic engineering is, that phase of transportation engineering</p>			

which deals with planning, geometric design, and traffic operations of roads, streets, and highways, their networks, terminals, abutting lands, and relationships with other modes of transportation). This topic is learning students to know traffic system components like driver, vehicle, and roadway. Students are going to collect data about the main system variables and evaluation parameters like spot speed, volume different types data, and travel time and the delay time computations on different parts of the traffic design service facilities. Traffic flow different characteristics will be given to students in order to understand in detail the methodology of evaluating each type of the traffic system facilities found in his/her country in order to develop them later on to better service. In the second part of the traffic engineering course, students are going to learn some applications in this part of transportation science like how to evaluate the traffic operations in the different types on uninterrupted flow traffic facilities like the Two-Way-Two-Lanes roads, multi-Lanes arterials, and the Basic Freeway segments in and/or outside city urban or suburban or rural areas. Evaluation is including the Level of Service LOS computation for both existing and future conditions and the stage of future planning to such type of roads. The topic is dealing with signalized intersections and their LOS evaluation for the existing and future conditions in order to develop them for more better service conditions. Un-signalized intersections could be studied in the same procedure as discussed above for signalized one too.

#### Module 41

Code	Course/Module Title	ECTS	Semester
CE405	Engineering project I	2	7
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
-	2	32	18
Description			
This module allows students to apply the ideas, principles, strategies, and approaches they learned in their undergraduate courses to a practical civil engineering project. The main objectives of the graduation project are 1. To make the students understand and practice the basic engineering design concepts for a multidisciplinary civil engineering project. 2. To expose the students to group learning and teamwork by working on a multidisciplinary project. 3. To improve the oral and written communication skills of the students. 4. Prepare students for the practical tasks of the work place after graduation. This includes building ability of the students to perform a complete project.			

#### Module 42

Code	Course/Module Title	ECTS	Semester
CE406	Computer applications	3	7
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
-	2	33	17
Description			
Computer application module Providing the technical possibility for students to use the various engineering programs, helping students analyze and design multi-story buildings and footings as well as retaining structures. So, reducing the effort involved in analyzing and designing them manually by adopting all theoretical concepts that were taken in the previous stages and applied in this course. Through this module, The student recognizes the advantages of the program and the importance of using it for the analysis and design of structures, Comparison of program results with manual solutions and with specifications and accuracy of results and verifying the results obtained from software			

programs by comparing with those obtained manually.

#### Module 43

Code	Course/Module Title	ECTS	Semester
CE407	Reinforced concrete design II	7	8
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	3	78	97
Description			
The students will be familiar with the fundamentals for the reinforced concrete design of prestressing structures considering the international codes in design as ACI and ASSHTO codes. Precast construction and prestressed concrete specifications should be recognized. Another item is the design of reinforced concrete bridges. To make the student able to understand and start working in the design field			

#### Module 44

Code	Course/Module Title	ECTS	Semester
CE408	Foundation engineering II	7	8
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	3	78	97
Description			
In foundation Engineering II, lectures have been organized into three parts: the first part has covered the structural design of different types of shallow foundations. The second part has covered the analysis and design deep foundations. More specifically it covers the ultimate pile capacity under vertical load for piles in sand and for piles in clay. It is covered for both single and group piles. The immediate and consolidation settlement of single and group piles have also been covered. The third part has covered the analysis and design of retaining structures including stability and structural design. Two types of retaining structures have been covered: gravity and cantilevered.			

#### Module 45

Code	Course/Module Title	ECTS	Semester
CE409	Structural drawing and estimation	6	8
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	2	63	87
Description			
Structural Drawing, introducing students to the structural drawings by studying its formation, drawing and detailing, then gradually enriched their knowledge as civil engineers who could deal with all engineering drawings, enabling students to draw and read structural, architectural, plumbing, and			

electrical plans, and to be able to deal with them skillfully. Engineering estimation: It is the art of dealing with calculating the quantities of all construction materials needed for the construction of any building and a preliminary estimate for calculating the costs required for construction, which provides an opportunity to determine the correct budget for the project before commencing its implementation, as well as identifying alternative materials for implementation and comparing costs with each other to reach the optimal cost.

#### Module 46

Code	Course/Module Title	ECTS	Semester
CE410	Environmental and sanitary engineering	6	8
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	3	78	72
Description			
Introduction of Environmental & sanitary engineering: -it is a branch of civil engineering it is concerned with public health and it is concerned with securing pure water suitable for domestic, industrial and commercial uses .it is also concerned with discharge of polluted water used in residential communities and industry facilities, as well as water resulting from rain outside the boundaries of populated residential areas after treatment. The objective of course deals with the basic principles and design aspects of sanitary engineering infrastructure. This comprises: drinking water supply and treatment, sewerage and wastewater treatment in addition to the deals with quality and quantity of water and wastewater calculations, design of water treatment plant units, design water supply networks, design of sewerage systems and design of wastewater treatment plant units.			

#### Module 47

Code	Course/Module Title	ECTS	Semester
CE411	Engineering project II	2	8
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
-	2	33	18
Description			
This module allows students to apply the ideas, principles, strategies, and approaches they learned in their undergraduate courses to a practical civil engineering project. The main objectives of the graduation project are 1. To make the students understand and practice the basic engineering design concepts for a multidisciplinary civil engineering project. 2. To expose the students to group learning and teamwork by working on a multidisciplinary project. 3. To improve the oral and written communication skills of the students. 4. Prepare students for the practical tasks of the work place after graduation. This includes building ability of the students to perform a complete project.			

#### Module 48

Code	Course/Module Title	ECTS	Semester
CE412	English language IV	2	8



Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2		33	17
Description			
<p>The English class offers a comprehensive curriculum to enhance students' language skills and academic abilities. It covers various topics and language competencies, including reading, writing, research, speaking, and professional communication. Students explore areas such as education and learning, innovation in health and medicine, urban planning, water-food-energy interconnections, communication technology, and CV writing. Throughout the course, students develop good study habits, comparing and contrasting skills, rephrasing techniques, research proficiency, effective writing of introductions and conclusions, language for presentations, and punctuation rules. The class aims to equip students with the necessary language proficiency, critical thinking skills, and professional communication abilities to excel academically and in their future careers. By the end of the course, students will have strengthened their overall language proficiency and acquired valuable academic and professional skills.</p>			

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