8012101- 2 Principles of Engineering Economics (2: 3,0) Prerequisite: None

Simple and compound Interest Rates- Inflation- Principles of economic equivalence- Time Value of Money, Analysis of mono and multiple investments (Present and Future Values, Uniform Series, Linear gradient Series, Geometric gradient Series)- Real and Effective Interest Rates- Comparing options- Analysis of economic decisions in engineering organizations – Risk assessment – Applications on engineering sector.

8012102-3 Hydraulics 1 (2: 2,3) Prerequisite: 203205-4 Physics

Fluid properties– Forces in static fluids – Fluid pressure measurements - Hydrostatic forces on surfaces – Buoyancy and floating – Kinematics of fluid – Conservation of mass (Continuity Equation) – Energy law and its applications – Forces due to fluid motion – Conservation of Momentum and its applications – Pipe Flow – Dimensional analysis – Dynamic similarity and Hydraulic models.

8012103-3 Statics (3: 3,0) Prerequisite: 202120-3 Mathematics (2)

Introduction - Force Definition and Representation - Resolution of Forces - Resultant of a Concurrent Force system - Moment of Forces - The Couple - Resultant of a Non-concurrent Coplanar System - Equilibrium Conditions for a Concurrent Planar force system Equilibrium Conditions for a Non-concurrent Planar force system - Types of Structures - Types of loads - Types of supports - Determination of reactions - Condition Equations.

8012104-2 Hydraulics 2 (2: 3, 2) Prerequisite: 8012101-2 Hydraulics 1

Introduction to open channel flow – Steady uniform flow in open channel – Specific Energy and critical depth – Froude number – non-uniform rapidly varied flow (hydraulic jump) – Flow over sharp crested weirs – Flow over broad crested weirs – Basics equations for open channel design – Manning's Equation – Introduction to non-uniform gradually varied flow – Pump and turbines

8012201-2 Civil Drawing (2: 2, 3) Prerequisite: 8021201-2 Engineering Drawing

Introduction to civil engineering drawing – Projection of earthworks, side slopes, and curves - Types of retaining walls and abutments: brick, plain concrete, and reinforced concrete – Projection of water structures – Pipe culvert – Bridges – Projection of steel structures – Projection of reinforced concrete structures – computer applications.

8012202-3 Structural Analysis (1) (3: 4,0) 8012103-3 Statics

Deformations by virtual work method – Analysis of Statically Indeterminate Structures by consistent deformation method – Three Moments Equation – Moment Distribution Method-Stiffness Method-Influence lines for statically indeterminate structures.

8012203 - 2 Technical Reports (2: 3, 0) Prerequisite: 999807-2 English language for Specific Purposes1

Specifications of technical writing – Paragraphs, sentences and frame of technical writing – Expression modes in technical reports – Analysis of data – Method of writing of technical report – Studies, inspections, and tests.

8012205-2 Surveying (1) (2: 3,2) Prerequisite: 202110-3 Mathematics (1)

Introduction – Measuring units - Branches of surveying science - Drawing scales - Linear measurements - Types of Traverses -Traverses computations - leveling- types of leveling - Kind of levels - Longitudinal leveling - Cross-section leveling - grid leveling - Areas - Volumes - Calculations of cut and fill.

8013101-2 Engineering Geology (2: 3,2) Prerequisite: 203205-4 Physics

Introduction – Basics of mathematics for engineering geology – Basics of mechanics for engineering geology – Principles of structural geology – Rocks classification and their engineering properties– Chemical and physical weathering of rocks – Geological and geophysical exploration of rocks – Natural aggregates for construction – Elementary soil mechanics – Basics of ground water flow – Mass movements and landslide –. Mechanics of earthquakes and seismic hazards

8013102-2 Surveying (2) (2: 3,2) Prerequisite: 8012205-2 Surveying (1)

Theodolite - Angles and directions measurement using Theodolite - Traverses computations and correction methods – Omitted observations - Horizontal curves - Vertical curves - Tacheometric measurement -Trigonometric Leveling - Types and sources of errors - Theory of errors - Electronic distance measurements (EDM) and Total stations – Introduction to Global positioning system (GPS).

8013103-2 Structural Analysis (2) (2: 3,0) 8012202-3 Structural Analysis (1)

Deformations by virtual work method – Analysis of Statically Indeterminate Structures by consistent deformation method – Three Moments Equation – Moment Distribution Method-Stiffness Method-Influence lines for statically indeterminate structures.

8013201-2 Geotechnical Engineering 1 (2: 2,2) Prerequisite: 8013101 Engineering Geology

Soil origin –Soil classification –Soil phase- Soil compaction - Soil permeability – Site investigation

8013202-2 Water resources engineering (2: 3,0) Prerequisite: 8012204-2 Hydraulics 2

Hydrological cycle: Precipitation, Evaporation, Transpiration and Infiltration – Hydrograph analysis – Theory of unit hydrograph – S curve method – Hydrologic routing – Hydraulic routing –Characteristics and movement of groundwater – Depuit assumptions for unconfined groundwater flow –Steady well Hydraulics – Unsteady well hydraulics –Recharge of aquifers –Well overlaps and scenarios – Estimation of water demand and storage capacity of water reservoirs –Introduction to water desalination.

8013203-3 Properties and strength of construction materials (3: 3,2) Prerequisite: 8012202-3 Structural analysis(1)

Engineering materials: properties and evaluation - Testing machines and measuring devices - Tests: tension, compression, bending, shear, torsion – Properties and evaluation of: bricks, timber, ceramic and glass - Cement: manufacture, properties, types of cement and tests - Aggregates: types, properties, grading and tests.

8014101-3 Design of Steel Structures 1 (3:4,0) Prerequisite: 8013103-2 Structural Analysis 2

Properties of structural steel - Loads and stresses – Design of tension members – Design of compression members - Design of bolted and welded connections – Wind and earthquake bracing.

8014102-2 Geotechnical Engineering 2 (2:2,2) Prerequisite: 8013201 Geotechnical Engineering 1

In-situ stresses in soil - Stresses in soil mass - Compressibility of Soil - Shear Strength of soil - Lateral earth pressure - Slope stability – Bearing Capacity.

8014103-2 Concrete Technology (2: 3,2) Prerequisite: 8013203-3 Properties and Strength of Construction Materials

General introduction – Special types of concrete – Concrete manufactory – Properties and testing of fresh concrete - Properties and testing of hardened concrete – Concrete mix design – Quality control - Concrete durability – Non-destructive tests of concrete structures.

8014104-3 Design of Reinforced Concrete Structures 1 (3:4,0) Prerequisite: 8013103-2 Structural Analysis 2

Reinforced concrete fundamentals – Methods of designing "Ultimate Limit State" - Types of loads and their factors– Design and detailing of One-way and Tow-way Solid Slabs – Design and detailing of simple and continuous beams subjected to bending moment and shear force – Classification and design of short columns

8014105-2 Transportation and Traffic Engineering (2: 3,0) Prerequisite: 2024116-3 Probability and Statistics

Introduction of transportation systems – Roll of transportation in society development –Transportation systems – Urban transportation planning: [Data collection- transportation Modelling (trip generation, trip distribution, model split, traffic assignment) – Evaluation] - Traffic engineering : Introduction – Traffic flow characteristics – Roads capacity and level of service analysis.

8014201-3 Design of Reinforced Concrete Structures 2 (3:4,0) Prerequisite: 8014104-3 - Design of Reinforced Concrete Structures 1

Design of slabs: Paneled beams, Hollow Blocks and Flat Slabs – Design of sections subjected to eccentric forces – Design and detailing of Frames and their supports– Classification and design of slender columns – Design of Stairs.

8014202-2 Foundation Engineering (2:3,0) Prerequisite: 8014102 Geotechnical Engineering 2: 8014104-3 Design of Reinforced Concrete Structures1

Site and soil exploration- Calculation of bearing capacity- Settlement calculation under Footings – Design of shallow foundations – Design of Deep Foundation - Design of Retaining Walls and Sheet Piles.

8014203-3 Highways Engineering (3: 3,2) Prerequisite: 8014105-2 Transportation and Traffic Engineering

Functional classification for roads – Determinants and characteristics of the geometrical design – sight distances – Elements of cross section – Horizontal alignment – Vertical alignment - At grade intersections - Pavements Material types: asphalt, aggregates and local materials - Specifications and properties of the selected materials - Tests of sub grades, aggregates and asphalt – Design of asphalt concrete mixes - Quality control for pavement materials – Traffic characterization and axle loads determination – Design of flexible pavement – Design of rigid pavement.

8014204-2 Construction Methods and Equipment (2: 3,0) Prerequisite: 8014103-2 Concrete Technology

Overview of the construction projects management- equipment production rates -Earthmoving machinery and operations- Excavation and lifting - Loading & hauling – Compacting & finishing- Roads Construction Equipment - Concrete construction - Concrete form design - Construction economics- introduction to construction project life cycle.

8014205-3 Sanitary and Environmental Engineering (3:4,0) Prerequisite: 8012204-2 Hydraulics 2

Population growth studies – Water sources – Water pollution – Estimation of water demand – Characteristics of drinking water – Water purification systems – Water supply systems – Design and analysis of pipe networks – Properties of wastewater – Estimation of sanitary water discharges – Planning and design of sanitary drainage network – Design of rain water drainage networks – Waste water treatment systems.

8014206-2 Building Construction (2: 3,0) Prerequisite: Civil Drawing 8012201- 2

Definition of building construction concepts and main building elements – Construction Delivery System- Sequence of building construction- Training of students for reading and understanding the architectural drawings (Plans, Elevations, Sections)- Openings (doors, Windows)– Isolating of buildings – Different Structural Systems- Foundations- Main Criteria in designing Stairs- Buildings finishing works- Simple Examples of Calculating quantities of different elements of Buildings.

8015102-2 Contracts, Specifications and Quantity Surveying (2:3,--) Prerequisite: 8014206-2 Building Construction

Types of contracts and contract documents in civil engineering projects - General and Special conditions, and complete specifications in civil engineering projects– Sequence of different works items - Definition and methods of contract tendering in civil engineering projects– Calculation of quantities – Bills of Quantities - Drawings Review - Calculations of quantities using computer.

8015103-2 Projects Management (2: 3,0) Prerequisite: 8014204-2 Construction Methods and Equipment

Characteristics and phases of Construction projects – Activities and work breakdown structure in construction projects - Project planning, scheduling and control models in construction projects – cost management and Cash flow Conceptual - Project risk management- Decision making in construction projects- computerized scheduling in construction management.

8015104-2 Railways Engineering (2: 3,0) Prerequisite: 8014105-2 Transportation and Traffic Engineering

Introduction of railways - Train resistance and tractive power - Train braking force and distance - Alignment of railway lines – Geometric design of railways' tracks - Curves and Superelevation - Design of all track elements; (Rails- Sleepers – Ballast) - Track Stresses - Track Fittings and fastenings - Points and crossings - Track junctions and simple track layouts - Level crossings - Railway stations and yards - Signaling and Interlocking.

8015202-2 Design of Steel Structures 2 (2:3,0) Prerequisite: 8014101-3 - Design of Steel Structures 1

Design of columns and their supports connection – Design of Steel Beams – Design of connection subjected to M, N.F., S.F. - Loads, and stresses in bridges – Design of plate girder bridges –Design of Bridge Connections.

8015203-2 Engineering Ethics (2:2,0)

Personal and professional responsibility - Professional Ethics Code -Analyzing and solving ethical issues - Risks and Safety - Health and personal safety responsibilities - Credibility and reliability - Ethics of civil engineers - Cases and situations for ethics

8015203-2 Sustainable Infrastructures Projects (2:3,0) 8013102-2 Surveying (2)

Introduction to international sustainability assessment tools - processes and quantitative tools for sustainability assessment – Sustainability concept for design and construction of infrastructures - Introduction to coordinate systems, datum and map projections – Global positioning system - Setting out utility networks (horizontally and vertically) - Cut and fill works calculations - case study application for sustainable infrastructures projects.

Elective Courses

8015301-2 Special Topics in Public works engineering (2: 3,0)

Studies of advanced topics in public works engineering fields under supervision of staff for selection of the updated information and researches in the selected field.

8015302-2 Advanced Highways Engineering (2: 3,0) Prerequisite: 8014203-3 Highways Engineering

Stresses in flexible pavement - Stresses in rigid pavement - Computer applications in structural design of roads - Drainage systems – New trends of asphalt mixtures design on cold and hot conditions - Technology of embankment construction - Technology of pavement construction – Asphalt mix plants – Asphalt pavement distresses - Rigid pavement distresses -Asphalt pavement maintenance – Concrete pavement maintenance - Methods of pavement evaluation - Evaluation tests of pavement.

8015303-2 Advanced Transportation Engineering (2: 3,0) Prerequisite: 8014105-2 Transportation and Traffic Engineering

Public Passenger Transport – Energy Issues connected with transportation – Transportation safety - Intelligent Transportation Systems - Transportation Economics - Introduction of cargo transportation systems - Different types of containers- Regulation of container loading- Container handling systems in sea ports- Operating systems of sea container terminals- Aligning of sea container terminals- Aligning of container freight station- Capacity and efficiency of sea container terminals.

8015304-2 Remote sensing (2: 3,0) 8013102-2 Surveying (2)

Introduction - Principles of remote sensing – Photography air-systems - Air photo interpretation and applications - Multispectral imaging and thermal infrared - Digital images of U.S. satellites - Land sat and the French SPOT - Other remote sensing satellites - Radar imaging - Digital image processing - Computer applications.

8015305-2 Special Topics in Highway engineering (2: 3,0) Prerequisite: 8014203-3 Highways Engineering

Studies of advanced topics in highways engineering fields including recent trends in this field under supervision of staff for selection of the updated information and researches in the selected field.

8015306-2 Photogrammetric Surveying (2: 3,0) Prerequisite: 8013102-2 Surveying 2

This course introduces the science of photogrammetry, the history of photogrammetry, The geometry of the photographic camera, the geometry of vertical and near vertical aerial photos, scale determination, elevation by relief displacement; control and flight planning; geometry of stereo photos; parallax measurement, ground coordinates from measurements on a vertical photograph, Topographic Mapping.

8015307-2 Geographic Information System (2: 3,0) Prerequisite: 8013102-2 Surveying 2

Introduction – Principals and idea of the geographical information systems (GIS) – Types of data - Digital maps & updating, production methods and field methodology – Linking the digital images with the ground coordinates systems and the resulting accuracy - Essential considerations in design of data bases for using in GIS – Applications of GIS - Modeling of applications
Environmental studies - Software and hardware systems used in GIS.

8015308-2 Engineering applications of surveying (2: 3,0) Prerequisite: 8013102-2 Surveying (2)

The course is designed to give the students basic knowledge of engineering applications of surveying. Topics Include: Surveying of Existing features- Architectural photogrammetry- Setting out of constructions (vertical and horizontal)-Deformation measurements-Monitoring of construction movements- Application of surveying in highways and railways (Setting out vertical and horizontal curves)- Application of surveying in utility networks.

8015309-2 Airport engineering (2: 3,0) Prerequisite: 8014203-3 Highways Engineering

Introduction to air transport - Aircraft Characteristics -Airport Planning - Airport Obstructions - Airport Capacity and Configuration - Runway Design - Taxiway Design - Terminal Area and Airport layout - Lighting and marking - Heliports and their Design - Design of Airport pavements.

8015310-2 Special topic in surveying (2: 3,0) Prerequisite: 8013102-2 Surveying (2)

Studies of advanced topics in surveying engineering fields including recent trends in this field under supervision of staff for selection of the updated information and researches in the selected field.

8015311-2 Advanced Traffic Engineering (2: 3, 0) Prerequisite: 8014105 -2 Transportation and Traffic Engineering

Traffic surveys - Intersection control and design - At-Grade intersection capacity and level of service - Traffic accident analysis – Parking studies - Pedestrians analysis and safety - Impacts of road traffic on environment (air pollution and noise) - Local area traffic management- Traffic Safety.

8015312-2 Reinforced Concrete 3 (2:3,0) Prerequisite: 8014201-3 - Design of Reinforced Concrete Structures 2

Tanks: Design of water sections, Elevated Tanks, Design of Tanks rested on soil, Embedded Tanks. - Halls: Types of Hall Covering, Design of Domes and Cones.

8015313-2 Inspection, Maintenance and strengthening of Structures (2:3,0) Prerequisite: 8014103-2 Concrete Technology

Types of structures defects – Methods of structures inspection – Prepare of technical report about the inspection – Strengthening of structures – Structures maintenance and protection – Repair and protection of underground structures – Modern technology for repair of concrete structures – Repair of structures subjected to fire.

8015314-2 Advanced Engineering and Construction Management (2:3,0) Prerequisite: 8015103-2 Projects Management

Managing construction projects throughout their life cycles, advanced methods for construction projects planning and Cost estimating- Decision making in construction projects- Time-cost trade-off, construction management programming

8015315-2 Concrete Bridges (2:3,0) Prerequisite: 8014201-3 - Design of Reinforced Concrete Structures 2

Types of bridges – Loads on bridges – Distribution of loads on structural elements of bridge – Splices of bridges – Bearings of bridges – Design of different types of bridges – Structural details in bridges.

8015316-2 Foundations on Problematic Soils (2:3,0) Prerequisite: 8014201-3 Geotechnical Engineering 2

Properties and behavior of swelling soil - Properties and behavior of loose soils - Properties and behavior of collapsible soils - Properties and behavior of soft soils – Foundations on problematic soils.

8015317-2 Design of Composite Structures (2:3,0) Prerequisite: 8014201-3 - Design of Reinforced Concrete Structures 2

Advantages and Disadvantages of Composite Structures – Composite Beams – Composite Columns – Composite Columns subjected to Bending Moments – Connections and Hinges – Structural Details.

8015318-2 Dynamics of Structures and Earthquake Engineering (2:3,0) Prerequisite: 8013103-2 Structural Analysis 2

Single Degree of Freedom (SDOF) undamped free vibration mode - SDOF damped free vibration mode – SDOF under harmonic loading – Dynamic behavior due to earthquake loading – Multi degree of freedom system – Damped motion of shear buildings- Computer Applications.

8015319-2 Applications of Nano-Technology in Civil Engineering (2:3,0) Prerequisite: 8014103-2 Concrete Technology

Introduction- Types of Nano particles used in in Civil Engineering Structures - Effect of Nano particles on the materials properties - Production of Nano particles -Application of Nano Technology in the Engineering Materials- Impact of Nanotechnology on Transportation Systems – Nano-Technology in Traffic Monitoring – Applications of Nanotechnology in Pavements - Applications of Nanotechnology in Environmental Engineering.

8015320-2 Deep and Special Foundations (2:3,0) Prerequisite: 8014202-3 Foundations Engineering

Definition of pile foundations – Static and dynamic analysis of pile bearing capacity – Determination of pile capacity in field and laboratory – Types of casinos – Casinos bearing capacity and its settlement in soil – Behavior of casinos under vertical and horizontal loads.

8015321-2 Special topic in Structural Engineering (2:3,0)

Studies of Advanced concept in structural Engineering in different fields as: structural analyses – foundation engineering –design of steel and concrete buildings – strength and properties of materials – project management – (all the items mentioned should be selected according to the updated information and researches in the field selected).

8015322-2 Harbors and Coastal Protection Engineering (2:3,0) Prerequisite: 8012204-2 Hydraulics 2

Harbor planning and construction - Theory of periodic waves - Wave energy- refraction, diffraction and reflection of waves – Winds and tides - Wave forces on marine structures - Design of coastal & marine structures.

8015323-2 Hydrology of Groundwater (2:3,0) Prerequisite: 8012302-2 Water Resources Engineering

Groundwater formation – Groundwater aquifers – Groundwater exploration - Groundwater flow - Groundwater equations – Well hydraulics - Well overlaps and scenarios - Design of well screens.

8015324-2 Design of modern Irrigation Systems (2:3,0) Prerequisite: 8012302-2 Water Resources Engineering

Introduction – Selection of modern irrigation system- Sprinkler irrigation system :kinds, efficiency and uniformity of the distribution, planning , kinds and characteristics of the Sprinklers, the hydraulic design of sprinkler lines, pumping needs - Drip irrigation system: elements of the systems, droppers choice and principals of the design, the plan, nets design, filters and the apparent blockage – On farm developed irrigation system: design of developed channels: nets of the pipes of low pressure, the concrete channels , pumping works and field constructions.

8015325-2 Buildings Sanitary Installation (2:3,0) Prerequisite: 8014205-2 Sanitary and Environmental Engineering

Primary study of sanitary installations – Sanitary plumbing – Design of water supply and drainage of houses buildings, administrative buildings, hospitals and factories – Fire resistance networks – Introduction to air conditioning systems.

8015326-2 Advanced Hydraulics (2:3,0) Prerequisite: 8012204-2 Hydraulics 2

Unsteady pipe flow - Hydraulic machines - Turbines and pumps – Hydraulic hammer – Critical shear stress – Unsteady open channel flow - Functions of hydraulic structures and safety – Energy dissipations.

8015327-2 Dams Engineering (2:3,0) Prerequisite: 8012204-2 Hydraulics 2

Reservoir planning: zones of storage in reservoirs, storage capacity, sedimentation – Multipurpose reservoirs – Earth and rock fill dams: classification of dams, design of dams, design of filters, stability of slopes – Causes of failures of earth dams – Spillways and stilling basins: types and methods of design.

8015328-2 Special Topics in Water Resources Engineering (2:3,0

Studying advanced topics in water resources engineering fields including hydraulics, hydrology, groundwater, irrigation and drainage engineering, sanitary and environmental engineering, design of water structures, and water desalination. The topic will be determined according to the modern directions and recent trends in the selected field.

8015329-2 Hydraulics Modelling (2:3,0) Prerequisite: 8012204-2 Hydraulics 2

Introduction, Numerical techniques used in hydraulic modeling, Development of physical models, Modelling of open-channel systems, Modelling of closed-conduit flow, Modelling of hydraulic structures.