



**AI-AHLYIYA AMMAN UNIVERSITY**  
**FACULTY OF ENGINEERING**  
**DEPARTMENT OF CIVIL ENGINEERING**

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**COURSE DESCRIPTION**

of

**CIVIL ENGINEERING PROGRAM**

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**Number of Credit Hours: 160 Cr. Hr.**

**Course Labeling Code**

Faculty	Code	Department Code	Year Level	Field Subject	Serial	Number
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**Example:**

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**08 Faculty of Engineering Code**

**6 Department Code.**

**4 Year Level.**

**2 Field subjects.**

**06 Serial Number on the course in the Field.**

**Course Information**

**Course Name {No. of Credit Hours} [Lectures – Contact Hours]**

**Example: Reinforced Concrete Design (2) {3} [3-3]**

**{3} 3 Credit Hours.**

**[3-3] 3 Lectures, 3 Contact Hours a week**

**0121181 English Language Communication Skills (1) {3} [3-3]**

Grammar: question tags, modals, future forms, articles, adjectives, adverbs, if structures; vocabulary: relationships, work, activities, media, war, sport; writing skills: essay, notes, messages, application letters; basic and advanced reading skills; basic and advanced listening skills; verbal skills: oral presentations, arguments.

**Prerequisite: 0171100 English Language (Remedial)**

**0161101 Arabic Language Communication Skills (1) {3} [3 – 3]**

Language levels: phonological level, grammatical level, rhetorical level, orthographic level, comprehension and speaking; grammar exercises, nominal sentences, verbal sentences, kana and its sisters, Inna and its sisters, dual, masculine plural, feminine plural, indeclinable nouns, vocative, appositives; exercises in morphology, present participle and past participle; spelling and punctuation, dictionaries, listening and speaking

**Prerequisite: 0161100 Arabic Language (Remedial)**

**0161200 Military Sciences {3} [3 -3]**

The establishment and development of the Hashemite Kingdom of Jordan; the history of the Arab Legion; peacekeeping troops; preparing the nation for defense and liberation.

**Prerequisite: None**

**Exception: Non-Jordanian**

**0161201 National Education {3} [3 – 3]**

Concepts and terms; geography of Jordan; contemporary political history of Jordan; Jordanian Society; Jordanian constitutional and democratic life; Jordanian national institutions; challenges facing Jordan; threats to civic life: fanaticism, extremism, terrorism, violence; corruption: definitions, types, causes, impact, and prevention.

**Prerequisite: None**

**0152102 English Language Communication Skills (2) {3} [3-3]**

Grammar: comparisons, passives, reported speech, relative clauses, gerunds, infinitives; vocabulary: explore, excess, food, money, success, crime; writing skills: essay, formal letters, letters of complaint; basic and advanced reading skills; basic and advanced listening skills; verbal skills: oral presentations, arguments, oral complaints.

**Prerequisite: 0121181 English Language Communication Skills (1)**

**0161300 Islamic Culture {3} [3 – 3]**

Definition of the culture, characteristics of the Islamic culture, Islamic culture and other cultures; the sources of Islamic culture: The Holy Quran, Sunna, the Arabic language, history of Islam; fields of Islamic culture: faith, worship, morals; challenges facing the Islamic culture:

orientalism, globalization, secularism; young people and the impacts of foreign cultures, women and Islam, Islam and terrorism.

**Prerequisite: None**

**0162102 Arabic Language Communication Skills (2) {3} [3 – 3]**

Definition of the Arabic language and its levels; understanding and comprehending extracts; practicing syntax and morphology: the style of command and demands; unconditional morphology relevant to interrogative cases; “kad”, [k&d] and its sisters; adjectival, exaggerated expressions; adverbs of time and place, the forms of “al-haser”[al-haser]; dictation exercises; the conditions of writing “al-hamza” (the glottal stop); numbers; composition, essay writing, listening and spoken extracts .

**Prerequisite: (0161101) Arabic Language Communication Skills (1)**

**0162301 History of Jordan and Palestine {3} [3 – 3]**

The geography of Jordan and Palestine, Jordan and Palestine in ancient times, general historical look, Jordan and Palestine in the Mamluki period, Jordan and Palestine during the First World War (1914- 1918), Emirate of East Jordan (Transjordan), constitutional and legislative life in Jordan, Palestine under the British Mandate, and Jordanian-Palestinian relations, Jerusalem: historical status.

**Prerequisite: None**

**0411100 Human Rights {3} [3 - 3]**

This course deals with identifying the basic concepts of human rights in an analytical way, and then realistic clarify of the international & regional means dealing with human rights such as treaties, recommendations and international means that are in the process of formation, such imperative rules & customs, this course also address realistically the content of human rights and the rights of the first generation such as right of living. The second-generation rights such as the right to work and third-generation rights such as the right of environment. This course deals with the international ways to protect human rights, whether legal means "reports, complaints of States and individuals, commissions of inquiry," or other means such as the use of economic pressure or political use of force - the theory of intervention for the benefit of humanity.

**Prerequisite: None**

**Exception: Law Students**

**0132200 Psychology and Life {3} [3 – 3]**

Human behavior, fields of psychology, main approaches to human behavior. Introduce skills based on the understanding of human behavior, teaching students these skills related to the challenges facing students in their everyday life such as: problem-solving, self-confidence, coping with stress, mental health, establishing healthy relationships with others, motivation, and linking all these terms to real life through discussion and application.

**Prerequisite: None**

**Exception: Psychology Students**

**0143301 Entrepreneurship {3} [3 – 3]**

Economic science definition: its objectives and the economic problem; the relation between the economic science and other sciences; economic analysis methods; production possibilities curve; national income accounts; consumption; investment; saving; unemployment; inflation; money and banking; financial and monetary policy and its role in dealing with the imbalanced economy through these policies; economic development in terms of importance and objectives and economic planning to achieve such objectives; demand and supply theory and consumer equilibrium; cost and production theory; producer equilibrium in different markets.

**Prerequisite: None**

**0161301 Islam and Life {3} [3 – 3]**

**Prerequisite: None**

**0162302 Media and Public Relations {3} [3 – 3]**

The nexus between media and society in terms of the social, political, economic and cultural power of the media; the role of the media in giving people the opportunity to express their opinions and promote international relations; communication and public relations; communication and its types, levels, forms, properties, fields, activities, physical and nonphysical (symbolic) environment, and obstacles to the communicative process; public relations: its beginnings, development, principles, bases, importance, functions, planning, activities.

**Prerequisite: None**

**0561500 Tourism and Archaeology {3} [3-3]**

Tourism definition; classification of Tourism; the difference between tourist and other traveler's concepts, travel types, the definition of Archaeology and archaeological sites: Archaeological surveys and excavations; documentation; Jordan through the ages; components of tourism in Jordan; elements of tourist attractions in Jordan: archeological sites, natural sites, natural reserves, forests; tourist movement and types in Jordan; economical impact of tourism in Jordan.

**Prerequisite: None**

**Exception: Hotels and Tourism Students**

**0161303 Sport and Health {3} [3 – 3]**

Defining health and fitness: physical education, health education; the cognitive, emotional, skill-oriented, and social goals of physical education; the history of physical education: ancient, medieval, and modern ages, the Olympics, Athletics in Jordan: nutrition and exercising; athletic injuries: bone, joint, muscle, skin injuries; special exercises for figure deformation; diseases related to lack of exercise: diabetes, obesity, being underweight, back pain, cancer; hooliganism: causes and recommended solutions for hooliganism.

**Prerequisite: None**

**0162305 Environmental and Public Safety {3} [3 – 3]**

The concept of the environment: its laws and relation to other sciences, primary and secondary components, cycle of elements in the natural environment, environmental problems, pollution of the environment, the problem of the depletion of environmental resources, principles of public health and diseases: the concept of public health, pathogens, viruses, bacteria, parasites, fungi, insects; the environment and pathology: organic, genetic, reproductive and psychological pathology; nutrition and public health: types of food, malnutrition diseases, undesirable eating habits; the environment and public health from an Islamic perspective: Quranic verses and sayings of the Prophet.

**Prerequisite: None**

**0162306 Science and Life {3} [3 – 3]**

Origin and evolution of life: origin of universe, solar system formation and the origin of the earth; prebiotic chemistry; water for life sustenance contributions of polymer industry - natural and synthetic polymers; pharmaceuticals and cosmetics; generic and herbal drugs; drug abuse and its consequences.

**Prerequisite: None**

**0111101 Mathematics (1) {3}[3-3]**

Review of basic algebra, functions, limits, continuity, derivatives of algebraic, trigonometric, exponential and logarithmic functions. curve sketching, related rates problems, maximum-minimum problems, indefinite integral, definite integral and applications with emphasis on engineering and pharmacy models.

**Prerequisite: None**

**0111202 General Physics (1) {3} [3-3]**

Physics and measurement; motion in one dimensions; vectors; motion in two dimensions; the laws of motion; circular motion; applications of Newton's laws; energy of a system; conservation of energy; linear momentum and collisions; rotation of a rigid object about a fixed axis; angular momentum; static equilibrium and elasticity; universal gravitation; fluid mechanics; oscillatory motion; wave motion; sound waves; superposition and standing waves; temperature; the first law of thermodynamics; the kinetic theory of gases; heat engines, entropy, and the second law of thermodynamics.

**Prerequisite: None**

**0111203 General Physics (2) {3} [3-3]**

Electric fields; Gauss law; electric potential; capacitance and dielectrics; current and resistance; direct current circuits; magnetic fields; source of the magnetic field; Faraday's law; inductance; alternating- current circuits; electromagnetic waves.

**Prerequisite: 0111202 General Physics (1)**

**0111204 General Physics Lab. {1} [1-2]**

Experimental error and data analysis; measurements; vectors; kinematics; Newton's second law; friction; centripetal force; work and energy; Hooke's law; simple pendulum; specific heat of metals; determination of the coefficient of viscosity by Stoke's law; Archimedes principle and specific gravity; ohm's law; Kirchoff's law; Wheatstone bridge & resistivity; the oscilloscope, RC circuit

**Co-requisite: 0111203 General Physics (2)**

**0112102 Mathematics (2) {3}[3-3]**

Applications of the Definite Integral; Techniques of Integration; Hyperbolic Functions; Inverse Trigonometric Functions; L'hospital's Rule and Indeterminate Forms; Improper Integrals; Taylor's Formula; Sequences and Infinite Series and Applications with Emphasis on engineering models.

**Prerequisite: 0111101 Mathematics (1)**

**0811201 Computer Skills (Engineering) {3} [3-3]**

The basic concepts of programming using C++ language: C++ programming; controls structures; functions; arrays; pointers; an introduction to classes and objects.

**Prerequisite: 0331200 Computer Skills (Remedial)**

**0812101 Technical Writing {1} [1-1]**

Identify and write technical and scientific reports in English; focus on the technical side on every part of the report; practical applications on selected topics.

**Prerequisite: 0121181 English Language Communication Skills (1)**

**0812102 Engineering Ethics {1} [1-1]**

Engineering ethics; applied ethics and moral principles that apply to the practice of engineering; obligations on the shoulders of engineer towards society and towards its clients and his profession; ethics code engineering practice.

**Prerequisite: 0121181 English Language Communication Skills (1)**

**0832103 Engineering Mathematics (1) {3} [3-3]**

Different methods of solving ordinary differential equations applicable to the first, second and higher-order DEs, linear and nonlinear DEs, homogeneous and nonhomogeneous DEs as an

engineering application, modeling of some engineering, physical, and social problems will be given.

**Prerequisite: 0112102 Mathematics (2) (to be passed)**

**0832104 Engineering Mathematics (2) {3} [3-3]**

Linear algebra: matrices, vectors, determinants, solution of linear systems of equations, inverse of a matrix; matrix Eigenvalues problems: Eigenvalues, Eigenvectors, and diagonalization; complex analysis: complex numbers and functions, analytic and harmonic complex functions, exponential, trigonometric and logarithmic complex functions.

**Prerequisite: 0832103 Engineering Mathematics (1).**

**0832107 Engineering Statistics {3}[3-3]**

Applications of statistics in engineering; topics include: presentation and treatment of data; introduction to probability theory and probability distribution (discrete and continuous); counting techniques; sampling theory; statistical estimation; testing hypothesis; correlation; regression analysis.

**Prerequisite: 0112102 Mathematics (2).**

**0833105 Numerical Analysis {3} [3-3]**

General numerical methods: equation solving via iteration, interpolation; numerical integration, and numerical differentiation; numerical methods in linear algebra, Gauss elimination, least squares method, numerical methods for differential equations.

**Prerequisite: 0832104 Engineering Mathematics (2)**

**0871101 Engineering Workshop {1} [1-2]**

Workplace safety and use of tools; Basic skills of measuring and machining; Basic skills of welding; Household electric circuit installation; Basics of carpentry and its tools.

**Prerequisite: None**

**0871102 Engineering Drawing {2} [2-3]**

Use of Instruments; Lettering; Graphic Geometry; Orthographic; Isometric Drawing and Sketching; Sectional Views; Computer Aided Design; Applications in Civil, Mechanical, Architectural and Electrical Engineering

**Prerequisite: None**

**0862101 Statics {3}[3-3]**

Principles of mechanics; system of units; force vectors; resultant forces; equilibrium of a particle; rigid bodies; equivalent systems of forces; centriods and centers of gravity; analysis of structures: frames, machines, and trusses; shear forces and bending moments; friction; moments of inertia; principle of virtual work.

**Prerequisite: 0111202 General Physics (1)**

**0862102 Surveying {3}{3-3}**

Introduction; units and significant Figures; theory of errors in observations; distance measurement; leveling, angles, azimuths, bearings; coordinate geometry in surveying calculations; area and volume; introduction to GPS, Photogrammetry /and GIS.

**Prerequisite: 0112102 Mathematics (2)**

**0862103 Surveying Lab. {1} [1-2]**

Pacing and taping; slope distance measurement using tapes and clinometers; horizontal distance measurement through obstacle; building layout; leveling; measurement of elevation by rise and fall method; contour map and scale; profile leveling; application of theodolite.

**Co-requisite: 0862102 Surveying**

**0862200 Strength of Materials {3}{3-3}**

Mechanical properties of materials; stresses and strains in members subjected to tension, compression, and shear; torsion stresses; flexural and shearing stresses in beams; combined stresses; transformation of stresses and strains; deflection of beams; buckling of columns.

**Prerequisite: 0862101 Statics (to be passed)**

**0862201 Concrete Technology and Engineering Materials {3}{3-3}**

Cement production; properties and types of cement; hydration of cement; aggregate properties and mixing water; mixing, placing, compaction and tests of fresh concrete; types and applications of admixtures and additives; strength, durability and tests of hardened concrete; concrete mix design.

**Prerequisite: 0862400 Engineering Geology**

**0862202 Concrete Technology and Engineering Materials Lab.{1} [1-2]**

Fineness of cement test; density of cement test; normal consistency of cement pastes and initial and final setting times tests; sieve analysis of aggregate test; Los Angeles abrasion test; impact value test; bulk density of coarse aggregates; specific gravity and absorption of fine and coarse aggregates; fresh concrete slump test; Vebe test; compaction factor test; Schmidt hammer test, cube test; concrete cube destructive test.

**Co-requisite: 0862201 Concrete Technology and Engineering Materials**

**0862400 Engineering Geology {3}{3-3}**

Earth structure; minerals; clay minerals; type of rocks and their properties; site investigation and exploration; use of rocks as construction materials; ground water, earthquake; landslides; soil classification.

**Prerequisite: 0121181 English Language Communication Skills (1)**



### **0863203 Structural Analysis (1) {3}{3-3}**

Introduction to structural analysis; loads: static, environmental and dynamic loading; classification of structural elements; stability and determinacy of structures: determinate trusses, cables, beams and frames; influence lines of beams and trusses; deflections in elementary structures.

**Prerequisite: 0862200 Strength of Material**

### **0863204 Structural Analysis (2) {3}{3-3}**

Analysis of statically indeterminate structures: Force Method, Slope-Deflection Method, Moment Distribution Method; introduction to matrix structural analysis.

**Prerequisite: 0863203 Structural Analysis (1)**

### **0863300 Transportation Engineering {3}{3-3}**

Introduction to transport and transportation engineering; types passenger and freight transportation; transportation systems and elements (highway, railway, airport and harbours); design criteria for transportation systems; traffic flow theory and queuing theory; introduction to capacity analysis and quality of service; logistic in transportation; transportation environmental impact; introduction to transportation planning.

**Prerequisite: 0832107 Engineering Statistics and 0862102 Surveying**

### **0863301 Highway Geometric and Railway Design {3}{3-3}**

Classification of highway and railway systems; Geometric design concepts for highways and railways; design control and criteria; sight distance requirements; design of horizontal and vertical alignments; cross-section elements; super-elevation attainment; side slopes and drainage requirements; earthwork computations; highway intersection types; design of at grade-intersections and grade separation intersection; route alternative evaluation; practical applications; computer applications in geometric design.

**Prerequisite: 0863300 Transportation Engineering**

### **0863401 Geotechnical Engineering {3}{3-3}**

Introduction to soil mechanics; formation and structure of soil; Atterberg's limits; classification of soil; compaction; permeability; seepage flow; stress distribution; consolidation; shear strength; lateral earth pressure; stability of slopes.

**Prerequisite: 0862200 Strength of Materials (to be passed)**

**Prerequisite: 0862400 Engineering Geology.**

**0863402 Geotechnical Engineering Lab. {1} [1-2]**

Specific gravity; moisture content; liquid; plastic and shrinkage limits; consolidation test; sieve analysis; field density; compaction test; permeability; Shear strength of soil: direct shear, unconfined and triaxial tests; consolidation test.

**Co-requisite: 0863401 Geotechnical Engineering**

**0863500 Engineering Hydraulics {3}[3-3]**

Fluids in static state and motion; flow in pipes; head losses; cavitation; design of pipe networks; pump characteristics and selection; open Channel flow; uniform flow; Chezy and Manning equations; varied flow; specific energy; critical depth; hydraulic jump; engineering applications.

**Prerequisite:0833106 Fluid Mechanics**

**0863501 Fluid Mechanics and Engineering Hydraulics Lab. {1} [1-2]**

Center of pressure; Flow above opening and control gates; Pressure in pipes; Flow under control gate; Hydraulic jump; Type of flow; Venture meter.

**Co-requisite: 0863500 Engineering Hydraulics**

**0864205 Reinforced Concrete Design (1) {3}[3-3]**

Materials properties; load calculations according to ACI; flexural analysis and design of beams; design for shear and diagonal tension; bond, anchorage and development length; design of one way slabs; short columns under compression combined with moment (interaction diagrams); design of foundation (spread footing and wall footing).

**Prerequisite: 0863203 Structural Analysis (1) & 0862201 Concrete Technology and Engineering Materials.**

**0864206 Reinforced Concrete Design (2) {3}[3-3]**

Serviceability of beams and one-way slabs; continuous beams: loading patterns, moment envelopes; design of biaxial Loaded columns; slender columns; design for torsion, torsion plus shear; design of two-way slabs; design of combined footings.

**Prerequisite: 0863204 Structural Analysis (2)**

**Prerequisite: 0864205 Reinforced Concrete Design (1) (to be passed)**

**0864207 Design of Steel Structures {3}[3-3]**

Introduction: specifications, loads and methods of design; analysis and design of tension and compression members; design of beams for flexure, shear, and torsion; analysis and design of beam-columns; bolted and welded connections.

**Prerequisite: 0863204 Structural Analysis (2)**

### **0864302 Highway and Traffic Engineering {3}[3-3]**

Traffic engineering studies and measurement (traffic volume, speed and delay); Types of traffic flows (interrupted flow and uninterrupted flow); highway capacity analysis for freeways, multilanes and two-lane, highways; Intersections analysis (controlled and uncontrolled); traffic light signal design; pedestrian facilities; an introduction to traffic safety and accident analysis; sign and markings; evaluation of traffic noise and emission; introduction to intelligent transportation system; computer applications in traffic engineering.

**Prerequisite: 0832107 Engineering Statistics (to be passed)**

**Prerequisite: 0863300 Transportation Engineering**

### **0864303 Pavement Design and Airport Engineering {3}[3-3]**

Types of pavements; stress analysis in flexible and rigid pavements; traffic load forecasting and analysis; design of flexible and rigid pavement for highways and airports; asphalt mix design; introduction pavement distresses type and causes and evaluation economic analysis and optimization of pavement alternatives; computer applications in pavement design.

**Prerequisite: 0863300 Transportation Engineering**

### **0864304 Pavement Design and Airport Engineering Lab. {1} [1-2]**

The tests of asphaltic materials: Saybolt viscosity, Penetration, Ductility, Flash and Fire Point, Softening Point; Loss on Heating; Asphalt Mix Design (Marshall Method); Maximum Specific Gravity; Extraction Test; Skid Resistant and Surface Texture; British Pendulum; California Bearing Ratio test.

**Co-requisite: 0864303 Pavement Design and Airport Engineering**

### **0864403 Foundation Engineering {3}[3-3]**

Site investigation; foundation classifications; bearing capacity; foundation settlement; factors affecting foundation design; spread footing; combined footing; wall footing; mat foundations; lateral earth pressure and retaining walls; settlement.

**Prerequisite: 0864205 Reinforced Concrete Design (1)**

**Prerequisite: 0863401 Geotechnical Engineering**

### **0864502 Engineering Hydrology {3}[3-3]**

Hydrological cycle; Surface runoff; Rainfall-runoff analysis; Hydrograph analysis; Unit hydrograph; Synthetic unit hydrograph development; Hydraulic channel routing; Hydrologic reservoir routing; Basics of groundwater hydrology; Probability and statistics concepts in hydrologic design; Rational method design; Engineering applications.

**Prerequisite: 0863500 Engineering Hydraulics**

**0864504 Environmental and Sanitary Engineering {3}{3-3}**

Definitions of the environmental engineering concepts; Pollution sources and types; Pollution prevention; Air pollution: sources and causes; Principles of water chemistry and Microbiology; Design of water distribution systems; Drinking water treatment; Wastewater conveyance systems; Design of sewers; Wastewater characteristics and treatment.

**Prerequisite: 0863500 Engineering Hydraulics.**

**0864505 Environmental and Sanitary Engineering Lab. {1} [1-2]**

Analysis of drinking water and wastewater to determine: acidity, turbidity, alkalinity, hardness, ammonia, and chlorine content; Coagulation; Biological Oxygen Demand (BOD) and Chemical Oxygen Demand (COD); Dissolved and suspended solid materials; Ion exchange; Carbon adsorption.

**Co-requisite: 0864504 Environmental and Sanitary Engineering**

**0864701 Specifications, Contracts, and Quantity Surveying {3}{3-3}**

Introduction to the Jordanian legal systems and law applicable to the construction industry; Introduction to value engineering and quality control; An introduction to the legal aspects of construction projects, emphasis on legal problems directly applied to the practice of project management; Contracts and specifications documents, codes and zoning laws and labor laws; Quantity survey procedure, methods and analysis; quantity surveys and pricing; bidding and negotiating.

**Prerequisite: 0863301 Highway and Railway Geometric Design**

**Prerequisite: 0864205 Reinforced Concrete Design (1)**

**0864901 Field Training {3} [Eight Weeks]**

Students are required to conduct field training after passing 110 credit hours for eight weeks in a pre approved and recognized institute, department, company or firm in one of the various areas in civil engineering.

**Prerequisite: Pass 110 Cr.H.**

**0865208 Bridge Engineering {3}{3-3}**

Types of bridges; material properties; loads on bridges; design of bridge slabs; design of reinforced concrete bridges; design of pre-stressed concrete bridges.

**Prerequisite: 0863204 Structural Analysis (2)**

**Prerequisite: 0864205 Reinforced Concrete Design (1)**

**0865503 Treatment of Liquid and Solid Wastes {3}[3-3]**

Wastewater management; Advanced wastewater treatment and reuse; Sources, types, and composition of solid wastes; sanitary landfills; landfill techniques for domestic, industrial, and hazardous wastes; landfill rehabilitation.

**Prerequisite: 0864504 Environmental and Sanitary Engineering.**

**0865702 Construction Project Management {3}[3-3]**

Concepts and definition; Planning; Project scheduling techniques (Gantt Chart, CPM, PERT); Developing the schedule; Cost management; Risk management; Project organization (site and resources).

**Prerequisite: 0864701 Specifications, Contracts, and Quantity Surveying.**

**0865902 Graduation Project (1) {1} [1-1]**

Students work in groups to conduct a graduation project in two phases, graduation project I is the first phase which includes developing proposal, literature review, problem identification and data collection.

**Prerequisite: Pass 120 Cr.H.**

**0865903 Graduation Project (2) {2} [2-2]**

This is a continuation of graduation project I, where students start their analysis and design to conclude with.

**Prerequisite: 0865902 Graduation Project (1)**

**0813108 Applied Engineering Mathematics{3}[3-3]**

Mathematical modeling of engineering systems; Systems of differential equations; Introduction to Matlab for solving algebraic and differential equations, matrix operations, graphing etc.; Fourier series and integrations; Introduction to partial differential equations and their solutions using: Separation of variables, Laplace transformation and finite difference techniques.

**Prerequisite: 0833105 Numerical Analysis**

**0833106 Fluid Mechanics {3}[3-3]**

Fundamentals of fluid mechanics; Pressure Variations and measurements; Hydrostatic force principles; Fluid Kinematics; Bernoulli equation; Mass, Energy and Momentum principles; Forces on submerged bodies; Laminar and turbulent flows in closed conduits; Engineering applications.

**Prerequisite: 0862101 Statics (to be passed)**

**0874106 Engineering Economy and Management**

Engineering Project Development; Decision Making; Basic Concepts of Capital Investment: Formulas and Applications, Rates of Return, Economic Feasibility of Projects (Net Future Value, Net Present Value, and Equivalent Uniform Cash Flow); Comparison of Mutually Exclusive Proposals; Benefit-Cost Ratio Method; Depreciation; Corporate Taxation; Resource Allocation.

**Prerequisite: 0832107 Engineering Statistics**

**0911567 General Chemistry for Engineers {3}{3-3}**

Basic information about matter classification and properties, elements and atoms, ionic and molecular compounds; measurements, chemical reactions; electronic structure; properties of gases, intramolecular forces, concentrations; acids and bases; kinetics, energy and thermodynamics

**Prerequisite: none**

**0911568 General Chemistry Lab for Engineers {1} [1-2]**

Introduction to laboratory safety rules; physical separation of mixtures: distillation, extraction, and recrystallization; empirical formula of compound; determination of acid and base in vinegar; indicators; buffers; measurement of pH; identification of chemical substances; solutions.

**Co-requisite: 0911567 General Chemistry for Engineers**

**0865104 Computer Applications in Civil Engineering {3} [3-3]**

Practical applications using civil engineering computer software packages in structure, transportation, soil, or management. Using available software in the analysis and design of projects.

**Prerequisite: 0864302 Highway and Traffic Engineering**

**Prerequisite: 0864206 Reinforced Concrete Design (2)**

**0865106 Selected Topics in Civil Engineering {3}{3-3}**

Department Approval.

**0865209 Earthquake Engineering {3}{3-3}**

Concept of seismic design; analysis of earthquake effects; choice and design of earthquake resistance systems; the behavior of reinforced concrete under cyclic loading; analysis according to static force procedure, response spectrum; analysis, design of reinforced concrete sections to resist earthquake loads.

**Prerequisite: 0863204 Structural Analysis (2)**

### **0865210 Prestressed Concrete {3}[3-3]**

Introduction; pre-stressed concrete concepts and materials; detailed estimation of losses, design for flexure; design for shear and torsion; slab and beam design; Composite construction and design; shear-friction theory; computer applications.

**Prerequisite: 0864206 Reinforced Concrete Design (2)**

### **0863305 Public Transportation Engineering {3}[3-3]**

Role of public transportation; urban public passenger modes; transport network types; methods of estimating public transportation demand; public transport facility capacity and quality of service; network and route planning and design; terminal design.

**Prerequisite: 0864302 Highway and Traffic Engineering**

### **0865306 Pavement Maintenance and Rehabilitation {3}[3-3]**

Introduction to pavement maintenance management process; pavement networks definitions and classifications; pavement distress evaluation and rating procedure; Pavement testing types (destructive and nondestructive tests); pavement condition forecasting; overview of maintenance and rehabilitation techniques; network level management; project level management; computer applications in pavement maintenance and rehabilitation.

**Prerequisite: 0864303 Pavement Design and Airport Engineering**

### **0865506 Water Resources {3}[3-3]**

Hydrologic and hydraulic design concepts for water resources systems; Functions and design of hydraulic structures; Storm water systems design; Groundwater occurrences and Darcy's law; Equations of groundwater flow; Well hydraulics; Flow in confined and unconfined aquifers; Engineering economy concepts in planning and management of water resources systems; Computer applications in water resources; Contemporary issues.

**Prerequisite: 0864502 Engineering Hydrology.**

### **0865507 Irrigation, Drainage, and Dam Engineering {3}[3-3]**

Sources of irrigation water; Long term storage; Design of dams and reservoirs; Design of irrigation structures and drainage canals; Design of culverts and measurement structures; Contemporary issues

**Prerequisite: 0863500 Engineering Hydraulics**

**Remedial Requirements (to a student who has not passed the level exam)**

**0161100 Arabic Language (Remedial) {3} [3 – 3]**

The concept of language and its levels, comprehension and speaking; grammar exercises; nominal sentences, verbal sentences, kana and its sisters, inna and its sisters, masculine plural, feminine plural, singular, dual, numbers, appositives; punctuation marks, exercises in morphology (present and past participles); spelling issues (hamza/glottal stop writing): conjunctive hamza (hamzat wasl) and hamza qat', alef following group waw, alif layyinah ('flexible alif') and nunation (tanwin).

**Prerequisite: None**

**0171100 English Language (Remedial) {3} [3-3]**

Grammar: auxiliary verbs, the English tenses; Vocabulary: relationships, media, places, appliances, activities; Writing Skills: paragraph writing, distinguishing between formal and informal letters; Basic Reading Skills; Basic Listening Skills; Verbal Skills: oral presentations, arguments, formal phone calls, restaurants recommendation.

**Prerequisite: None**

**0331200 Computer Skills (Remedial) {3} [3 – 3]**

IT Essentials: Introduction to Personal Computer, Computer Assembly, An Overview of Preventive Maintenance; Operating System (WINDOWS 10): Settings, Managing Folders and Files, Search; Basics Skills in Microsoft Word 2016; Basics Skills in Microsoft PowerPoint 2016; Basics Skills in Microsoft Excel 2016.

**Prerequisite: None**