

CIVIL and Environmental ENGINEERING DEPARTMENT

History:

Civil Engineering is one of the first engineering sciences that accompanied the development of humankind, and that it plays a major and vital role in the evolution of life and progress. This is like a constantly evolving science with continuous growths. Recently, the Civil Engineering intertwined largely with the industrial development for the production of new construction materials to meet the growing requirements to the needs of the labor market. The Civil Engineering has many specialized fields as analysis, design, construction, operation and maintenance of constructed facilities. The country infrastructure includes buildings, roads, bridges, airports, rail and traffic management, water and sanitation. In addition to, methods of treating sewage and study of environmental pollution and ways to mitigate it, building dams, digging wells, canals, management of engineering projects and solid waste management.

The Civil Engineer is the specialist who qualifies for the analysis, design, construction, operation and maintenance as well as to address the engineering issues, trying to find appropriate solutions and economic development. That allows the student to study Civil Engineering prepares future engineers to deal direct and correct and in a manner commensurate with the reality and contribute to the transport conscious of civilization and international technology, which in turn helps the continuation of the comprehensive development drive witnessed by our beloved country.

Earning Credit Units requirements:

In order to qualify for a Bachelors of Science in Civil Engineering degree:

- A student must successfully complete 155 credit hours with an overall GPA of 2.75 out of 5 or better while satisfying the curriculum requirements of his program of specialization.
- Each student is also required to complete one summer training of 10 weeks in industry under the supervision of a faculty member.
- The typical study period is five years (10 semesters) and the credit units are distributed as follows:

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|---------------------------------------|----|
| ○ University Requirements | 26 |
| ○ Faculty Requirements | 44 |
| ○ Program Compulsory Requirements | 67 |
| ○ Program Elective Requirements | 12 |
| ○ Free Courses (from outside Faculty) | 6 |

Compulsory courses:

| Course code and number | Course title | credit hours | Communication hours | Distribution of communication hours (lecture, Lab, Exercises) | prerequisite |
|------------------------|--------------------------------|--------------|---------------------|---|-----------------------|
| CEN 201 | Statics | 3 | 4 | (3 , -- , 1) | PHYS 281 |
| CEN 202 | Strength of Materials | 3 | 5 | (2 , 2 , 1) | CEN 201 |
| CEN 221 | Construction Management | 3 | 3 | (3 , -- , --) | IEN 255 |
| CEN 240 | Structural Analysis (1) | 3 | 4 | (3 , -- , 1) | CEN 201 |
| CEN 251 | Hydraulics (1) | 3 | 5 | (2 , 2 , 1) | MATH 203 +CEN 201 |
| CEN 260 | Environmental Eng. Principles | 3 | 3 | (3 , -- , --) | CHEM 281 |
| CEN 271 | Surveying | 3 | 5 | (2 , 2 , 1) | MATH 202 |
| CEN 333 | Geotechnical Engineering | 3 | 5 | (2 , 2 , 1) | CEN 202 |
| CEN 334 | Foundation Engineering | 3 | 4 | (3 , -- , 1) | CEN 333 + CEN 342 |
| CEN 340 | Structural Analysis (2) | 3 | 4 | (3 , -- , 1) | CEN 240 |
| CEN 341 | Materials of Construction | 3 | 5 | (2 , 2 , 1) | CEN 202 |
| CEN 342 | Reinforced Concrete Design (1) | 3 | 4 | (3 , -- , 1) | CEN 240 |
| CEN 352 | Hydraulics (2) | 3 | 5 | (2 , 2 , 1) | CEN 251 |
| CEN 353 | Hydrology | 3 | 4 | (3 , - , 1) | CEN 352 |
| CEN 361 | Environmental Pollution | 2 | 2 | (2 , -- , --) | CEN 260 |
| CEN 381 | Transportation Engineering | 3 | 5 | (2 , 2 , 1) | CEN 271 |
| CEN 390 | Summer Training | 2 | -- | (-- , -- , --) | Pass 110 Credit UNITS |
| CEN 402 | Numerical Meth. for Civil Eng. | 3 | 3 | (3 , -- , --) | CEN 340 |
| CEN 442 | Reinforced Concrete Design (2) | 3 | 3 | (3 , -- , --) | CEN 342 |
| CEN 462 | Wastewater Engineering | 3 | 4 | (3 , -- , 1) | CEN 352 +CEN 260 |
| CEN 499 | B.Sc. Senior Project | 4 | 6 | (2 , 4 , --) | Pass 110 Credit UNITS |
| Total | | 62 | 83 | (51, 18 , 14) | |

Courses Description "Compulsory":

1- CEN 201: Statics

General principles of statics; Force vectors (2D & 3D); Equilibrium of a particle (2D & 3D); Force system resultants (2D & 3D); Equilibrium of a rigid body (2D); Structural analysis (Trusses-2D); Center of gravity and centroid of a body; Moments of inertia; Friction

2- CEN 202: Strength of Materials

Review of statics, internal reactions. Concept of stress. Concept of strain, Stress-strain relations. Deformation of axially loaded members. Torsion of circular members. Normal force, shear force and bending moment diagrams. Flexure and shearing stresses in beams. Transformation of plane stresses. Concept of design of beams. Concept of beam deflection. Concept of buckling of columns. Lab experiments.

3- CEN 221: Construction Management

Introduction to Construction; Construction Contracts; Construction Planning; Construction Scheduling; Financial Planning and Cost Control; Construction Equipment and Economics; Construction Safety and Health; Engineering Ethics.

4- CEN 240: Structural Analysis (1)

Basic principles. Analysis of statically determinate trusses, beams, frames, arches, suspension cables. Influence lines for statically determinate structures. Deflection of structures. Buckling of columns.

5- CEN 251: Hydraulics (1)

Dimensions and Units, Properties of fluids, Fluid pressure and its measurements, Hydrostatics and its applications, Equilibrium of floating bodies, Fluid masses subjected to acceleration, Hydro-kinematics of fluids, Bernoulli equation and its applications, Momentum equation and its applications, Flow in pipes. Dimensional analysis; Model analysis and similitude. Laboratory experiments.

6- CEN 260: Environmental Eng. Principles

Introduction, Components of Global Environment, Definition and Building blocks of the Biosphere, Ecosystem and its Biotic Component, Natural Equilibrium in the environment, disturbances in natural equilibrium, Basis of Environmental Engineering, Environment and Human Interaction, Water Quality, Engineered systems for Wastewater Treatment and Disposal, Air Quality, Engineered Systems for Air Pollution Control.

7- CEN 271: Surveying

Introduction to the basic surveying theory and practice; Units of measurements and conversions; Error analysis; Distance measurements by taping; Electronic surveying measurements; Leveling; Angle measurements; Traversing and traverse computations; Topographic surveying and mapping; Area and volume computations; Circular curves; introduction to photogrammetry; introduction to geographic information system (GIS); introduction to global positioning system (GPS) and 3D scanning; Use of surveying software

such as Surfer and photomodeler. Laboratory experiments.

8- CEN 333: Geotechnical Engineering

Introduction to engineering geology, Earth surface and physical properties of earth materials; Weight-volume relationships; Physical properties of soil; Soil classification; Permeability and seepage; Shear strength; Compressibility; Consolidation and settlement; Introduction to lateral earth pressure and slope stability. Laboratory experiments.

9- CEN 334: Foundation Engineering

Site exploration and selection; Types of foundations; Bearing capacity of shallow foundations; Foundation settlement; Structural Design of shallow foundations; Deep foundations; Structural Design of Deep foundations; Retaining walls; Structural Design of retaining walls; Computer applications.

10- CEN 340: Structural Analysis (2)

Analysis of statically indeterminate structures by method of consistent deformations; Method of slope-deflection and moment distribution; Influence lines for statically indeterminate structures; Approximate methods for analysis of multi-sections forms; Classical stiffness method of structural analysis; Direct stiffness method for trusses.

11- CEN 341: Materials of Construction

Manufacturing, Properties and Tests of metals, aggregate, cementing materials, fresh and hardened PC concrete, asphalt concrete, masonry, wood and plastics. Design and production of PC concrete and asphalt mixtures. Computer applications in mix design. Laboratory experiments.

12- CEN 342: Reinforced Concrete Design (1)

Introduction to properties of concrete and reinforcing steel; Behavior of reinforced concrete under flexure and shear; Introduction to ACI-Code; Types of loads and their factors; Ultimate strength method of design; Analysis and design of singly and doubly reinforced sections; Analysis and design of T-section; Design of beams against shear forces; Development length; Design of solid one-way slab, two-way slab, cantilever slab; Design of short columns.

13- CEN 352: Hydraulics (2)

Flow in open channels, Types of flow in channels, Uniform flow through open channels, most economical section of channels, Rapidly varied flow, gradually varied flow, measurements of flow in open channels, flow over weirs, flow under sluice gates, Hydraulic machines(turbines and pumps). Laboratory experiments.

14- CEN 353: Hydrology

Introduction, The Hydrologic Cycle, Hydrologic Processes, Precipitation and Measurement Methods, Evaporation and Evapo-transpiration, Water sheds and it's characteristics, Methods of Calculating Maximum Surface Runoff, Hydrograph and Unit Hydrograph, Floods and Methods of Calculating Design Floods, Stream Flood Routing. Movement of ground water, Hydraulics of wells, Design of wells, ground water exploration, well testing. Laboratory

experiments.

15- CEN 361: Environmental pollution

Natural and anthropogenic environment, definition and concerns of environmental pollution, Hydrological cycle, Nutrient cycles, Population growth and its consequences, Energy problem, Global environmental issues, Acid rain, Ozone layer depletion, sources and classification of water pollutants, control strategies, Air pollution sources and effects, Sampling and measurement, Control methods, Land pollution and its types.

16- CEN 381: Transportation Engineering

Transportation as a system; human and vehicle characteristics; traffic flow characteristics; highway capacity analysis; highway control devices; public transportation; urban transportation planning; parking facilities; transportation safety; intelligent transportation system and computer applications; introduction to railway, waterway, airport and pipeline. Laboratory experiments.

17- CEN 390: Summer Training

Field training conducted under the supervision of a faculty member; The student must submit a detailed technical report by the end of training period explaining what he learned during this training.

18- CEN 402: Numerical Meth. for Civil Eng.

Development of stiffness matrix for elements from first principles. Superposition of loads and elements. Linear analysis by hand and computer of plane and space structures comprising one-dimensional truss and beam/frame elements.

19- CEN 442: Reinforced Concrete Design (2)

Review ACI 318- Code provisions; Design of paneled beams, Design of continuous beams; Design of one-way hollow blocks slab; Design of two-way hollow blocks slab; Design of flat slabs; Design of RC stairs; Design of sections under moment and normal force; Design of eccentrically loaded columns using interaction diagrams; Design of RC frame with reinforcement details.

20- CEN 462: Wastewater Engineering

Introduction; Flow and characteristics of wastewater; Design of a storm collection system; Design of a sewerage system; Wastewater treatment processes; Advance biological wastewater treatment processes: nitrification and denitrification, phosphorus removal; Design of biological wastewater treatment systems; Sludge treatment and disposal; Refuse collection and disposal; Reuse of wastewater. Laboratory experiments

21- CEN 499: B.Sc. Senior Project

Team-work on a civil engineering capstone design project involving comprehensive design experience; exposure to professional practice with practitioner involvement. Preparation of the project report and its presentation.

| Selected Electives | Course code and number | Course title | credit hours | Communication hours | Distribution of communication hours (lecture, Lab, Exercises) | prerequisite |
|---------------------------|-------------------------------|--|---------------------|----------------------------|--|---------------------|
| 1- | CEN 422 | Construction Engineering | 3 | 3 | (3,--,--) | CEN 221 |
| 2- | CEN 424 | Construction Contracting | 3 | 3 | (3,--,--) | CEN 221 |
| 3- | CEN 435 | Applications in Foundation Engineering | 3 | 3 | (3,--,--) | CEN 334 |
| 4- | CEN 439 | Soil Improvement | 3 | 3 | (3,--,--) | CEN 334 |
| 5- | CEN 443 | Design of Steel Structures | 3 | 3 | (3,--,--) | CEN 340 |
| 6- | CEN 444 | Advanced Reinforced Concrete Design | 3 | 3 | (3,--,--) | CEN 342 |
| 7- | CEN 445 | Maintenance & Rehabilitation of Structures | 3 | 3 | (3,--,--) | CEN 342 |
| 8- | CEN 446 | Advanced Construction Materials | 3 | 3 | (3,--,--) | CEN 341 |
| 9- | CEN 451 | Design of Hydraulic Structures | 3 | 3 | (3,--,--) | CEN 352 |
| 10- | CEN 453 | Water Supply Engineering | 3 | 3 | (3,--,--) | CEN 353 |
| 11- | CEN 457 | Water Resources Engineering | 3 | 3 | (3,--,--) | CEN 353 |
| 12- | CEN 463 | Wastewater Reclamation & Reuse | 3 | 3 | (3,--,--) | CEN 361 |
| 13- | CEN 464 | Solid Wastes Engineering | 3 | 3 | (3,--,--) | CEN 361 |
| 14- | CEN 465 | Environmental Impact Assessment | 3 | 3 | (3,--,--) | CEN 361 |
| 15- | CEN 471 | GPS and GIS Applications | 3 | 3 | (3,--,--) | CEN 271 |
| 16- | CEN 482 | Highway Design & Construction | 3 | 3 | (3,--,--) | CEN 381 |
| 17- | CEN 483 | Traffic Engineering | 3 | 3 | (3,--,--) | CEN 381 |

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|-----|--------------|-------------------------------|-----------|-----------|-------------------|---------------------|
| 18- | CEN 486 | Flexible Pavement Maintenance | 3 | 3 | (3,--,--) | CEN 381 |
| 19- | CEN 497 | Special Topic in Civil Eng. | 3 | 3 | (3,--,--) | Chairman's Approval |
| | Total | | 57 | 57 | (57,--,--) | |

Selected Elective Courses Description

1- CEN 422: Construction Engineering

Construction cost estimation; Construction estimation using Excel; Earthmoving materials and operations; Excavating and lifting; Loading and hauling; Compacting and finishing; Value engineering; Concrete form design.

2- CEN 424: Construction Contracting

Contract definition. Participants in a construction contract. Types of contracts; formation principles of a contract, performance or breach of contractual obligations. Analysis and comparison of the different kinds of construction contracts. Bidding logistics. Legal organizational structures. Types and uses of specifications. Sample of different forms of contracts utilized in construction.

3- CEN 435: Applications in Foundation Eng

Aspects of Geotechnical Engineering. Topics include: site investigation, terrain analyses, in situ testing, groundwater problems, deep foundations, tie back walls and bracing, and coffer dams. Computer applications.

4- CEN 439: Soil Improvement

Principles of soil improvement. Types of improvement and factors influencing them. Mechanical and hydro improvements. Physical and chemical improvements. Computer applications.

5- CEN 443: Design of Steel Structures

Properties of steel. Types of loads. Philosophy of load resistance factor design (LRFD) method. Analysis and design of tension and compression members. Axially loaded columns. Base plate. Design of beams in flexure and shear. Beams with cover plates. Unsymmetrical bending. Deflection. Design of beams-column. Bolted and welded connections

6- CEN 444: Adv. Reinf. Concrete Design

Introduction to prestressed concrete, ACI provisions; Types of prestressing, losses stresses; Deflection, flexural and shear strengths of P.S.C.; Retaining walls, types and forces on R.W. and design of R.W; Construction of R.C. water tanks, water-proofing, loads detailing of reinforcements and joints; Design of R.C. circular and rectangular tanks

7- CEN 445: Maintenance & Rehab. of Struc

Maintenance and rehabilitation of structures concepts; Evaluation of existing structures: strength, durability and deficiencies; Destructive and non-destructive testing; Damaged structures and deterioration mechanisms; Criteria and techniques for repairing and strengthening of concrete structures.

8- CEN 446: Adv. Construction Materials

Properties and strength of light weight concrete, massive concrete, high strength concrete,

hot weather concrete, high performance concrete. Waterproofing materials. Sound insulating materials, advanced technology in concrete.

9- CEN 451: Design of Hydraulic Structures

Crossing up structures, Bridges (Timber, Steel, RC), Culvert structures, Siphon structures, Aqueduct Structures, Dams, Gravity dams, Buttress dam, Earth dam, Rock fill dam, Arch dam.

10- CEN 453: Water Supply Engineering

Introduction; work of the sanitary engineer; Water demand; Water quality; Various sources of water; Water intakes; Hydraulic analysis of water distribution systems; Conventional water treatment processes; Advance treatment processes of drinking water: softening, removal of ferrous and manganese, control of taste and odor, and reduction of dissolved salts; Pumps and pumping stations

11- CEN 457: Water Resources Engineering

Principles of water resources engineering, Objective of water resource development, Water laws, Reservoirs, Dams, Hydropower generations, Flood routing and control, Water resources environment, heating pollution of water, Reuse of wastewater.

12- CEN 463: Wastewater Reclamation & Reuse

Potential reuse applications. Sources of water for reuse. Treatment technologies suitable for water reuse applications. Criteria for each type of reuse application. The overall procedures for determining the feasibility and planning of water reuse systems as well as the management structure of reuse projects. The management of the bio-solids resulting from the treatment of wastewater and related regulations governing their use and disposal.

13- CEN 464: Solid Wastes Engineering

Introduction, The impacts of solid waste generation, Variations in the composition and quantity of solid waste, types of land pollution, Characterization of municipal solid wastes including physical, Chemical, and biological characteristics; Functional elements of solid waste management, Solid waste management systems, Engineering principles of integrated solid Waste management practices including resource recovery, composting, Incineration and landfill design

14- CEN 465: Environmental Impact Assess.

Environmental inventory, Environmental impact assessment, Features of the environmental policy act and its implementations, Planning and management of impact studies, Methodology for environmental impact assessment, Role of environmental engineering firms, Role of regulatory agencies and control boards, Role of the public, Guidelines for preparation of project report and its evaluation, methods of clearance from the concern authorities at various levels, Environmental monitoring.

15- CEN 471: GPS and GIS Applications

Introduction to the basic for GPS and GIS applications; Geodesy: introduction, the ellipsoid and geoids, geodetic position , geoids undulation ,deflection of the vertical, geodetic coordinate system; Map Projection: projections used in state plane coordinate systems, UTM projection; GPS: overview of GPS, differential GPS, GPS static survey, GPS kinematic survey; GIS: introduction to GIS, GIS data sources and data format, creating GIS databases, GIS applications, use of surveying software such as GeoMedia and Leica Geo Office.

16- CEN 482: Highway Design & Construction

Characteristics of driver, pedestrian vehicle, and traffic flow affecting highway design; geometric design of highways; layouts of intersections, interchanges and terminals; highway drainage; review of highway paving materials; design of asphalt paving mixtures; pavement design; highway construction and supervision; categorize common pavement surface distress and associated correction activates; introduction to maintenance management system; computer applications on highway geometric design.

17- CEN 483: Traffic Engineering

Traffic Engineering studies and measurement; traffic flow theory and queuing theory; highway capacity analysis; parking analysis and layout design; traffic signs, marking and channelization; signalized intersection design and operation; roundabout design and management; ITS applications in traffic Eng.; computer application in traffic engineering.

18- CEN 486: Flexible Pavement Maintenance

Essential terminologies and concepts of preservation existing highway asphalt pavements; characterizing flexible pavement distresses and identifying possible cause of distresses; relating pavement distress types and distress severity to cost-effective repair alternatives; simple procedure to inventory pavement conditions and select maintenance methods.

19- CEN 497: Special Topic in Civil Eng.

In-depth study of relevant civil engineering topics not covered in other courses of the program in order to enhance students' knowledge in the field of civil engineering.