



Table (4) A Plan Of Study For B.Sc. In Civil Engineering

(Fourth Year) Senior Year

No	Course No.	Course Title	Туре	Weekly hours			Unita	
INO.				Theoretical	Tutorial	Practical	Units	
First Semester	CE401	Reinforced Concrete Structures Design	Eng. Science	2	1	-	2	
	CE403	Foundation Engineering I	Eng. Science	3	1	_	3	
	CE405	Highway Materials	Eng. Science	2	1	2	3	
	CE407	Water Supply Engineering	Eng. Science	2	1	2	3	
	CE409	Equipments and Construction Method	Eng. Science	2	1	—	2	
	CE411	Hydraulic Structures	Eng. Science	2	1	—	2	
	CE413	Steel Structures Design I	Eng. Science	2	1	—	2	
	CE415	GIS Applications	Eng. Science	-		1	1	
	ER401	Engineering Graduation Project (Cont).	Eng. Science	1		2	2	
	Sum			16	7	7	20	
				30			20	
Second Semester	CE402	Prestress Concrete Design	Eng. Science	2	1	_	2	
	CE404	Foundation Engineering II	Eng. Science	3	1	—	3	
	CE406	Pavements Analysis and Design	Eng. Science	2	1		2	
	CE408	Environmental and Sewerage Engineering	Eng. Science	2	1	2	3	
	CE410	Quantity Estimation and Specifications	Eng. Science	2	1	—	2	
	CE412	Dams Engineering	Eng. Science	1	1	—	1	
	CE414	Steel Structures Design II	Eng. Science	2	1	—	2	
	CE416	Bridges Engineering	Eng. Science	1	1	_	1	
	CE417	Technical English Language IV	Humanity	2	_		2	
	ER401	Engineering Graduation Project	Eng. Science	1	_	2	2	
	Sum			18	8	4	20	
				30			20	





IV - 4^{th.} Year

Course Number: CE401 Course Name: Reinforced Concrete Structure Design Credit hours: 3 Pre-requisite: None Course Contents:

This course covers:- Direct Design Method: (Type of slab systems, Limitation of D.D.M., Minimum slab thickness for deflection control, total factored static moment, Longitudinal distribution of moments, Transverse distribution of longitudinal moments, Shear in two way slab systems, one-way shear (beam action), two-way shear (punching Shear), punching shear without moment transfer, punching shear with moment transfer, Effect of openings on shear strength. Yield line theory of slabs: Basic concepts, work done, mechanism, guide line to draw axis of rotation, notation, Yield line by virtual work method, Yield line analysis of one-way slab, Yield line analysis of two-way slab.

Course Number: CE402 Course Name: Prestress Concrete Design Credit hours: 3 Pre-requisite: None Course Contents:

This course covers: Introduction, The principles of prestressed concrete, construction materials, and system for prestressing, losses, and flexural members, concepts of design in prestressed concrete including elastic and ultimate strength analyses, deflections, shear, end zones and construction..

Course Number: CE403 Course Name: Foundation Engineering I Credit hours: 4 Pre-requisite: None Course Contents:

This course covers : Soil investigation, Natural Soil Deposits and Subsoil Exploration; Soil Origin, Residual Soil, Gravity Transported Soil, Alluvial Deposits, Lacustrine Deposits, Glacial Deposits, Aeolian Soil Deposits, Organic Soil, Some Local Terms for Soils, Engineering Characteristics of Annasseriah Soil, Subsurface Exploration; Exploratory Borings in the Field, Procedures for Sampling Soil, Split-Spoon Sampling, Sampling with a Scraper Bucket, Sampling with a Thin-Walled Tube, Sampling with a Piston Sampler, Observation of Water Tables, Standard



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Penetration Test (SPT), Vane Shear Test (VST), Cone Penetration Test (CPT), Pressuremeter Test (PMT), Plate Load Test (PLT), Lateral Earth Pressure; Introduction, A Generalized Case for Rankine Active, Pressure-Granular Backfill, Rankine Active Pressure with Vertical Wall Backface and Inclined, Coulomb's Active Earth Pressure, Lateral Earth Pressure Due to Surcharge, Active Earth Pressure for Earthquake Conditions—Granular Backfill, Active Earth Pressure for Earthquake Condition (Vertical Backface of Wall and Backfill), Passive Pressure, Rankine Passive Earth Pressure, Rankine Passive Earth Pressure-Vertical Backface and Inclined Backfill, Coulomb's Passive Earth Pressure, Comments on the Failure Surface Assumption for Coulomb's Pressure Calculations, Caquot and Kerisel Solution for Passive Earth Pressure (Granular Backfill), Passive Pressure under Earthquake Conditions, Retaining Walls; Introduction, Gravity and Cantilever Walls, Proportioning Retaining Walls, Application of Lateral Earth Pressure Theories to Design, Stability of Retaining Walls, Check for Overturning, Check for Sliding along the Base, Check for Bearing Capacity Failure, Construction Joints and Drainage from Backfill, Comments on Design of Retaining Walls and a Case Study, Mechanically Stabilized Retaining Walls; Soil Reinforcement, General Design Considerations, Retaining Walls with Metallic Strip Reinforcement, Step-by-Step-Design Procedure Using Metallic Strip Reinforcement, Retaining Walls with Geotextile Reinforcement, Sheet-Pile Walls; Introduction, Construction Methods, Cantilever Sheet-Pile Walls, Special Cases for Cantilever Walls Penetrating Clay, Anchored Sheet-Pile Walls, Moment Reduction for Anchored Sheet-Pile Walls Penetrating into Sand, Computational Pressure Diagram Method for Penetration intoSandy Soil, Field Observations for Anchor Sheet-Pile Walls, Free Earth Support Method for Penetration of Clay, Anchors, Holding Capacity of Anchor Plates in Sand, Holding Capacity of Anchor Plates in Clay, Ultimate Resistance of Tiebacks, Braced cuts; Introduction, Braced Cut Analysis Based on General Wedge Theory, Pressure Envelope for Braced-Cut Design, Pressure Envelope for Cuts in Layered Soil, Design of Various Components of a Braced Cut, Case Studies of Braced Cuts, Bottom Heave of a Cut in Clay, Stability of the Bottom of a Cut in Sand, Lateral Yielding of Sheet Piles and Ground Settlement.

Course Number: CE404 Course Name: Foundation Engineering II Credit hours: 4 Pre-requisite: None Course Contents:

This course covers : Bearing Capacity Equations; Introduction, Terzaghi equation, Meyerhof equation, Hansens' Equation, Vesic's Equation, Modefied Hansen's Equation, Effect of Water Table on Bearing Capacity, Footings with Eccentric Inclined Loadings, Bearing Capacity for Footings on Layered Soils, Bearing Capacity of Footings on Slopes, Settlement of Shallow Foundations; Introduction,



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Elastic Settlement of Shallow Foundation on Saturated Clay, Elastic Settlement in Granular Soil; Settlement Based on the Theory of Elasticity, Improved Equation for Elastic Settlement, Settlement of Sandy Soil: Use of Strain Influence Factor, Settlement of Foundation on Sand Based on Standard Penetration Resistance, Settlement in Granular Soil Based on Pressuremeter Test (PMT), Effect of the Rise of Water Table on Elastic Settlement, Consolidation Settlement; Primary Consolidation Settlement Relationships, Three-Dimensional Effect on Primary Consolidation Settlement, Settlement Due to Secondary Consolidation, Field Load Test, Presumptive Bearing Capacity, Pile Foundations; Introduction, Types of Piles and Their Structural Characteristics, Continuous Flight Auger (CFA) Piles, Estimating Pile Length, Installation of Piles, Load Transfer Mechanism, Equations for Estimating Pile Capacity, Meyerhof's Method for Estimating Qp, Vesic's Method for Estimating Qp, Coyle and Castello's Method for Estimating Qp in Sand, Correlations for Calculating Qp with SPT and CPT Results in Granular Soil, Frictional Resistance (Qs) in Sand, Frictional (Skin) Resistance in Clay, Ultimate Capacity of Continuous Flight Auger Pile, Point Bearing Capacity of Piles Resting on Rock, Pile Load Tests, Elastic Settlement of Piles, Laterally Loaded Piles, Pile-Driving Formulas, Pile Capacity For Vibration-Driven Piles, Wave Equation Analysis, Negative Skin Friction, Group Piles; Types of Drilled Shafts, Construction Procedures, Other Design Considerations, Load Transfer Mechanism, Estimation of Load-Bearing Capacity, Drilled Shafts in Granular Soil: Load-Bearing Capacity, Load-Bearing Capacity Based on Settlement, Drilled Shafts in Clay: Load-Bearing Capacity, Load-Bearing Capacity Based on Settlement, Settlement of Drilled Shafts at Working Load, Lateral Load-Carrying Capacity Characteristic Load and Moment Method, Structural Design of Shallow Foundation; Continuous Foundation, Square Foundation, Rectangular Foundation, Combined Foundation, Mat Foundation, Structural Design of Pile Foundation.

Course Number: CE405 Course Name: Highway Materials Credit hours: 5 Pre-requisite: None Course Contents:

This course covers : *Subgrade Soil Characterization:* Soil classification; properties of subgrade layers; CBR and plate load test; field compaction and control; introduction to soil stabilization; physical and chemical modification: stabilization with admixtures like cement, lime, calcium chloride, fly ash and bitumen. *Aggregate Characterization:* Origin, classification, types of aggregates; sampling of aggregates; mechanical and shape properties of aggregates, aggregate texture and skid resistance, polishing of aggregates; proportioning and blending of aggregates: Super pave gradation, Fuller and Thompson's Equation, 0.45 power maximum density graph and aggregate tests. *Bitumen Characterization:* Bitumen sources and manufacturing; chemistry of bitumen; bitumen structure; Rheology of bitumen; bitumen tests; visco-elastic and fatigue properties; creep test; permanent deformation parameters and other properties; modified bitumen: *Hot Mix Asphalt Design:-* Desirable properties of





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bituminous mixes; design of bituminous mixes; Marshall's specifications and design; introduction to super pave mix design procedure

Course Number: CE406 Course Name: Pavement Analysis and Design Credit hours: 4 Pre-requisite: Highway Materials Course Contents:

This course covers : *Road Pavements and pavement layers* - types, functions, choice factors affecting design and performance of flexible and rigid pavements; *Stresses, Deflection and strain in flexible pavements*: Application of elastic theory, stresses, deflections / strains in single, two and three layer system, applications in pavement design; *Flexible pavement design:* Empirical, semi empirical and theoretical design approaches; Design steps by CBR method; design by AASHTO and Asphalt Institute methods. *Stresses in rigid pavements:* Types of stresses and causes; Introduction to Westergaard's equation for calculation of stresses in rigid pavements due to wheel loads and temperature; Considerations in rigid pavement analysis, wheel load stresses, warping stresses, frictional stresses, combined stresses. *Rigid pavement design:* Design of cement concrete pavements for highways; Design of joints, reinforcements, tie bars, dowel bars and slab thickness. *Overlay Design and Computer Applications. Pavement Maintenance.*

Course Number: CE407 Course Name: Water Supply Engineering Credit hours: 5 Pre-requisite: None Course Contents:

This course covers: General introduction to Sanitary Engineering, Water Demand, Fire Demand, water Supply Works, population Forecasting, Water Source, Water Quality, Distribution System, Pipes, Valves, Meters, Pumps, Corrosions, Water Treatment processes, Intake and Screen, Coagulation, Flocculation, Sedimentation and Mass Sludge, Filtration and Washing process, Disinfection and Chlorination, Storage Works, Special Treatment, Flow in Pipes, Network analysis, Hardy cross method.

Course Number: CE408 Course Name: Environmental and Sewerage Engineering





Credit hours: 5 Pre-requisite: None Course Contents:

This course covers: Basic concept of Environment and Sewerage Engineering, Wastewater characteristics, Estimated of Wastewater Flow, Wastewater collection systems, Wastewater treatment processes, Screens, Grit removal chamber, Primary and Secondary sedimentation tank, Biological treatment, Activated sludge process, Trickling filter process, Sludge handling, Intensity and frequency of rainfall, Estimating run- off water (Rational method), Hydraulic design of wastewater and storm water network, river pollution, Principles of Solid waste management, Introduction to air pollution.

Course Number: CE409 Course Name: Equipment and Construction Method Credit hours: 3 Pre-requisite: None Course Contents:

This course covers : Construction Equipments (classification and uses), Factors Affecting the Selection of Construction Equipments, Construction equipments Economic life, Engineering rules in the selection of construction equipment, Soil Stabilization and Compaction, Tractors and Related Equipments, Scrapers, Excavation Equipments, Concrete Industry & Concrete productivity, Formwork for Concrete Structures, Piles and Pile-Driving Equipments, Pumping Equipments, Safety Engineering.

Course Number: CE410 Course Name: Quantity Estimation and Specifications Credit hours: 3 Pre-requisite: None Course Contents:

This course covers : Introduction to Estimating and Role of Estimating Engineer during Construction Project Life Cycle , The types of Estimating(Detailed estimating , Approximate Estimating) , The types of measurements and units of measurement used to measure quantities , Construction works (Classification and methods of measurement by using a consolidated standard guide) , Estimating method of construction works quantities and preparing Bill of quantities(BOQ) , Measurement Practice , Earthworks for civil Construction projects , Cost planning and methods of preparing the initial estimates of the cost of Construction projects (Floor-Area method , Cubic method , Approximate Quantities method , Unit Functional method) , Pricing for items Construction works , Payment and credit rules , Technical Specifications for the construction works , General Conditions of Contract for Works of Civil



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Engineering, project for(Estimating and preparing of specifications for construction building).

Course Number: CE411 Course Name: Hydraulic Structures Credit hours: 3 Pre-requisite: None Course Contents:

This course covers : Introduction To Hydraulic Structures, Types of Hydraulic Structures, Regulators, Types and Locations of Regulators, Hydraulics of Regulators, Discharge of Regulators With Fully and Partial Opening of Gate, Design of Floors, Causes Of Floor Failures, Design of Floor by using Bligh's and Lane's Theory, Energy Dissipaters, Hydraulic Jump, Types and Characteristics of Hydraulic jump, Types and Design of Stilling Basin, Transitions, Gates, Design of Sliding Gate, Culverts, Hydraulic and Structural Design of Box Culverts, Siphon, Hydraulic Design of Siphon.

Course Number: CE412 Course Name: Dams Engineering Credit hours: 3 Pre-requisite: Hydraulic Structure Course Contents:

This course covers : Introduction To Dams, Classification of Dams, Factors Governing Selection Site of Dams, Factors Governing Selection Type of Dams, Earth Dam, Types of Earth Dams, Preliminary Section of Earth Dam, Causes of Failures of Earth Dams, Selection Of Suitable Section of Earth Dam, Seepage Through Earth Dam, Stability Analysis of Slopes, Concrete Dams, Types of Concrete Dams, Gravity Dams, Forces Acting on Gravity Dams, Elementary Profile of Gravity Dams, Stability of Gravity Dams, Design of Low Gravity Dams.

Course Number: CE416 Course Name: Bridges Engineering Credit hours: 2 Pre-requisite: None Course Contents:

Introduction to bridge engineering, Historical background of bridges and types, Loads on bridges and force distribution, Bridge geometry, Structural analysis and design of bridge structures, Design of concrete and steel bridges in accordance with the latest AASHTO specifications. Introduction to long span cable-stayed and suspension bridges.



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Course Number: CE413 Course Name: Steel Structures Design I Credit hours: 3 Pre-requisite: None Course Contents:

This course covers :introduction to structural steel design , specifications ,load , methods of design , analysis of tension member , design of tension member, introduction of axially loaded compression member , design of axially loaded compression members, analysis and design of base plate , introduction to beam , design of beam for moments, design of beam for shear ,deflection , introduction to bending and axial force , analysis and design of beam-column braced or unbraced.

Course Number: CE414 Course Name: Steel Structures Design II Credit hours: 3 Pre-requisite: Steel Structures Design I Course Contents:

This course covers : This course covers :bolted connection, eccentrically loaded bolt and historical notes of rivets, welded connections, building connection, composite beam, composite column, cover plate beam and built up girder, design of steel building, introduction to low rise building, type of steel frame used for building, common type of floor construction.

Course Number: CE415 Course Name: GIS Applications Credit hours: 1 Pre-requisite: None Course Contents:

This course covers : Introduction to GIS, Data and Information, Spatial Data and attribute Data, Vectors and Rasters, Spatial Referencing, Coordinates Systems, Measurements on vectors, Measurements on Rasters, Spatial selection Queries, Data Classifications, Data base management systems, Spatial analysis (clip, intersect, union, erase, identity, buffer), 3D analysis (Surface, contour, slope, aspect, hill shade, Area and volume), Maps production, GIS applications in Civil Engineering.

Course Number: ER401 Course Name: Engineering Graduation Project Credit hours: 3 Pre-requisite: None Course Contents:



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This course covers : Different projects supervised by the staff members.