DEPARTMENT OF CIVIL & ENVIRONMENTAL ENGINEERING

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Mission

The mission of the Civil and Environmental Engineering Department is dedicated to educate and graduate commendable civil engineers by providing a high-standard education delivered in a stimulating and supportive environment that expose students to a broad balanced program of theoretical and practical learning; to prepare graduates to build skills, competencies, leadership qualities, professionalism and ethics, in addition to cultivate a sense of creativity as well as team-work innovations to impart professional services of the highest quality to the community and the environment; and to instill in them a passion to continuous and lifelong learning (LLL) to surmount problems encountered in a rapidly changing and challenging world, for a better lifelong productive career.

Objectives

- Be competent to handle complex engineering tasks and provide innovative solutions through the integration of best practices.
- Be recognized for their ability to pursue graduate studies in Civil Engineering and related interdisciplinary areas as well as aptitude for lifelong learning.
- Demonstrate leadership in their fields of expertise and service to local and international communities.

Learning Outcomes

The graduates of the CE program will acquire each of the following characteristics and abilities, which constitute the program outcomes in conformity with the objectives. The student shall :

1. Identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.
2. Be able to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.
3. Gain skills to communicate effectively with a range of audiences.
4. Be able to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.
5. Function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.
6. Be able to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.
7. Gain ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

Degree Requirements

The undergraduate curriculum for the degree of Bachelor of Engineering in Civil Engineering consists of 150 credit-hours of course work, where the requirements can be finished in ten consecutive semesters. Also, the student has to complete the IC3 license related to the use of computer applications.

Career Opportunities

The demand for civil engineers has been consistently high, in the Middle East and the Gulf region, during the last decade. Engineers have been involved primarily in large public and private development projects. The emerging reconstruction activity in Lebanon and the Gulf offers ever increasing and expanding opportunities for civil engineers for even decades to come. Graduating civil engineers are benefiting from very stimulating work experiences in the region, many of which are related to mega projects in the building and infrastructure sectors; this has resulted in a booming job market and in highly competitive salaries for civil engineers. Potential senior students are on high demand for recruitment by leading engineering companies for practical training, prior to their graduation, and eventually hired as practicing engineers.

The civil engineering graduate can generally work either in the private sector or in government agencies. Civil engineers attain a broad spectrum of skills sought by almost every profession. The fields of work applied to civil engineering are in form of design and consultation, contracting and supervision, or management and quality control. Being interrelated, it is not unusual that these fields are combined during the performance of a project. The civil engineer can work as an employee, partner, or owner in consulting design offices (local or regional) in the departments of structures, transportation and planning, geotechnical engineering, environmental engineering, water resources, and computer software. Also, contracting firms and construction management offices have job opportunities for civil engineers.

Program Overview

The Student's Study Plan is provided to every CE student upon his/her enrollment. The CE curriculum consists of 150 total credits divided into the following components:

I. Common Requirements (60 credits)	**Credits**
General University Requirements	20 (12 Comp & 8 Elect)
Basic Sciences and Mathematics	26
General Engineering Courses	14
II. CE Program-Specific Requirements (90 credits)	**Credits**
A. Civil Engineering Core Courses	73
B. Civil Engineering Technical Electives	12
C. Internship (Approved Experience / Independent Study)	1
D. Final Year Project (FYP)	4

I. Common Requirements

The list of Common Requirement courses with descriptions are presented in the introductory pages of the Faculty of Engineering section in this catalog. The general engineering courses (14 credits) are:

Course	Title	Credits	Prerequisite
COMP 208	Programming I	3	
CVLE 210	Statics	3	
INME 221	Engineering Economy	3	
MCHE 201	Engineering Drawings and Graphics	3	
ENGR002	Introduction to Engineering	2	

II. CE Program-Specific Requirements

A. Civil Engineering Core Courses

The Civil Engineering core courses are listed in the table below.

Course	Title	Credits	Pre-/Co-requisites
CVLE 208*	Environmental Biology	2	
CVLE 210**	Statics	3	
CVLE 211	Mechanics of Materials	3	Pre: CVLE 210
CVLE 213	Structures I	3	Pre: CVLE 211
CVLE 214	Structures II	3	Pre: CVLE 213
CVLE 222	Construction Materials I	3	Pre: CVLE 211 & CHEM 241
CVLE 231	Engineering Geology	2	
CVLE 260	Engineering Surveying I	2	Pre: MATH281
CVLE 261	Engineering Surveying II	2	Pre: CVLE 260
CVLE 270	Civil Engineering Drawings & Detailing	2	Pre: MCHE 201
CVLE 323	RC Structures I	3	Pre: CVLE 213& MATH 381
CVLE 324	RC Structures II	3	Pre: CVLE 323
CVLE 325	Construction Materials II	3	Pre: CVLE 222
CVLE 333	Soil Mechanics	3	Pre: CVLE 211 & CVLE 231
CVLE 341	Hydraulics I	3	Pre: PHYS282
CVLE 342	Hydraulics II	3	Pre: CVLE 341
CVLE 354	Environmental Engineering	2	Pre: CVLE 208
CVLE 371	Structural Modeling	2	Pre: CVLE 213 & COMP 208
CVLE 425	Steel I	3	Pre: CVLE 213
CVLE 426	Steel II	3	Pre: CVLE 425
CVLE 427	Building Information & Modeling	3	Pre: CVLE 324
CVLE 432	Foundation Engineering	3	Pre: CVLE 323 & CVLE 333
CVLE 441	Hydrology	2	Pre: CVLE342
CVLE 453	Sanitary Engineering	3	Pre: CVLE354
CVLE 463	Transportation & Traffic Engineering	3	Pre: MATH281
CVLE 464	Highway Engineering	3	Pre: CVLE463 & CVLE 333
CVLE 466	Construction Project Management	3	Pre: CVLE323
CVLE 467	Construction Planning & Scheduling	3	Pre: CVLE466
CVLE 500	Research Methodology	2	Pre: ENGL300

* Basic Sciences Course

** General Engineering Course

A.1 Description of the CE Core Courses

ENGR 002 INTODUCTION TO ENGINEERING (2Crs.: 2Lec,0Lab): Introducing the student to the engineering profession in general and the learning objectives that new students should attain, as aligned with the ABET requirements. Covering the basics of the engineering profession and engineering ethics. Introduction to the different engineering majors and to the learning objectives as specified by ABET. Insight into different engineering courses that are not technical in nature (e.g., engineering economy)
Engineering design tasks that allow the student to start thinking as engineers: problem definition, specification of constraints, investigation of different solution alternatives, implementation of best solution, writing technical reports. Fundamental tools and numerical software used in engineering. The tools and software covered could be generic or specific to a major.

CVLE 208-ENVIRONMENTAL BIOLOGY (2Crs.: 2Lec)
Molecular biology and genetics, microbial cell structure and function, microbial metabolism, microbial growth, and water and soil microbiology. In addition, the course will introduce topics related to the use of biotechnologies for renewable energy, production of alternative fuels, and enhancement of various aspects related to the ecosystem.

CVLE 210-STATICS (3Crs: 3Lec)

Force vectors (analytical and graphical methods), free-body diagrams; equilibrium of particles and rigid bodies in two and three dimensions; structural elements and supports; plane and space trusses; axial, shear, and moment diagrams of beams; Cable-supported structures. Friction; center of gravity and centroid; moment of inertia. Applications.

CVLE 211-MECHANICS OF MATERIALS (3Crs: 3Lec)

Center of Gravity. Moments of Inertia. Stresses, strains, stress-strain relationships. Axial Stress and deformation, Pure bending., Deflection due to bending, Stresses due to Combined Bending and Axial force, Direct Shear, Torsion, Shear stresses and deformation due to torsion, Combined stresses. Stress transformation and Mohr's circle. ***Pre-req: CVLE 210***

CVLE 213-STRUCTURES I (3Crs: 3Lec)

Types of loads, structural elements and supports. Stability and determinacy of structures. Analysis of simple, cantilever and overhanging ended beams. Axial, shear, and bending moment diagrams. Analysis of compound and inclined Beams,& frames. Elastic deformation (slope and deflection) of beams by double-integration method; Moment-area theorems; and Conjugate Beam Method***. Pre-req: CVLE 211***

CVLE 214-STRUCTURES II (3Crs: 3Lec)

Strain energy theorems – Slopes and deflection of beams, frames and trusses utilizing principle of virtual work. Flexibility method for analysis of indeterminate structures. Matrix analysis of structures. Effect of temperature change and yielding of supports. Three Moment Equations and applications. Slope-deflection method for analysis of beams and rigid frames. Concept of Moment distribution methods and applications on continuous beams, and frames with and without side-sway. ***Pre-req: CVLE 213***

CVLE 222-CONSTRUCTION MATERIALS I (3Crs: 2Lec & 2Lab)

Portland cement: Processing, Specifications, Properties, Types. Aggregates: Processing, Properties, Grading, Testing. Water, Admixtures, Concrete mix design (mixture proportioning), Properties and Testing of fresh concrete (Workability tests), Hard Concrete Testing. Batching, Mixing and Placing, ***Pre-req: CVLE 211& CHEM241***

CVLE 231-ENGINEERING GEOLOGY (2Crs: 2Lec)

Earth-structure, composition and properties of rocks; geologic processes; geologic hazards; geologic structure and engineering consequences; terrain analysis and geologic mapping; interpretation and use of geologic maps; application of geology to engineering practice; reservoirs, dam sites, and construction of tunnels.

CVLE 260-ENGINEERING SURVEYING I (2Crs:1Lec & 2Lab)

Basic principles, linear surveying and scales, maps plotting, compass surveying, theodolite surveying: Vernier, optical and digital, traverses: open, closed, link, and traverse network, adjustment and plotting, engineering and precise leveling, contouring. ***Pre-req: MATH281***

CVLE 261-ENGINEERING SURVEYING II (2Crs: 1Lec & 2Lab)

Distance measurements, stadia system, tangential system, and double image system, Basics of electromagnetic distance measurements EDM, total Station, introduction to GPS, areas and volumes for earthworks, mass hauk diagrams, curve ranging simple, compound, reversed, transition, and vertical curves. ***Pre-req: CVLE 260***

CVLE 270-CIVIL ENGINEERING DRAWING AND DETAILING (2Crs:1Lec & 2Lab)

Graphical analysis of engineering drawings, computer-aided drafting and work drawing, applications: RC slabs, beams, stairs, retaining walls, footing, RC bridges, weirs, earth slopes, roads, interchanges and sections. AutoCAD Applications. ***Pre-req: MCHE 201***

CVLE 323-RC STRUCTURES I (3Crs: 3Lec)

Introduction, working stress and limit state methods of design. Sections subjected to: normal force, bending moment, and shear, eccentric force, torsion, bond development and anchorage, code requirements, detailing, applications: columns and beams. ***Pre-req: CVLE 213, MATH 381***

CVLE 324- RC STRUCTURES II (3Crs: 3Lec)

Serviceability limit state: deflection, cracking and exposure to fire resistance, floor systems: solid slabs, ribbed slabs, flat plate, and slabs, waffle slabs, and paneled beam floor slabs, design methods: Direct design method, and equivalent frame method, loads transmitted from floors to the supported beams, code requirements, detailing, and applications.

Pre-req: CVLE 323

CVLE 325-CONSTRUCTION MATERIALS II (3Crs: 2Lec & 2Lab)
Supplementary Cementitious Materials, Field investigation, Hot-weather concreting, Cold-weather concreting, Special types of concrete; High-strength concrete, Mass concrete, High performance concrete, Analysis of fresh concrete, Analysis of hard concrete, Concrete Durability, Concrete problems and defects,. Building Construction Materials (Blocks, Tiles, Reinforcing Bars,..), ***Pre-req: CVLE 222***.

CVLE 333-SOIL MECHANICS (3Crs: 2Lec & 2Lab)
Origin and nature of soil, clay minerals and soil structure, phase relationships, grain size analysis, consistency and soil classification. Soil Hydraulics: Principle of effective stresses, capillarity, permeability, pumping wells, 1-D and 2-D seepage, flow nets, filter design. Stress distribution, Mohr circles and pole method. Compressibility of soil, theory of consolidation. Failure criteria. Shear strength of soil slope stability, mass procedures and methods of slices. Laboratory testing and reports. ***Pre-req: CVLE 211 & CVLE 231***

CVLE 341-HYDRAULICS I (3Crs: 2Lec & 2Lab)
Properties of liquids. Hydrostatic, measurements of liquid pressures, buoyancy, principles of liquid kinematics and dynamics, continuity, energy, and momentum equations, application: steady flow, flow in pipes, velocity and discharge measurements, laminar and turbulent flow, head losses, pipe networks, emptying of tanks, laboratory experiments. ***Pre-req: PHYS282***

CVLE 342-HYDRAULICS II (3Crs: 2Lec & 2Lab)
Open channel hydraulics: Classification of open channel flow. Flow resistance equations, velocity distribution, boundary shear stress distribution and critical shear, design of channel cross-section, hydraulic jump, gradually varied flow, flow measurement, hydraulic models, pumps: function, types and performance curves. Main specifications of pumps, economical design of pumps and piping system, pumps in parallel and series, selection of pumps, installation, priming, and water hammer. Intake design. Laboratory experiments. ***Pre-req: CVLE 341***

CVLE 354-ENVIRONMENTAL ENGINEERING (2Crs:2Lec)
Saltwater intrusion: Ghyben-Herzberg interface, limiting conditions, hydrodynamic effects, control methods. Outdoor air pollution: meteorology effects, atmospheric dispersion, point-source Gaussian plume model. Solid waste management: landfill disposal and design, liners and cover systems, use of geosynthetics, vertical barriers, slope stability and settlement analyses. Groundwater pollution: contaminant transport, cone of depression, capture–zone curves, control of groundwater plumes, remediation techniques. Environmental impacts of highways and dams projects**.** ***Pre-req: CVLE208***

CVLE 371-STRUCTURAL MODELING (2Crs:1Lec & 2Lab)
Programming: routines of elements stiffness, overall matrix, bandwidth, solution of equations and calculation of elements internal forces, use of available packages (SAP 2000, STAAD, ROBOT, etc.) ***Pre-req: CVLE 213, COMP208***

CVLE 425-STEEL I (3Crs: 3Lec)
Introduction - Structural Framing Floor Systems - Stability & Bracing Systems - Tension Members - Compression Members - Bolted Truss Connections - Welded Truss Connections - Laterally Supported Beams - Lateral Torsion Buckling of Beams - Specifications & Detailing. ***Pre-req: CVLE 213***

CVLE 426-STEEL II (3Crs: 3Lec)
Beam-Column Members - Built-up Columns - Eccentrically Loaded Connections - Slip-Critical Bolts - Frame Connections - Axially and Eccentrically Loaded Column Bases - Built-up Plate Girders - Field Splices - Elastic Composite Construction - Specifications & Detailing. ***Pre-req: CVLE 425***

CVLE 427-BUILDING INFORMATION & MODELING (3Crs: 2Lec-2Lab)
BIM uses for Architecture, Engineering and Construction (AEC) industry, create 3D representations of structures on Autodesk Revit, explore spatial relationships between different components of the model, model building information, obtain bills of quantities (BOQ) and bar bending schedules (BBS), document projects and understand the value of the BIM process and what it offers. ***Pre-req. 324***

CVLE 432-FOUNDATION ENGINEERING (3Crs: 3Lec)
Soil investigation, sampling and in-situ testing. Shallow foundation: types, bearing capacity and settlement, design of isolated, combined and raft foundations. Groundwater control and dewatering. Deep foundations: bearing capacity and settlement / displacement of axially-and laterally-loaded piles, driving formulas, pile load tests, negative skin friction, pile groups; structural design of pile caps. Code requirements, computer applications***. Pre-req: CVLE 323 & CVLE 333***

CVLE 441-HYDROLOGY (2Crs: 2Lec)
The hydrologic cycle, precipitation, system flow, evaporation, transpiration, hydrograph analysis, estimating volume runoff, runoff from snow, reservoir engineering, and channel routing, groundwater: occurrence, aquifers, hydraulics of wells, surface and subsurface investigations of groundwater. Water harvesting, surface and ground water case studies. ***Pre-req: CVLE 342***

CVLE 453-SANITARY ENGINEERING (3Crs.:3Lec)
Sources of water supply, quality of water, water and diseases, water consumptions, collection works and water purification, chlorination and distribution systems, quantity of sewage, sewage systems, and appurtenances, and methods of sewage disposal, sewage treatment: necessity and methods. ***Pre-req: CVLE 354***

CVLE 463-TRANSPORTATION & TRAFFIC ENGINEERING (3Crs: 3Lec)
Introduction to urban transportation planning, travel behavior, transportation demand models, public transport planning, line capacity, headways, operation principles, traffic engineering principles, traffic control, traffic management, transportation infrastructure and facilities, transport and the environment, air pollution, traffic noise, energy consumption, evaluating alternative transportation plans: Technical, environmental, economic criteria. ***Pre-req: MATH281***

CVLE 464-HIGHWAY ENGINEERING (3Crs.:3Lec)
Elements of highway transportation planning, traffic engineering, geometric design of highways, highway planning, vertical and horizontal Alignment, transition curves, super-elevation, and intersections, highway materials: mineral aggregates and bituminous materials, structural design of rigid and flexible pavements: bituminous pavements, base courses, concrete pavements. ***Pre-req: CVLE 463 & CVLE 333***

CVLE 466-CONSTRUCTION PROJECT MANAGEMENT (3Crs.:3Lec)
Organization and administration: construction company and project, construction project identification and objectives, construction project's lifecycle, project delivery methods, cost estimating and bidding, staffing for construction, milestones' planning, and quality control. ***Pre-req: CVLE 323***

CVLE 467-CONSTRUCTION PLANNING & SCHEDULING (3Crs.:3Lec)
Principles of project planning, Gantt chart, networks (activity on arrows and activity on nodes), critical path method, precedence diagraming, schedule control, codes, collaborative planning, resource management (leveling and allocation), project control (earned value analysis), schedule reduction, PERT, line of balance scheduling, Primavera P6, and Microsoft Project. ***Pre-req: CVLE 466***

CVLE 500-RESEARCH METHODOLOGY (2Crs.:2Lec):
Steps for conducting a successful research: formulating a research problem, conceptualizing a research design, constructing an instrument for data collection, writing a research proposal, collecting data, processing & displaying data, writing a research report. ***Pre-req.: ENGL300.***

CVLE 501 FINAL YEAR PROJECT I (1Cr) / CVLE 502 FINAL YEAR PROJECT II (3Crs)
After completing 110 credits of course work, the student becomes eligible to sign up for the Final Year Project (FYP) that extends over two semesters; beginning in Fall-semester (***Pre-req.: ENGL300)*** and ending in the following Spring-semester (***Pre-req. CVLE500)***. The FYP experience requires students to work in teams to complete a specific project, submit a technical report, and give a presentation on a significant, relevant, and comprehensive engineering problem. The FYP is intended to stimulate student creativity and critical thinking, and build skills in formulating, designing, developing, building, communicating, and managing engineering projects. The project aims to provide students with a transitional experience from the academic world to the professional world. ***Pre-req.: INME221***

CVLE 499 INTERNSHIP (1Cr). This is a professional training which should not be less than four weeks. The

training is followed by a presentation session where the students are supposed to present what they have learned.

B. Civil Engineering Technical Electives

The CE curriculum includes three 3-credit hour courses as technical electives. The courses are chosen from the courses listed in the table below, with their descriptions given thereafter.

Course	Title	Credits	Pre-/Co-requisites
CVLE 482	Contracts, Quantities & Specifications	3	Pre: CVLE 324
CVLE 510	Non-Destructive Concrete Testing	3	Pre: CVLE 222
CVLE 511	Photogrammetry and Geodesy	3	Pre: CVLE 261
CVLE 512	Advanced Surveying	3	Pre: CVLE 261
CVLE 513	Computer Application for Surveying	3	Pre: CVLE 261
CVLE 514	Advanced Structural Analysis	3	Pre: CVLE 214
CVLE 515	Advanced Mechanics of Materials	3	Pre. CVLE 325
CVLE 516	Inelastic Analysis of Structure	3	Pre: CVLE 214
CVLE 517	Earthquake Engineering	3	Pre: CVLE 324 & CVLE 426
CVLE 518	Materials Technology	3	Pre: CVLE 222
CVLE 519	Concrete Technology	3	Pre: CVLE 222
CVLE 520	Structural Modeling of Buildings	3	Pre: CVLE 371
CVLE 521	Steel Bridges	3	Pre: CVLE 426
CVLE 522	Reinforced Concrete Bridges	3	Pre: CVLE 324
CVLE 523	Advanced Reinforced Concrete	3	Pre: CVLE 324
CVLE 524	Tall Building Structure	3	Pre: CVLE 324
CVLE 525	Pre-Stressed Concrete Structure	3	Pre: CVLE 323
CVLE 526	Design with Geosynthethics	3	Pre: CVLE 432
CVLE 527	Retaining Structures	3	Pre: CVLE 432
CVLE 528	Soil and Site Improvement	3	Pre: CVLE 333
CVLE 529	Feasibility Study and Marketing	3	Pre: CVLE 482
CVLE 530	Railway Engineering	3	Pre: CVLE 463
CVLE 531	Harbor Engineering	3	Pre: CVLE 333
CVLE 532	Road Traffic Safety	3	Pre. CVLE 463
CVLE 533	Pavement Analysis and Design	3	Pre. CVLE 464
CVLE 534	Advanced Highway Engineering	3	Pre: CVLE 464
CVLE 535	Airports Engineering	3	Pre: CVLE 464
CVLE 536	HMA for Highways and Airports	3	Pre. CVLE 464
CVLE 537	Irrigation and Drainage Engineering	3	Pre: CVLE 441
CVLE 538	Hydraulic Structures	3	Pre: CVLE 342
CVLE 539	Hydraulic and Hydrologic Modeling	3	Pre: CVLE 441
CVLE 540	Public Transport Systems	3	Pre. CVLE 463
CVLE 541	Water Treatment and Water Desalination	3	Pre. CVLE 453
CVLE 542	Water and Wastewater Treatment	3	Pre: CVLE 342 & CVLE 453
CVLE 543	Water and Wastewater NetworkS	3	Pre: CVLE 342
CVLE 546	Environmental Process Engineering	3	Pre: CVLE 354
CVLE 561	Building Construction and Safety	3	Pre. CVLE 211
CVLE 563	Engineering Statistics	3	Pre. MATH 381
CVLE 564	Quality Control in Concrete Construction	3	Pre. CVLE 222
CVLE 566	Introduction to Finite Elements	3	Pre. CVLE 214
CVLE 567	Advanced RC Structures	3	Pre. CVLE 324
CVLE 581	Mechanical Eng. for Civil Engineers	3	
CVLE 582	Electrical Eng. for Civil Engineers	3	
CVLE 586	Construction Business Management	3	Pre. CVLE 466
CVLE 587	Simulation of Construction Operations	3	Pre. CVLE 466
CVLE 588	Temporary Support Structures	3	Pre. CVLE 466
CVLE 591	Urban Infrastructure Management	3	Pre. CVLE 466
CVLE 593	Sustainable Concepts & Materials	3	Pre. CVLE 325
COMP 424	Artificial Intelligence & Robotics for Engs	3	Pre. COMP 208

B.1 Description of the CE Technical Elective Courses

B.1.1 Structural Eng. Sequence Courses

CVLE 510-NON-DESTRUCTIVE CONCRETE TESTING (3Crs.:3Lec)
Types, calibration and maintenance. Analysis of fresh concrete. Accelerated testing methods. Analysis of hardened concrete. Core drilling and testing. Partially destructive testing. Non-destructive testing. Load testing. Assessment of reinforcement condition. Standards, Specifications and Code of Practice of existing documents relevant to preceding items and discussion of their relevance. ***Pre-req: CVLE 222.***

CVLE 514-ADVANCED STRUCTURAL ANALYSIS (3Crs.:3Lec)
Force and Displacement Methods for analysis of indeterminate structures. Flexibility and Stiffness matrix method for analysis of indeterminate trusses, beams, and frames. Grid beams and structures on elastic supports. Influence lines of indeterminate structure utilizing concepts of virtual work and moment distribution methods – Qualitative and Quantitative approaches. ***Pre-req: CVLE 214.***

CIVE 515 - ADVANCED MECHANICS OF MATERIALS. (3Cr.: 3Lec).
Stresses and strain analysis, elaso-plastic analysis, buckling of columns, strain energy method, shear flow and shear center, impact loads, deflection of beams, fracture mechanics: crack initiation and propagation. Fatigue of metals. ***Pre-req: CVLE 325***

CVLE 516-INELASTIC ANALYSIS OF STRUCTURE (3Crs.:3Lec,)
Plastic analysis: concept of plastic analysis, plastic hinges, incremental load method (step by step), mechanism method, upper bound, lower bound, and uniqueness theorems, combined mechanisms, beams, multistory, multiply and gable frames, computer implementation. ***Pre-req: CVLE 214.***

CVLE 517-EARTHQUAKE ENGINEERING (3Crs.:3Lec,)
Earthquake causes and measures, earthquake faults and waves, plate tectonics, structural dynamics of single and multi-degree of freedom systems, dynamic response spectra, equivalent static lateral force method, lateral loads resistive systems, mitigation of earthquake forces. ***Pre-req: CVLE 324 & 426***

CVLE 518-MATERIALS TECHNOLOGY (3Crs.:3Lec,)
Theory of composites: Micro-composite and Macro–composite, Engineering applications of fibers, Design of Composite sections, Nonlinear analysis, Fracture Mechanics: crack initiation and propagation. ***Pre-req: CVLE 222.***

CVLE 519-CONCRETE TECHNOLOGY (3Crs.:3Lec,0Lab): Evaluation of Existing Structures, field investigation, hot-weather concreting, cold-weather concreting, special types of concrete; (High-strength concrete, Mass concrete, High performance concrete), analysis of fresh concrete, analysis of hard concrete, concrete structures defects, concrete epoxy injection, ready-mixed concrete. ***Pre-req: CVLE222***.

CVLE 520-STRUCTURAL MODELING OF BUILDINGS (3Crs.:3Lec,)
The course include the modeling technique for the numerical structural analysis of building with a review of the basic Structural systems in buildings, the loadings (Gravity, Lateral, temperature, settlement…..), the modeling of space truss structures, of building skeletons, of slabs and shear walls of walls and deep beams as pier and spandrel. ***Pre-req: CVLE 371.***

CVLE 521-STEEL BRIDGES (3Crs.:3Lec)
Types of Steel Bridges – Loads – Bracing Systems – Multi-Span Roadway & Railway Bridges – Composite Construction of Girder- Slab Bridges. Design of splices and bearings. Design of Truss Bridges and Arched Bridges. Specifications and Detailing. ***Pre-req: CVLE 426.***

CVLE 522-REINFORCED CONCRETE BRIDGES (3Crs.:3Lec,)
Introduction, types of bridges, and loads, slab type hollow-type bridges, box-type bridges, girder type bridges, bearing pads, code requirements, detailing applications. ***Pre-req: CVLE 324.***

CVLE 523-ADVANCED RC STRUCTURES (3Crs:3Lec)
Design of framed structures, hinges, corbels and brackets, beam ledges, and shear friction, slender columns, biaxial bending, reinforced concrete stairs, water tightness, applications: ground, underground and elevated tanks, deep beams, circular beams, code requirements. Detailing. ***Pre-req: CVLE 324***

CVLE 524-TALL BUILDING STRUCTURE (3Crs.:3Lec,)
Introduction, types of structural resisting systems, structural walls, cantilever columns, rigid frames, dual systems, code requirements, detailing. ***Pre-req: CVLE 324.***

CVLE 525-PRE-STRESSED CONCRETE STRUCTURE (3Crs.:3Lec,)
Definitions, methods of prestressing, materials and their properties, losses of prestress, elastic behavior and stress distribution under different load stages, analysis and design of homogeneous sections, care of simply supported members. ***Pre-req: CVLE 323.***

CVLE 561-BUILDING CONSTRUCTION AND SAFETY (3Crs.:3Lec)
Building process and frameworks, foundation, concrete, masonry, and metals. Roof types and decks. Thermal, aqoustical, and moisture protection. Doors and windows. Finishes. Construction safety, engineering principles to control hazards, maintaining optimally safe systems, applications of engineering principles to process safety and hazards analysis, mitigation, and prevention. ***Pre-req. CVLE 211***

CVLE 564-QUALITY CONTROL IN CONCRETE CONSTRUCTION (3Crs.:3Lec)
Guides for Quality Management System, Quality Assurance, Quality Control Procedure, Evaluation of Strength, Inspection of Ready Mix Plant, Standard Specifications for Ready Mix Plant, Site Investigation, Assessment of Existing Structures. ***Pre. CVLE 222***

CVLE 566 INTRODUCTION TO FINITE ELEMENTS: (3Crs.:3Lec)
Review of matrix Algebra, 1-dimensional elements, basic elements: interpolation and shape function formulation techniques: variational methods, Galerkin and weighted residual methods, isoparametric elements, numerical integration, finite element in structure dynamics, use of FE software. ***Pre-req. CVLE 214***

CVLE 567 Advanced RC Structures (3Crs.:3Lec,0Lab)
Design of framed structures, hinges, corbels and brackets, beam ledges, and shear friction, slender columns, biaxial bending, reinforced concrete stairs, water tightness, applications: ground, underground and elevated tanks, deep beams, circular beams, code requirements. Detailing. ***Pre-req: CVLE 324.***

CVLE 592 SUSTAINABLE CONCEPTS & MATERIALS, (3Cr.: 3Lec)
Sustainability concepts and practices. Development of a sustainable built environment. Sustainable design practice, sustainability metrics, life-cycle analysis and the implications of the use of energy, water and other natural resource use in civil engineering projects. Green building that include energy, water, sustainable sites, materials and resources, and indoor environmental quality.
Prerequisite: ***Pre-req: CVLE 325.***

B.1.2 **Geotechnical Eng. Sequence Courses**

CVLE 526-DESIGN WITH GEOSYNTHETICS (3Crs.:3Lec,)
Overview on geosynthetic products: geotextiles, geogrids, geonets, geomembranes and geocomposites; physical, mechanical, hydraulic and environmental properties. Functions: separation, reinforcement, filtration, and drainage. Applications: unpaved and paved roads, reinforced-earth walls, embankments, foundations, slope stabilization, drainage behind retaining walls, erosion control, landfill liners and caps, earth dams, and wick drains. Construction methods, techniques, and specifications. Computer applications. ***Pre-req: CVLE 432.***

CVLE 527-RETAINING STRUCTURES (3Crs.:3Lec)
Lateral earth pressures: at rest, active and passive states, limit equilibrium methods and theory of elasticity, seismic conditions, hydrostatic and seepage pressures. Retaining walls: design of gravity, cantilever, and basement walls. Sheet-piles: cantilever and anchored bulkheads, free- and fixed-earth support methods, moment reduction, anchorage design. Braced cuts: pressure envelopes, design of sheeting, wale beams and struts, stability against bottom heave or piping. Shoring systems: types, control of groundwater, construction stages, anchors prestressing and testing, ground settlement around excavations. Code requirements, computer applications. ***Pre-req: CVLE 432.***

CVLE 528-SOIL AND SITE IMPROVEMENT (3Crs.:3Lec)
Mechanical methods: compaction theory, properties of compacted soils, laboratory tests, field equipment, compaction specifications and control, dynamic compaction, vibroflotation, blasting techniques. Hydraulic methods: theory of wells, dewatering systems, drainage of slopes, preloading and use of vertical sand/wick drains. Physical and chemical methods: granular admixtures, Portland cement, lime, calcium chloride, fly ash, bitumen, grouting materials and techniques. Inclusion methods: reinforced earth with steel strips or geosynthetics, soil nails and rock bolts. Laboratory and computer applications. ***Pre-req: CVLE 333.***

B.1.3 Environmental Eng. & Water Resources Sequence Courses

CVLE 537-IRRIGATION AND DRAINAGE ENGINEERING (3Crs.:3Lec)
Irrigation: planning and design of canals networks, field irrigations, sprinkler irrigation system, drip irrigation system, drainage: importance of drainage, open drainage design and planning, tile drainage design and planning, canal lining design. ***Pre-req: CVLE 441.***

CVLE 538-HYDRAULIC STRUCTURES (3Crs.:3Lec.)
Hydraulic and structural design of drainage structures, design of dams, environmental considerations, design of pumping stations, design of control structures, design of drop structures, applications. ***Pre-req: CVLE 342***

CVLE 539-HYDRAULIC AND HYDROLOGIC MODELING (3Crs.:3Lec,)
Hydraulic modeling: Physical modeling, numerical modeling, hydrologic modeling, application of deterministic and probabilistic concept to simulate and analyze hydrologic systems; discussion of the theory and application of linear and non-linear, lumped, and distributed systems techniques in modeling the various phases of the hydrologic cycle. ***Pre-req: CVLE 441.***

CVLE 541-WATER TREATMENT AND WATER DESALINATION, (3Crs.:3Lec)
Physical, chemical and biological water quality parameters determinations and standards; water treatment units: screens; sedimentation, coagulation/flocculation processes, filtration, and disinfection. This course will also survey the commonly used thermal and membrane based desalination technologies. Environmental, sustainability and economic factors which may influence the performance, affordability and more wide-spread use of desalination systems for fresh water production and reuse will be highlighted. ***Pre-req. CVLE 453***

CVLE 542-WATER AND WASTE WATER TREATEMENT (3Crs. :3Lec,)
Water networks quality of raw water, intakes, pumping raw water to treatment plant, plain and chemical sedimentation, filtration, disinfection, ground tank, characteristics of wastewater, aerobic and anaerobic processes-preliminary, primary and tertiary treatment-biological filtration, activated sludge-oxidation ditches, stabilization ponds-aerated, lagoons-sludge treatment and Re-use. ***Pre-req: CVLE 342 and CVLE 453.***

CVLE 543-WATER AND WASTE WATER NETWORKS (3Crs.:3Lec,)
Storage of water, ground and elevated storage, equalization between consumption rates and storage, high lift pumps, distribution network (pipe lines, valves, connections, and hydrants), construction and maintenance of collection works.(Domestic, storm, industrial and filtration wastewater), design of collection gravity systems, sewer appurtenances, safety of maintenance of collection works, pumping wastewater to treatment and recycle locations. ***Pre-req: CVLE 342***

CVLE 546-ENVIRONMENTAL PROCESS ENGINEERING (3Crs.:3Lec)
An introduction to analysis, characterization, and modeling of environmental, physical, chemical, and biological processes and reactor configurations commonly used for water quality control; applications to the development and design of specific water and wastewater treatment operations; discussion of economic and legislative constraints and requirements. ***Pre-req: CVLE 354***

CVLE 591- Urban Infrastructure Management (3Crs.:3Lec)
Basics of the management of urban infrastructures: Socioeconomic, demographic, technological, environmental, and financial challenges and reflection on infrastructure services and management practices. Various infrastructure management concepts and application in the context of urban energy, urban transportation, water and wastewater infrastructure, solid wastes infrastructure, and communication infrastructure. Environmental characteristics of infrastructure: Efficiency, sustainability, and resilience. ***Pre-req: CVLE 466***

B.1.4 Transportation Eng. Sequence Courses

CVLE 511-PHOTOGRAMMETRY AND GEODESY (3Crs.:3Lec,)
Principles of photography, types of photographs, aerial cameras, vertical photographs: scale, ground coordinates, relief displacement, project planning: end and side lap-flying height, ground coverage, and flight map-stereoscopic viewing, figure of the earth, geodetic coordinates system, theory of errors, methods of least squares, triangulation network, trilateration network, types of conditions, adjustment network. ***Pre-req: CVLE 261.***

CVLE 512-ADVANCED SURVEYING (3Crs.:3Lec,)
Astronomical observations for geodesy, Surveying by total station. Positioning by intersection and resection: with angles and with distances. Trilateration system. Adjustment of trilateration network. Adjustment by variation of coordinates. The use of laser beam in surveying. Global positioning system GPS. ***Pre-req: CVLE 261.***

CVLE 513-COMPUTER APPLICATION FOR SURVEYING (3Crs.:3Lec)
Route surveying and geometric design, topographic site surveys and mapping, civil engineering and construction surveys, layout of industrial plants, building, pipelines and manufacturing machinery, horizontal curves ,circular curve layout by different methods, special circular curve problems, compound and reverse curves, vertical curves. General software for surveying: CivilCad, SURFER, SDR, software for GPS surveying. ***Pre-req: CVLE 261.***

CVLE 530-RAILWAY ENGINEERING (3Crs.:3Lec,)
Train dynamics (Tractive Effort, Train Resistances, Ruling Gradient, Acceleration and Deceleration, Braking and Stopping distances), Design of Railway tracks (Subgrade, Ballast Section, Sleepers, Rails, fastenings and rail joints, Stresses in Track Components), Track alignment (Cant - Transition Curves - Longitudinal and Cross sections, Track junctions (turnouts- crossings- crossover- double cross over- slips, planning dimensions of track junctions), Stations (passenger stations- freight stations- planning of marshalling yards- locomotive and wagons yards), Control of Train Movement and Signaling (types of Signaling systems- Mechanical and Electrical signaling systems- automatic block sections- green wave). ***Pre-req: CVLE 463.***

CVLE 531-HARBOR ENGINEERING (3Crs.:3Lec,)
Theory of Waves, wave refraction and diffraction, wave forces on vertical walls, Port Planning, water and land areas, breakwaters, temporary and fixed breakwaters, submerged and ruble mound breakwaters, wall breakwaters composite breakwaters, gravity quay walls, plain concrete blocks Quay walls, cantilever and anchored sheet piles, Marine platforms supported by group piles**. *Pre-req: CVLE 333.***

CVLE 532- ROAD TRAFFIC SAFETY (3Crs.:3Lec,)
The course is intended to introduce topics in traffic safety. Included will be information on how to understand and utilize crash data, safety analysis methods described in the Highway Safety Manual, statistical methods in safety analysis, human factors and crash causality, and an overview of other emerging safety issues and resources. ***Pre-req: CVLE 463.***

CVLE 533- PAVEMENT ANALYSIS AND DESIGN : (3Crs.:3Lec0)
The course introduces the concepts of analysis, behavior, performance, and structural design of flexible and rigid pavements for highways and airports. It covers pavement performance, stress in pavements, pavement behavior under moving loads, traffic loading analysis, types of materials used in pavement layers, climatic factors, drainage, and an introduction to pavement management concepts. The course covers both empirical and mechanistic-empirical design methodologies. ***Pre-req: CVLE 464.***

CVLE 534-ADVANCED HIGHWAY ENGINEERING (3Crs.:3Lec,0Lab): Highway and Airports pavement design (flexible and rigid pavements), Stress Analysis in flexible and rigid pavements, pavement response under traffic load, failure of flexible and rigid pavements, highways pavement maintenance and rehabilitation (methods, programs, management), types and design, Hot mix Asphalt Concrete: Materials, Design Methods and Testing. ***Pre-req: CVLE 464.***

CVLE 535-AIRPORTS ENGINEERING (3Crs.:3Lec,)
Principles of Airport Planning, Components of Airports (airside, landside), Aircraft characteristics, Airport operations, Airport System planning, Site selection, Land use, Airport terminal area and airport access, Airport Capacity and delays, Airport geometric design (Runways, Taxiways, Aprons), Safety Surfaces (Obstacle limitation surfaces: approach, take-off, transition, conical, horizontal), Airport pavement (types, design, construction). ***Pre-req: CVLE 464.***

CVLE 536- HMA FOR HIGHWAYS AND AIRPORTS (3Crs.:3Lec,)
The course covers the origin, production, specifications, properties, and characterization of various material constituents incorporated in the construction of highway and parking pavements. It covers the practices and techniques used in evaluation of asphalt binders, aggregates, and mixtures with emphasis on different approaches for asphalt mix designs. Quality control, material production, and construction technologies will be described.. ***Pre-req: CVLE 464.***

CVLE 540- PUBLIC TRANSPORT SYSTEMS: (3Crs.:3Lec,)
Evolution and role of urban public transportation modes, systems and services. Technical characteristics and their impacts on capacity, service quality, and cost. Current practice and new methods for data collection and analysis. Performance evaluation, route and network design, frequency determination. Effects of pricing policy and service quality on ridership, methods for estimating costs associated with proposed service changes, organizational models for delivering public transportation service including finance and operations, fare policy and technology, operations management. ***Pre-req: CVLE 463.***

CVLE 563- ENGINEERING STATISTICS: (3Crs.:3Lec,)
Role of statistics in engineering with the fundamental ideas and techniques of statistical analysis and regression in reference to decision taking in engineering applications. Methodology required for efficiently plan, conduct, present, analyze, and interpret the results from experimental and observational studies. Tools required for dealing with the uncertainties present in making interferences and decisions based on sample data. The covered topics descriptive statistics, distributions, hypothesis testing, regression models, and non-parametric tests. **. *Pre-req: MATH 381.***

B.1.5 Construction Management Sequence Courses

CVLE 482- CONTRACTS, QUANTITIES & SPECIFICATIONS (3Crs.:3Lec)
Structure of the construction documents and their inter-relationships, building requirements, general and particular contract conditions. Areas and methods of measurements used in engineering projects. Quality measurements and schedules, specifications of contracts. Cost analysis and estimation. ***Pre-req: CVLE 324.***

CVLE 529- FEASIBILITY STUDY AND MARKETING (3Crs.:3Lec)
Economics: cost nature and concepts, cost definition, material, labor cost, factory overhead, direct cost, indirect cost, variable cost, fixed cost, semi-variable semi-fixed cost, differential and increment cost, and opportunity cost, cost measurement and equations, cost reports, profits, consumption, risk, financial institutions, long-term contract, Labor's law, Insurance. ***Pre-req: CVLE 482.***

CVLE 586- CONSTRUCTION BUSINESS MANAGEMENT (3Crs.:3Lec)
Theoretical principles and practical skills required to manage a firm operating in the construction industry, including financial management, accounting systems and transactions, depreciation, costs and profits management, and cash flows management. ***Pre-req: CVLE 466.***

CVLE 587- SIMULATION OF CONSTRUCTION OPERATIONS (3Crs.:3Lec)
Planning of construction operations, design of efficient processes, construction supply chain management, simulation paradigms: discrete-event simulation, agent-based modeling and system dynamics, simulation of construction operations. ***Pre-req: CVLE 466.***

CVLE 588- TEMPORARY SUPPORT STRUCTURES (3Crs.:3Lec)
Design and construction of temporary support structures used in the construction industry, including concrete formwork, scaffolding, jumping formwork, cofferdams, and caissons. ***Pre-req: CVLE 466.***

B.1.6 Other Engineering Courses

CVLE 581 MECHANICAL ENG. FOR CIVIL ENGINEERS, (3Cr.: 3Lec).
Water supply for buildings (rise and pumping system), heat losses and thermal insulation, ventilation, sound insulation.., and air conditioning. Lifts and escalators. Soil and waste systems for buildings (sump-pump).

CVLE 582 ELECTRICAL ENG. FOR CIVIL ENGINEERS, (3Cr.: 3Lec)
Direct-current circuits. Alternating current circuits. Wiring specifications. Building connection diagrams. Switching boards. Protective devices. Motors: types, use, connections, power, and energy calculations. Power factor improvement and electrical consumption Cables: types and selections.

COMP 424 ARTIFICIAL INTELLIGENCE AND ROBOTICS FOR ENGINEERS (3 Cr.: 3 Lec) Introduction to artificial intelligence and machine learning. Introduction to robotics. Programming in Python: data type, expressions, functions, loops and control. Data plotting and analysis. Smart agent models. Supervised and unsupervised learning. Knowledge representation and reasoning. ***Pre-req: COMP 208.***

C. Internship (Approved Experience/ Independent Study)
This is a professional training which should not be less than four weeks. The training is followed by a presentation session where the students are supposed to present what they have learned. *(Refer to the department policy for further details)***.**

D. Final Year Project
After completing 110 credits of course work, the student becomes eligible to sign up for the Final Year Project (FYP) that extends over two semesters. The FYP experience requires students to work in teams to complete a specific project, submit a technical report, and give a presentation on a significant, relevant, and comprehensive engineering problem. The FYP is intended to stimulate student creativity and critical thinking, and build skills in formulating, designing, developing, building, communicating, and managing engineering projects. The project aims to provide students with a transitional experience from the academic world to the professional world. (*Refer to the Final Year Project Policy for more details).*

III. Four Years Study Plan (150 Credits)

First Semester (18 Credits)		Crs.	Pre/Co-requisites
CVLE 210	Statics	3	
MATH 281	Linear Algebra	3	Pre: MATH112
PHYS 282	Material Properties and Heat	3	
MCHE 201	Engineering Drawing and Graphics	3	
CHEM 241	Principles of Chemistry	3	Pre: CHEM110
ENGR 002	Introduction to Engineering	2	
BLAW 001	Human Rights	1	

Second Semester (18 Credits)		Crs.	Pre/Co-requisites
CVLE 211	Mechanics of Materials	3	Pre: CVLE 210
CVLE 260	Engineering Surveying I	2	Pre : MATH281
CVLE 270	Civil Engineering Drawing and Detailing	2	Pre: MCHE 201
CVLE 208	Environmental Biology	2	
MATH 282	Calculus	3	Pre:MATH111
PHYS 281	Electricity and Magnetism	3	Pre:PHYS120
COMP 208	Programming I	3	

Summer I (8 Credits)		Crs.	Pre/Co-requisites
ENGL 001	English Language	2	Pre: Int Eng 4
ARAB 001	Arabic Language	2	
GENE xxx	General Electives	4	

Third Semester (18 Credits)		Crs.	Pre/Co-requisites
CVLE 213	Structures I	3	Pre: CVLE 211
CVLE 231	Engineering Geology	2	
CVLE 261	Engineering Surveying II	2	Pre: CVLE 260
CVLE 341	Hydraulics I	3	Pre: PHYS282
MATH 381	Probability and Statistics	3	Pre: MATH 282
MATH 283	Differential Equations	3	Pre: MATH 281 & MATH 282
ENGL 211	Advanced Writing	2	Pre: ENGL 001

Fourth Semester (17 Credits)		Crs.	Pre/Co-requisites
CVLE 214	Structures II	3	Pre: CVLE 213
CVLE 222	Construction Materials I	3	Pre: CVLE 211& CHEM 241
CVLE 342	Hydraulics II	3	Pre: CVLE 341
INME 221	Engineering Economy	3	
MATH 284	Numerical Analysis	3	Pre: MATH 283
ENGL 300	Speech Communications	2	Pre: ENGL 211

Summer II (6 Credits)		Crs.	Pre/Co-requisites
MGMT 002	Entrepreneurship I	2	
GENE xxx	General Electives	4	

Fifth Semester (17 Credits)		Crs.	Pre/Co-requisites
CVLE 325	Construction Materials II	3	Pre: CVLE 222

CVLE 323	RC Structures I	3	Pre: CVLE 213,MATH381
CVLE 333	Soil Mechanics	3	Pre: CVLE 211 & CVLE 231
CVLE 425	Steel I	3	Pre: CVLE 213
CVLE 463	Transportation & Traffic Engineering	3	Pre: MATH281
CVLE 441	Hydrology	2	Pre: CVLE 342

Sixth Semester (18 Credits)		**Crs.**	**Pre/Co-requisites**
CVLE 324	RC Structures II	3	Pre: CVLE 323
CVLE 426	Steel II	3	Pre: CVLE 425
CVLE 464	Highway Engineering	3	Pre: CVLE 463 & CVLE 333
CVLE 466	Construction Project Management	3	Pre: CVLE 323
CVLE 500	Research Methodology	2	Pre: ENGL 300
CVLE 354	Environmental Engineering	2	Pre: CVLE 208
CVLE 371	Structural Modeling	2	Pre: CVLE 213 , COMP208

Summer III (1 Credit)		**Crs.**	**Pre/Co-requisites**
CVLE 499	Internship (Approved Experience / Independent Study)	1	

Seventh Semester (14 Credits)		**Crs.**	**Pre/Co-requisites**
CVLE 501	Final Year Project I	1	Pre: ENGL 300
CVLE 427	Building Information & Modeling	3	Pre: CVLE 324
ENGR 001	Engineering Ethics	1	(Completed 90 crds)
CVLE xxx	Technical Electives	3	
CVLE 467	Construction Planning & Scheduling	3	Pre: CVLE 466
CVLE 453	Sanitary Engineering	3	Pre: CVLE 354

Eighth Semester (15 Credits)		**Crs.**	**Pre/Co-requisites**
CVLE 502	Final Year Project II	3	Pre: CVLE 500 & CVLE 501
CVLE 432	Foundation Engineering	3	Pre: CVLE 323 & CVLE 333
CVLE xxx	Technical Electives	9	

[1] Selected from any Engineering program offered courses (as per restriction indicated in footnote (3) below).
[2] Must have completed 110 Credits including ENGL 300 in order to take a department technical elective or Final Year Project.

IV. Courses Offered to Other Majors

The Civil & Environmental Engineering Department offers four courses for other engineering majors. These courses are described below.

CVLE 201 - THEORY OF STRUCTURES FOR ARCHITECTS (2Crs.:1Lec,2Lab):
Theory and concepts of structures to emphasize an intuitive comprehension of the fundamental principles of structural behavior including loading, shear and bending moments. Calculation of internal forces in simple structures such as cantilevers, simples beams, and overhanging beams. Calculation of internal forces in truss members.

CVLE 202 - SURVEYING FOR ARCHITECTS (2Crs.:1Lec,2Lab):
Technology discussion of the major topics in surveying engineering technology including field instrumentation, boundary surveying, topographic surveying. Measurement of distances, directions and angles, using the tape, level, compass, transit and theodlit. Computation of areas and traverses, lines and grades. Introduction to construction surveys, and an introduction to GPS measurement.

CVLE 301 - CONCRETE AND STEEL STRUCTURES (2Crs.:1Lec,2Lab):
Combined course addressing two technical fields:

- Review of concrete and steel structure systems. Reinforced concrete fundamentals, reviewing basics of reinforced concrete behavior and introducing methods of design used in current engineering practice. Basic mechanics of structural concrete introduced in examining bending, shear, and axial forces. Topic areas including beams, slab systems, columns, foundations, retaining walls, and an introduction to pre-stressed concrete.
- Review of statics and strengths of materials, review of tension, compression and bending steel members. Design of trusses, columns, and beams structural elements.

CVLE 303 - SOIL MECHANICS & FOUNDATIONS, AND TESTING & PROPERTIES OF MATERIALS (2Crs.:1Lec,2Lab):
Combined course addressing two technical fields:

- Introduction to soil mechanics: Soil formation and soil structure; soil composition; grain size analysis; plasticity of soils; effective stress concept; shear strength, stress distribution; bearing capacity of shallow foundation; theory of consolidation; settlement; soil exploration. Foundations: shallow, deep foundations, and pile caps.
- Introduction to testing and properties of materials: strength characteristics of building materials and material assemblies; stresses and strains; rigidity and deformation; temperature effects; torsion effects; combined loading of elements and systems.