

The undergraduate Curriculum of Civil Engineering Department College of Engineering – University of Babylon

1- Class: First

1.1- First Semester

Code	Subject	Studying Hours			Applied units
		First semester			
		Theory	Lab.	Tut.	
EnCiMa111(3)	Mathematics I	3	-	1	3
EnCiMe122(3)	Engineering Mechanics I	3	-	1	3
EnCiCp133(3+2)	Computer Programming	2	2	-	3
EnCiEd144(4)	Engineering Drawing	-	4	-	2
EnCiEs155(2)	Engineering Statistics	2	-	1	2
EnCiAl177(2)	Arabic Language	1	-	-	1
EnCiEl199(2)	English Language	1	-	1	1
Total		12	6	4	15
Number of Weekly Hours		22			15

1.2 - Second Semester

Code	Subject	Studying Hours			Applied units
		Second semester			
		Theory	Lab.	Tut.	
EnCiMa199(3)	Mathematics II	3	-	1	3
EnCiMe11010(3)	Engineering Mechanics II	3	-	1	3
En Ci Wo 1 13 13(2+2)	Engineering Workshop	2	2	-	3
EnCiEd11212(4)	Engineering Drawing and drawing by computer II	-	4	2	2
EnCiEg11515(2)	Engineering Geology	2	-	1	2
EnCiBm11414(2+1)	Building Materials	2	2	1	3
EnCiEl11616(2)	English Language	1	-	1	1
Total		13	8	7	17
Number of Weekly Hours		28			17

2- Class: Second

2.1 - First Semester

Code	Subject	Studying Hours			Applied units
		First semester			
		Theory	Lab.	Tut.	
EnCiMa2171 (3)	Mathematics III	3	-	1	3
EnCiSm2182 (3)	Strength of Materials I	3	-	1	3
EnCiCp2193 (2+2)	Programming	1	2	-	2
EnCiSe2204(2+1)	Engineering Surveying I	2	2	1	3
EnCiCt2248(2+2)	Concrete Technology I	2	2	-	3
EnCiFm2226(2+2)	Fluid Mechanics I	2	2	1	3
EnCiBaCd2215(2)	Building Construction	2	-	-	2
En CiEl 21616 (2)	English Language	1	-	1	1
Total		16	5	8	20
Number of Weekly Hours		29			20

2.2 – Second Semester

Code	Subject	Studying Hours			Applied units
		Second semester			
		Theory	Lab.	Tut.	
EnCiMa2259(3)	Mathematics IV	3	-	1	3
EnCiSm22610(3)	Strength of Materials II	3	-	1	3
EnCiHr21721(2)	Human Rights	2	-	-	2
EnCiSe22812(2+2)	Engineering Surveying II	2	2	-	3
EnCiCt23115 (2+2)	Concrete Technology II	2	2	-	3
EnCiFm23014(2+2)	Fluid Mechanics II	2	2	1	3
En Ci El 2 2616 (2)	English Language	1	-	1	1
Total		15	6	4	18
Number of Weekly Hours		25			18

3- Class: Third

3.1 - First Semester

Code	Subject	Studying Hours			Applied units
		First semester			
		Theory	Lab.	Tut.	
EnCiSt3332 (3)	Theory of Structures I	3	-	1	3
EnCiSm3343 (2+2)	Soil Mechanics I	2	2	1	3
EnCiDrc3365(3)	Design of Reinforced Concrete I	3	-	1	3
EnCiEm3376(2)	Engineering Management and Economy	2	-	1	2
EnCiTe3387(2+2)	Traffic Engineering	2	2	-	3
EnCiLaDe3354 (4)	Irrigation and Drainage Engineering	3	-	1	3
EnCiEa3321 (2)	Engineering Analysis I	2	-	1	2
En Ci El 3 3616 (2)	English Language	1	-	1	1
Total		18	4	7	20
Number of Weekly Hours		29			20

3.2 – Second Semester

Code	Subject	Studying Hours			Applied units
		Second semester			
		Theory	Lab.	Tut.	
EnCiSt3409 (3)	Theory of Structures II	3	-	1	3
EnCiSm33410 (2+2)	Soil Mechanics II	2	2	1	3
EnCiRc34312(3)	Design of Reinforced Concrete II	3	-	1	3
EnCiNm36312(2)	Numerical Methods	1	2	1	2
EnCiSd37312(2)	Structural Drawing	-	4	-	2
EnCiEa3398 (2)	Engineering Analysis II	2	-	1	2
EnCiEa3399 (2)	Selected Topic	2	-	1	2
En Ci El 3 3726 (2)	English Language	1	-	1	1
Total		14	8	7	18
Number of Weekly Hours		29			18

4- Class: Fourth

4.1 - First Semester

Code	Subject	Studying Hours			Applied units
		First semester			
		Theory	Lab.	Tut.	
EnCiDs4419 (3)	Design of steel structures	3	-	1	3
EnCiCe4429 (3)	Methods of Construction and Estimation	3	-	1	3
EnCiTe4439 (2)	Transportation Engineering I	2	2	-	3
EnCiSe4449 (3)	Sanitary Engineering	3	-	1	3
EnCiHs4459 (2)	Hydraulic Structures	2	-	1	2
EnCiFe4469 (3)	Foundation Engineering I	3	-	1	3
EnCiSt4479 (2)	Selected Topic	2	-	1	2
En Ci El 4426 (2)	English Language	1	-	1	1
Total		19	2	7	20
Number of Weekly Hours		28			20

4.2 – Second Semester

Code	Subject	Studying Hours			Applied units
		Second semester			
		Theory	Lab.	Tut.	
EnCiDc4421 (3)	Design of concrete structures	3	-	1	3
EnCiSa4422 (2)	Structural Analysis	2	-	1	2
EnCiTe4423 (2)	Transportation Engineering II	2	2	-	3
EnCiH4424 (3)	Hydrology	3	-	1	3
EnCiFe4425 (3)	Foundation Engineering II	3	-	1	3
EnCiSt4426 (2)	Selected Topic	2	-	1	2
En Ci El 4427 (2)	English Language	1	-	1	1
Total		17	2	6	17
Number of Weekly Hours		24			17

EnCiAP4419 (4)	Annual Engineering Project	4	-	-	2
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The Syllabus of the Curriculum

The following is the syllabus of the subjects in the department curriculum .

- **FIRST YEAR**
- **First Semester**

- **Mathematics I**

Line and trigonometric function, Domain and range, Limits and compositions of functions, Continuous functions and derivatives, Application of derivatives, Inverse of trigonometric function, Domain and range of inverse of trigonometric function, Conic sections and other plane curves.

- **Engineering Mechanics I**

Basic Concepts , Resultant of Force System ,Equilibrium , Analysis of structures, Friction.

- **Computer Programming**

Computer Programming Introduction , Numbers systems , Algorithms and Flow charts , Input , Output and control statements , Two dimensional Matrices , Sub Programs, Functions.

- **Engineering Drawing and drawing by computer I**

Principles previews, Principles previews, Lines in engineering drawing, engineering text, Geometric operations.

Introductory lecture AutoCAD drawing program (a full explanation for the program interface), Complete explanation of the program interface, Explain how to use and identify the units of measurement and how to give commands to draw, Explain the modification orders through the command window, Explanation of drawing aid // snap, orth, polar, osnap, The student recognizes to all the drawing tools and how he used. The first tool is a tool to draw a line (there are three ways to draw line).Give some examples that illustrate the ways that draw the line, Student recognize on how to apply the examples that were given to him in the previous lecture on computer(practical application of the previous lecture), Students recognize to the types of lines and how they are used and defined direct way to draw lines with giving him some examples of the types of lines and how to draw using direct the way, Student recognize on how to apply the examples that were given to him in the previous lecture on computer(practical application of the previous lecture), Students learn how to draw a polygon or polygonal , rectangle and ellipse shape and adopted the program in different ways, giving some examples of each form, Student recognize on how to apply the examples that were given to him in the previous lecture on computer(practical application of the previous lecture).

- Engineering Statistics

Statistical notations Fundamentals , Frequency and Probability distributions , Measures of Central location (The mean , Median , Mode , Midrange) , Measures of Variation or dispersion (The range , Mean deviation , The variance and standard deviation , Coefficient of variation) , Measures of Dispersion , Probability theory , Elementary probability theory, Special distributions (Discrete Probability distributions , Continuous probability distributions), Sampling Methods .

- Building Materials I

Classification of material , Properties of material , Mechanical properties of material (Type of force , Hooks law , strain , stress , Modulus of Elasticity , creep) clay Brick , Types of Brick according of material such as (cellular Block Thermestone) , Concrete bricks , glassy Brick , Lime – sandy Brick ,Types of Mortar Bonding Materials as (Gypsum , Lime).

- Second Semester

- Mathematics II

Integration, Area under the curve, Trapezoidal and Simpsons rule, Volumes, Surface area, Natural logarithm functions, Exponential functions, Methods of integration, Improper integral.

- Engineering Mechanics II

Center of Gravity , Centroid of Areas , Center of Pressure, Moment of Inertia, Kinematics-Absolute Motion .

- Engineering Drawing and drawing by computer II

Dimension, Pectorial Drawing, Sections.

students learn how to draw a circle and arc with different ways to drawn and giving some examples of each form, Student recognize on how to apply the examples that were given to him in the previous lecture on computer(practical application of the previous lecture), Learn the students how multi-line and curve and the different ways to drawn with and giving some examples of every shape and learn the students how to use shading tool, giving examples of this, Student recognize on how to apply the examples that were given to him in the previous lecture on computer(practical application of the previous lecture), A practical test to see how students' understanding the previous lectures to impose the student evaluation, Student recognize on the modification tools and how to choose the elements and then we begins with delete tool and then copying tool and transportation tool and a mirror tool and give examples of each tool and how to use them, Student recognize on how to apply the examples that were given to him in the previous lecture on computer(practical application of the previous lecture), Student recognize on other modification tools such as the Displacement tool and bending tool confluence of elements and break edges or corners of the elements and matrices Created, and giving adequate examples for each tool, Student recognize on how to apply the examples that were given to him in the previous lecture on computer(practical application of the previous lecture), Student recognize on other modification tools such as the extend , rotate, scale tools and giving adequate examples of each tool, Student recognize on how to apply the examples that were given to him in the previous lecture on computer(practical application of the previous lecture), A practical test to see how

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students' understanding the previous lectures to impose the student evaluation, Student recognize on how to write dimension on geometric shapes drawn and how to write and types of lines used in the program, giving adequate examples so, Student recognize on how to apply the examples that were given to him in the previous lecture on computer(practical application of the previous lecture).

- Building Materials II

Manufactories of Lime , Limes Kilns , Hydrated Lime , Types of Lime , Manufactories of cement , Woods (uses , properties) , Type of Material use covering the floors production of Tiles , Mineral (classification , proportion from yaw materials , Iron Mineral , Building stone (geological classification of stone as Rocks , Properties uses of very Type of stone Rocks in Building .

- Engineering Geology

The origin of rocks and nature , Geological origin of soil its Geometric properties , Minerals , Physical and Mechanical properties of rocks , Subsurface water Geology , River Geology , Structural Geology and Maps (include: PhotoDraw and different examples) , Geological investigations for building materials and roads Construction , Geological and Geotechnical investigations for Geometric buildings positions , Geophysical methods in civil Engineering , General preview and different examples .

- **SECOND YEAR**
- **First Semester**

Ci.En.132 Mathematics III

Polar Coordinate System , Vector , Partial Derivatives and Differential Equations , Complex Number .

Ci.En.232 Strength of Materials

Fundamentals principles of mechanics and simple stresses , Simple strain and deformation of axially loaded members , Torsion , Shear Force and bending moment diagrams .

Ci.En.332 Programming

Introducing Visual Basic , Visual Basic Fundamentals , Branching And Looping , Visual Basic Control Fundamentals , Menus And Dialog Boxes , Procedures , Arrays .

Ci.En.432 Engineering Surveying I

Introduction , Measurement distance by tape , Leveling , Sections , Directions .

- **Ci.En.532 Building Construction .**

Building construction stages , Buildings classifications (Types of construction) and building construction development , earth works , Foundation , Piles works , brick works , masonry works , Forms and scaffoldings , Columns , Beams and girders , Concrete works , arches lintels and sills , Damping proofing , Kind of stairs and their execution , Doors and Windows , Joins in buildings .

Ci.En.632 Fluid Mechanics I

Fluid Properties , Fluid Static (Fluid Pressure and its Measurement Methods , Hydrostatic Force on Immersed Plane Surfaces, Hydrostatic Force on Immersed Curved Surfaces , Relative Equilibrium (Linear Acceleration) , Uniform Rotation about a Vertical Axis , Dimensional Analysis , Dynamic Similitude , Kinematics of Fluid Flow (Flow Types) , Continuity Equation , Energy Equation , Momentum Equation .

Ci.En.832 Concrete Technology I

Introduction about Cement , Manufacture of Cement and its Compounds , Hydration of Cement , Volume of products of hydration , Cement tests , Types of cement , Portland cement , Special types of Portland cement , Natural cement , Superset pated cement , expanding cement , Aluminous cement , Aggregate , Classification of aggregate , Properties of aggregate , Bulking of sand , Detritus Substances in Aggregate , Soundness of aggregate , Alkali – , Aggregate Reaction , Sieve Analysis , Practical grading .

- **Second Semester**

Ci.En.132 Mathematics IV

Multiple Integrals , Infinite Sequence and Infinite Series , Determinants and Matrices
Determinants and Matrices , Hyperbolic Functions .

Ci.En.232 Strength of Materials II

Stresses in beams , Compound stresses and transformation of stresses and strains ,
Deflection of Beams , Columns .

Ci.En.432 Engineering Surveying II

Theodolite and Total Station , Areas , Curves , Tachometry , Topography , Earth
working .

Ci.En.632 Fluid Mechanics II

Losses in Pipes , Pipes in Series , Pipes in Parallel , Branching Pipes , Pipes
Network , Open Channel Flow , Open Channel Flow Equations , Critical Flow and Its
Applications, Pumps Hydraulic.

Ci.En.832 Concrete Technology II

Fresh concrete , Consistence of concrete , Workability and method of its testing ,
Factors affecting workability , Segregation , bleeding , mixing of concrete ,
Compaction of concrete , hot weather concreting , Hardened concrete , Strength of
concrete , types of strength , Factors affecting strength , Factors affecting strength test
results , Curing of concrete , Concrete mix design , American method , British method ,
Modulus of elasticity , Poisson's Ratio , Volume changes , swelling , shrinkage , Creep ,
Durability of concrete , permeability of concrete , Sulphate resisting of concrete , sea
water effect , Efflorescence, Cold weather concreting , Special types of concrete , Fiber
reinforced concrete , Self-Compacting , Concrete , High performance concrete ,
Lightweight concrete , Non-destructive tests , Schmidt hammer , ultrasonic pulse
velocity test .

- **THIRD YEAR**
- **First Semester**

- **Ci.En.133 Engineering Analysis I**

Ordinary Differential Equations of First Order , Linear Ordinary Differential Equation with Constant Coefficient .

- **Ci.En.233 Theory of Structures I**

Types of loads Equilibrium , Stability and Determinacy of Structures , Types of Trusses , Analysis of Different Types of Determinate Trusses , Axial Force , Shearing Force and Bending Moment Diagrams for Frames Axial Force , Shearing Force and Bending Moment Diagrams for Frames , Floor Beam Systems , Influence Line for Statically Determinate Structures , Series of concentrated moving loads on statically determinate Structures , Approximate Analysis of Statically Indeterminate Structures ,

- **Ci.En.333 Soil Mechanics I**

Soil nature , origin of soils , structural units of clay mineral particle, soil gradation (particle size characteristics), plastic of soil and Atterberg limit, soil classification and soil descriptive, phase relations, compaction , stresses within soil masses and concept of effective stresses, principle stress and Mohor circle, stress path concept.

- **Ci.En.433 Irrigation and Drainage Engineering .**

Irrigation and Drainage Concept , Irrigation and Drainage System , Water content and consumptive Use and Water Duty , Cross @ Longitudinal Section Design , Seepage and canal lining , Leveling and Land Grading , Methods of Irrigation , Drainage Systems .

- **Ci.En.533 Design of Reinforced Concrete I**

Introduction , stresses in concrete, ultimate strength design method, working strength design method , shear design, length of development, cut-off points, crack of concert beams , deflection of concert beams.

- **Ci.En.633 Engineering Management**

Introduction to engineering management , relationship between project achieving team and project phases, planning techniques, general limitation for engineering civil work in Iraq, engineering contract, project execution approaches, method of tendering, time – cost relationship, operation research, linear programming and its application, types of costs.

- **Ci.En.733 Traffic Engineering**

Driver, vehicle and pedestrian characteristics , Highway planning and administration , Types of sight distances , Geometric design (Elements and control) , Traffic studies (Volume, speed, capacity, delay, and headway) , Fundamental relationship between speed-flow-density. Linear and nonlinear relation (Speed-Density) , Types of at grade intersections and interchange , Design of traffic signals (Webster method) , Traffic signs type, shapes and colors and road marking , Parking types , Type of weaving section , Traffic accident causes, types, reporting surveys, and accident rates .

- Second Semester

- Ci.En.133 Engineering Analysis II

Simultaneous Linear Ordinary Differential Equations , Fourier Series , Partial Differential Equations and Boundary Value Problems.

- Ci.En.133 Numerical Methods

Solution of Nonlinear Equations in one real variable , Numerical Integration, Solution of linear System of equation, matrix inversion, Interpolation, curve fitting, Numerical Ordinary solution Differentiation Equations, Solution of partial Differentiation equation, Introduction to Finite Element Method .

- Ci.En.233 Theory of Structures II .

Deflection of Statically Determinate Structures by " Unit Load Method " , Analysis of Statically Indeterminate Structures by " Consistent Deformation Method " , Analysis of Statically Indeterminate Structures by " Slope - Deflection Method " , Analysis of Statically Indeterminate Structures by " Moment Distribution Method " .

- Ci.En.333 Soil Mechanics II .

Response of effective stress to change in total stress – consolidation analogy , Influence of seepage on effective stresses , Shear failure - -Mohr – Colomb failure law – shear strength parameters. Basic relationships, Shear strength tests: Laboratory tests (tri – axial compression and direct shear) , field methods (vane shear) , Shear strength of sands, behavior of loose and dense sand, liquefaction in sands, Shear strength of saturated clays, normally consolidated and over consolidated soils, undrained shear strength and $\sigma_u=0$ concept in saturated clays , Effect of disturbance and clay sensitivity , Strength in terms of effective stresses – drained shear strength parameters , Pore water pressure developed during undrained loading – pore pressure parameters, Flow in soil, permeability in soil, permeability tests.

- Design of Reinforced Concrete II

Slabs, one way solid, one way ribbed , two-way solid, two-way ribbed, Compression members (columns), Torsion, Stairways.

- Structural Drawing

Introduction, Structural Drawing expressions and scale, structural elements, Footing and Foundation types, Wall Footing, Separate Footing, Tie Beam, Combined Footing, Raft Foundation, Pile Footing, Reinforced concrete Columns, continuous beams, Reinforced concrete Slabs, One way slab, Two way slab, Means of Moving Between Levels, Type of Reinforced concrete stairs, steel trusses.

- FOURTH YEAR
- First Semester

- Design of concrete structures

Deflection control of two - way slabs , Direct design method of two - way slabs , Shear in two – way slabs , Equivalent frame method of two – way slabs , Yield – line analysis (Virtual – work) of slabs , Prestressed concrete / analysis and design of beams .

- Foundation Engineering I

Site investigations , Test borings , In situ testing , Slope stability (finite , infinite , slop) , Bearing capacity , Terzaghi's method to calculate bearing capacity effect of shape footing and water level on bearing capacity , Methods for calculation of bearing capacity in cohesion soil , Factor of safety , Calculation of settlement .

- Hydraulic Structures

Hydraulic Structures an permeable foundation, Hydraulic jump and energy dissipate devices, design of canal structures, Storage works.

- Transportation Engineering I

Cross-section elements of highway and earth works (Mass haul diagram) , Types of highway pavement , Aggregate used for asphalt paving mix (types, properties, gradation) , Asphalt paving mixture (properties, mix design methods) , Analysis of asphaltic mix (specification) , Evaluation of subgrade strength and soil stabilization , Defects of asphalt paving mixture and treatment .

- Sanitary Engineering

Introduction, Quantity of water, Population Estimation, Hydraulics, Fire Demand , Aqueducts water pipes, Collection and Distribution of water, Intakes, Clarification of water, Sedimentation of discrete particles, coagulation processes, Flocculation Processes, Filtration of water, Disinfection, Sewage- general consideration, Storm water flow, Sewer appurtenances, Design criteria.

- Methods of Construction and estimation

Construction equipment , Production of construction equipments Stabilization and compaction of the soil , Method of production and transport of ready mix concrete and asphalt Concrete , Formwork design for roofs and walls , Quantity survey , Planning for engineering projects , Types of Estimation , Methods for calculation of construction materials , Quantity tables and measurements , Methods for calculation of quantity and volumes of materials , Center line method , Pricing of Quantity , Technical specification , Project for Estimation .

- **Second Semester**

- **Design of steel structures**

Introduction :

Properties of structural steel W, S, C, MC, L, T rolled sections , AISC manual and specifications , Design approach:

Factor of safety, permissible and working stresses, elastic method, plastic method ,
Tension Members:

Net and effective area, permissible stresses, design of axially loaded tension member,
design of axial tension and bending , Compression Members:

Mode of failure of a column, buckling failure, Euler's theory, effective length,
slenderness ratio , design formula, built-up compression members, laced and battened
columns. ,

- **Structural Analysis**

Analysis of Multi-story Buildings. (to compute the moments, shear forces and axial
loads in slabs beams, columns and foundation) , Applications on the computer program
STAAD.Pro2006. (to analysis the buildings and frames) ..

- **Foundation Engineering II**

Lateral earth pressure , Rankin's Theory for slopping and horizontal surface , Cantilever
sheet piles , Structural design of foundation , Piles .

- **Transportation Engineering II**

Rigid pavement (layers, types, joints) , Flexible pavement (layers) , Asphalt materials
(types, properties, models) , Defects of asphalt paving mixture and treatment ,
Thickness design of flexible pavement (AASHTOO method) , Thickness design of rigid
pavement (AASHTOO method and PCA method) .

- **Hydrology**

The Hydrologic Cycle , Precipitation , Evaporation , Infiltration , Stream m
Hydrograph Analysis , Reservoir and Channel Routing , Ground Water Hydraulics ,
Well Hydraulics , Statistical Hydrology , Sediment Transport , Catchment's Simulation .