DEPARTMENT OF CIVIL ENGINEERING
BACHELOR OF ENGINEERING (BE) DEGREE

First year
Semester 1

Course Code	Course Title	Credit
CIVE 201	Statics	3
CSIS 206	Principles of Programming	3
ENGL 203	English Comm. Skills III	3
MATH 200	Calculus I	3
MATH 211	Linear Algebra	3
Elective 1		3

Total		18

First year
Semester 2

Course Code	Course Title	Credit
CIVE 202	Mechanics of Materials	3
CIVE 203	Engineering Drawing I	1
ENGL 2xx	English Elective	3
CIVE 290	Introduction to the Engineering Design Process	1
MATH 202	Calculus II	3
MATH 270	Differential Equations	3
Elective 2		3

Total		17

Second year
Semester 3

Course Code	Course Title	Credit
CIVE 204	Construction Materials and Methods	3
CIVE 205	Theory of Structures I	3
CIVE 206	Engineering Drawing II	1
CIVE 310	Building Laws	2
CSPR 201	The Formation of Civilization	3
MATH 246	Probability For Engineers	3
MATH 230	Numerical Analysis	3

Total		18

Second year
Semester 4

Course Code	Course Title	Credit
CIVE 208	Surveying	2
CIVE 209	Reinforced Concrete I	3
CIVE 210	Strength of Materials Laboratory	1
CIVE 214	Surveying Laboratory	1

CIVE 243	Fluid Mechanics Laboratory	1
CIVE 301	Soil Mechanics	3
CSPR 202	The Religious Experience: The Sacred	3
MECH 243	Fluid Mechanics	3
LISP 200	Library Use and Research Methods	1

Total		18

Third year

Semester 5

Course Code	**Course Title**	**Credit**
CIVE 303	Computer Aided Design	1
CIVE 304	Reinforced Concrete II	3
CIVE 306	Soil Mechanics Laboratory	1
CIVE 309	Engineering Economy	3
CIVE 312	Construction Management Fundamentals	2
CIVE 316	Construction Management Modeling	1
CIVE 324	Structural Steel Design	3
CIVE 389	Senior Design I	2
CSPR 203	Introduction to Modernity	3

Total		19

Third year

Semester 6

Course Code	**Course Title**	**Credit**
CIVE 307	Shallow Foundation Analysis and Design	3
CIVE 308	Transportation Engineering	3
CIVE 390	Senior Design II	2
Elective Lab 1		1
Elective 3		2
Elective 4		2
Elective 5		2
Elective 6		3

Total		18

Fourth year

Semester 7

Course Code	**Course Title**	**Credit**
CIVE 401	Theory of Structures II	3
CIVE 403	Deep Foundations	3
CIVE 404	Hydraulics	3
Elective 7		3

Total		12

Fourth year

Semester 8

Course Code	Course Title	Credit
CIVE 405	Prestressed Concrete	3
GENG 400	Engineering Seminars	1
GENG 402	Project Management	3
GENG 490	Graduation Project	3
Elective 8		3

Total		13

Fifth year

Semester 9 (Summer)

Course Code	Course Title	Credit
GENG 480	Field Training	3

Total		3

Fifth year

Semester 10

Course Code	Course Title	Credit
CIVE 503	Highway Design	3
GENG 490	Graduation Project (Re-activation)	0
CIVE 318	Environmental Engineering Modeling	1
Elective 9		3
Elective 10		3

Total		10

Total credits **146**

Elective 1: One Course from the Following List (or any 3-credit course in Basic Science approved by the Department):

Course Code	Course Title	Credit
BIOL 207	General Ecology	3

Elective 2: One Course from the Following List:

Course Code	Course Title	Credit
CHEM 202	Basic Chemistry	3
MECH 221	Engineering Dynamics	3

Electives 3, 4 and 5: Three courses from the Following List (or any 2-credit course approved by the Department):

Course Code	Course Title	Credit
CIVE 319	Revit for Civil Engineers	2
CIVE 320	Structural Detailing	2
CIVE 321	Advanced Computer-Aided Design	2
CIVE 322	Technical Platform Computing for Civil Engineering	2

CIVE 323	Introduction to Geographic Information System	2

Electives 6: One Course from the Following List:

Course Code	**Course Title**	**Credit**
CIVE 305	HVAC	3
CIVE 311	Sanitary Engineering	3

Elective 7: One Course from the Following List:

Course Code	**Course Title**	**Credit**
CIVE 428	Construction Safety Management	3
CIVE 555	Special Topics in Civil Engineering	3

Elective 8: One Course from the Following List:

Course Code	**Course Title**	**Credit**
CIVE 411	Introduction to Earthquake Engineering and Seismology	3
CIVE 443	Seismic Design of Reinforce Concrete Buildings	3

Elective 9: One Course from the Following List:

Course Code	**Course Title**	**Credit**
CIVE 520	Principles of Environmental Engineering	3
ENVE 401	Water Resources Engineering	3

Elective 10: (any 3-credit courses approved by the Department)

Elective Labs 1, 2, 3 and 4: One Lab from the Following List (or any 1-credit Lab approved by the Department):

Course Code	**Course Title**	**Credit**
CIVE 313	Transportation Engineering Modeling	1
CIVE 315	Geotechnical Engineering Modeling	1
MECH 233	Workshop Technology	1
PHYS 214	Fundamentals of Physics II Lab	1

COURSE DESCRIPTION

CIVE 201 STATICS 3.0: 3 cr. E
Concept of forces, moments, and other vector quantities; analysis of force systems; conditions of equilibrium; analysis of simple structures; friction; centroids and moments of inertia; shear and bending moment diagrams.

CIVE 202 MECHANICS OF MATERIALS 3.0: 3 cr. E
Fundamental stress and strain relationships, axial stress, safety factors, statically indeterminate axially loaded members, torsion, bending and shear stresses in beams, transformation of stress, combined stresses, deflections in beams, and analysis of columns.
Pre-requisite: CIVE 201

CIVE 203 DRAWING I 0.3: 1 cr. E
Concepts and practices in lettering, geometric construction, 2D multi-view and auxiliary projections, sections and connections, dimensioning, sketching wall sections, and perform architectural design. Emphasis on freehand sketching skills and learning AutoCAD (2D) basic drawing tools.

CIVE 204 CONSTRUCTION MATERIALS and METHODS 3.0: 3 cr. E
Physical and mechanical properties of construction materials; P/C concrete, asphalt, wood, ferrous metals, non-ferrous metals; proportioning of concrete mixes including admixtures with laboratory demonstrations. Finishing materials and methods.
Pre-Requisite: CIVE 202

CIVE 205 THEORY OF STRUCTURES I 3.0: 3 cr. E
Stress resultants (reactions, axial forces, shear forces, and bending moments) for beams and framed structures. Deflections of beams and frames by geometric methods (moment-area theorems and applications; conjugate beam analogy), and energy methods (virtual work method, Castigliano's theorems). Influence lines functions and their applications. Criteria for moving loads. Analysis of statically indeterminate beams and frames by force methods (consistent deformations) and displacement methods (slope deflection and moment distribution). Structural analysis with software application.
Pre-Requisite: CIVE 202

CIVE 206 DRAWING II (AutoCad) 0.3: 1 cr. E
The course aims at preparing the future civil engineer to meet the growing needs of the local specifications, and to be able to understand and create architectural drawings of residential buildings. Learning this course is based on the ability of using CAD packages (Auto CAD). The course seeks to develop the student effective utilization of computer aided drafting (CAD) skills, using AutoCAD to quickly create professional-quality 3D models.
Pre-Requisite: CIVE 203

CIVE 208 SURVEYING 3.0: 2 cr. E
The course consists of measuring and determining boundaries, areas, and location through traversing techniques. In addition, it includes providing the types of surveying, the methods of traversing and adjustment of errors, mathematical and physical concepts, coordinate systems, leveling, contour lines, mapping, horizontal and vertical curves.

Pre-Requisite: MATH 200

CIVE 209 REINFORCED CONCRETE I 3.0: 3 cr. E
Fundamentals of reinforced concrete behavior, analysis and design of rectangular beams, T- beams and one-way slabs including flexural and shear behavior, development and anchorage of reinforcement, deflections and crack control. Analysis and design of short reinforced concrete columns.
Pre-Requisite: CIVE 205

CIVE 210 STRENGTH OF MATERIALS LABORATORY 0.3: 1 cr. E
This course is designed to provide students with the basic properties, testing and inspection of common civil engineering materials that include mineral aggregates, cement, concrete, steel reinforcement and asphalt. Students will experience the way concrete is designed, mixed, compacted and tested according to international standards, and will gain a comparative knowledge of material properties and possible applications in construction. Written reports and oral presentation of experimental results are required.
Pre-Requisite: CIVE 204
Co-Requisite: CIVE 209

CIVE 214 SURVEYING LABORATORY 0.3:1 cr. E
Field application of concepts learned in class (CIVE 208) including basic measuring procedures for distances, elevations, angles, bearings, azimuth; theory of measurements and errors, mapping, construction and topographic surveys, traverses, adjustment and closure, area and volume computations.
Co-requisite(s): CIVE 206, CIVE 208

CIVE 243 FLUID MECHANICS LABORATORY 0.3: 1 cr. E
Laboratory applications in fluid mechanics including fluid measurements and properties; flow in pipes; Reynolds number; rainfall hydrograph; forces on gates; orifices; weirs; open channel flow; and pumps.
Co-requisite: MECH 243

CIVE 290 INTRODUCTION TO THE ENGINEERING DESIGN PROCESS 0.3: 1 cr. E
This course serves as a general introduction to the engineering profession, its main objectives and concerns. It focuses on the engineering design process, its phases, challenges and constraints. Additionally, students are exposed to the qualities and attributes of a modern day engineer as expected by professional engineering societies, including integrity, professionalism, ethical commitment, environmental requirements, and leadership, as well as the role of the engineer in society. This course aims at setting students on the way to future design and professional work.

CIVE 301 SOIL MECHANICS 3.0: 3 cr. E
Origin of soil and grain size, weight volume relationships and soil plasticity, engineering classification of soil, permeability and seepage, effective pressure concept, shear strength of soil, stress in a soil mass, soil consolidation settlement, lateral earth pressure (Retaining wall).
Co-requisite: CIVE 209

CIVE 303 COMPUTER-AIDED DESIGN 0.3: 1 cr. E
Application of computers to analyzing common structures. Use of standard industry software packages (ETABS and SAFE) for analyzing two dimensional and three dimensional structures including trusses, moment resisting frames, and shear walls against gravity. Introduction of Local and Global Coordinates Systems, the importance of the proper connectivity among elements as well as the definition of the

Cardinal points and the insertion points. Modeling of one-way and two-way slabs using different slabs types.
Export of Structure Reactions from ETABS to SAFE and modeling of foundations.
Co-requisite: CIVE 304

CIVE 304 REINFORCED CONCRETE II 3.0: 3 cr. E
Analysis and design of reinforced concrete structures and components: short columns subject to axial loads as well as axial load with uniaxial and biaxial bending, slender columns, beams subject to torsion, and two-way slabs (flat slabs and slabs with beams). Design according to the most recent edition of ACI-318M Code.
Pre-requisite: CIVE 209

CIVE 305 HEATING, VENTILATING and AIR CONDITIONING (HVAC) 3.0: 3 cr. E
Environmental comfort parameters. Heat transfer in building sections. Estimating heating, cooling and ventilation loads and the choice of appropriate systems. Design and layout of distribution ducts, pipes and outlets.

CIVE 306 SOIL MECHANICS LABORATORY 0.3: 1 cr. E
In this course, students will perform several field and laboratory test methods that are commonly used to determine the mechanical properties of soils. These properties are crucial for the design of the foundation of each construction. The course includes determination of critical soils index, classification of soils, moisture-density relationship, California bearing ratio and hydraulic conductivity tests.
Co-requisite: CIVE 301

CIVE 307 SHALLOW FOUNDATION ANALYSIS AND DESIGN 3.0: 3 cr. E
Analysis and design of shallow reinforced concrete footings: centrally loaded isolated footing, eccentrically loaded isolated footings, combined rectangular footing, combined trapezoidal footing, strap footing, mat foundation, retaining wall design.
Pre-requisites: CIVE 209, CIVE 301

CIVE 308 TRANSPORTATION ENGINEERING 3.0: 3 cr. E
The role of transportation in society and the engineer's role in planning, design and operation of transportation systems; consideration of system constraints, costs and basic design criteria. Theory and practice in highway design according to AASHTO criteria; design of vertical and horizontal curves and cross-sections. Introduction to traffic elements including intersection design and analysis of roads and intersections level of service.
Pre-requisite: CIVE 208

CIVE 309 ENGINEERING ECONOMY 3.0: 3 cr. E
The course introduces the student to the fundamental concepts of engineering economy covering: time value of money; effective interest rate; economic worth analysis and evaluation of private construction projects, namely: net present value, future and annual worth, and internal rate of return; evaluation of public projects, mainly benefit to cost ratio; replacement analysis: depreciation methods; break-even analysis: economic risk and after-tax cash flow.
Pre-requisite: MATH 200

CIVE 310 BUILDING LAWS 3.0: 2 cr. E

The purpose of this course is to instruct the students to organize the building industry, and to enhance their knowledge of the Lebanese Building Laws in order to safeguard the environment, as well as private and public rights.
Pre-requisite: CIVE 203

CIVE 311 SANITARY ENGINEERING 3.0: 3 cr. E
Sources and quantities of water supply and methods of collection, treatment and distribution. Quantities, treatment and disposal of wastewater. Quality parameters, criteria and international standards for drinking water and wastewater pollution control.
Pre-requisite: MECH 243

CIVE 312 CONSTRUCTION MANAGEMENT FUNDAMENTALS 3.0: 2 cr. E
Civil Engineers working on sites as construction managers need to know the basics of construction management. Planning, scheduling and control are the three basic tools for construction managers. This course introduces the basic planning principles and procedures. It also expands on project deterministic project scheduling: mainly bar charts, network schedules AON, AOA and CPM. The course tackles the principles of cost estimation and also the quantity take-off and bar bending schedule estimation. This course introduces students to the leadership skills the construction manager must acquire.
Pre-requisites: CIVE 206, CIVE 209

CIVE 313 TRANSPORTATION ENGINEERING MODELING 0.3: 1 cr. E
Highway design using professional commercial software integrating planning, geometric design including horizontal and vertical curves design, cross-sections with cut and fill calculations, and traffic modeling including traffic lights design and level of service. Results visualizations and assessment.
Pre-requisite: CIVE 206
Co-requisite: CIVE 308

CIVE 315 GEOTECHNICAL ENGINEERING MODELING 0.3: 1 cr. E
Geotechnical analysis and design using commercial software PLAXIS including design of foundations and lateral earth retaining systems. Results visualizations and assessment.
Co-requisite: CIVE 307

CIVE 316 CONSTRUCTION MANAGEMENT MODELING 0.3:1 cr. E
Use of commercial software for the operations, planning, budgeting, scheduling, resource allocation, resource leveling, and controlling construction projects.
Co-requisite: CIVE 312

CIVE 318 ENVIRONMENTAL ENGINEERING MODELING 0.3:1 cr. E
Analysis and design using commercially available software: wastewater treatment plant; sizing of tanks; effluent concentration, results visualizations and assessment: cost analysis, operation and maintenance.

CIVE 319 REVIT FOR CIVIL ENGINEERS 3.0:2 cr. E
The Autodesk Revit software is a Building Information Modeling (BIM) program that streamlines the design process through the use of a central 3D model, where changes made in one view update across all views and on the printable sheets. The first part of the course is designed to teach engineering students the Autodesk Revit functionality as they would work with it throughout the design process. Students begin by learning about the user interface and basic drawing, editing, and viewing tools; then learn design development tools including how to generate a structural model and interface with ETABS

for analysis and design purposes. Finally, they learn the processes that take the model to the construction documentation phase. The second part of the course focuses specifically on the ability of the engineering students to design a well-coordinated project on Revit and then use the same Revit file for scheduling, management, quantity take-off, and planning either using the Revit software or by connecting the Revit file to different management software such as Primavera or MS Project.
Pre-requisites: CIVE 206, CIVE 303
Co-requisite: CIVE 316

CIVE 320 STRUCTURAL DETAILING 3.0:2 cr. E
A computer-aided drafting technique and drawings generation course using CAD programs. It includes generating drawings based on the conventions of engineering graphical communication with applications to different Civil Engineering areas of specialty. The course concentrates on the detailing and shop drawings preparation of Reinforced Concrete members according to ACI-315. A required project at the end of the course introduces the students to the preparation of execution drawings and consideration of production methods.
Pre-requisite: CIVE 206
Co-requisites: CIVE 304, 307

CIVE 321 ADVANCED COMPUTER AIDED DESIGN 3.0: 2 cr. E
Advanced modeling techniques using ETABS/SAFE Software packages. It consists of modeling in multiple grid systems using Cartesian and/or Polar coordinates, as well as non-concentric modeling with a variation in the Cardinal Points and Insertion Points; the use of Section Designer members and Non-Prismatic elements; all loading types and shapes in global and local coordinates; the ETABS concept for the Pattern Live Load; modeling of inclined slabs for stairs and ramps, and modeling of shells for all types of domes. Introduction to the ETABS overwrites for the design of Reinforced Concrete members (Seismic or Non-Seismic Design) using ACI318 Provisions. Introduction to temperature loads. Design of all types of Foundations using SAFE.
Pre-requisite: CIVE 303

CIVE 322 TECHNICAL PLATFORM COMPUTING FOR CIVIL ENGINEERING 3.0: 2 cr. E
This course develops computing skills using the technical computing platform Mathematica. Topics include: introduction to Mathematica, symbolic, numeric, graphics, animations, programming, document organization and typesetting. Applications to statics, dynamics, engineering mechanics, fluid mechanics and other engineering related courses. Emphasis on ability to plan solutions to technical problems then execute and prepare organized technical reports including tables, figures and illustrations.
Pre-requisites: MATH 200, MATH 211, CIVE 201, CSIS 206

CIVE 323 INTRODUCTION TO GEOGRAPHIC INFORMATION SYSTEM 3.0: 2cr. E
Basic theoretical and practical understanding of GIS concepts and technical issues and its application to the design and analysis of environmental engineering systems. The focus is a fundamental understanding of spatial data acquisition, civil and geo- processing, geo-statistical methods; visualization, and querying of spatial data; network modeling, terrain mapping, and spatial analysis. Students are trained through extensive computer lab sessions. The course will be based on the recently released ESRI ArcGIS 10.5.
Pre-requisites: CIVE 206, CIVE 208

CIVE 324 STRUCTURAL STEEL DESIGN 3.0: 3 cr. E

The primary objective of the course is to provide the student with solid background in the fundamentals of structural steel design. Steel will be used for typical civil engineering structures such as trusses, bridges, and framed structures. Structural design establishes the configuration, details and dimensions for standard AISC rolled shapes. The course addresses the design of simple individual structural elements (truss members, beams and columns in braced frames) and the design of simple connections of structural elements (welded and bolted).
Pre-requisite: CIVE 205

CIVE 389 SENIOR DESIGN I 3.0: 2 cr. E
In this course, first of two "Senior Design" courses, students shall work in multi-disciplinary teams to design a civil engineering project under the supervision of a Project Advisor. Projects will contain components of several civil engineering disciplines in order to integrate many elements of the curriculum. This includes some of the following: Structures, Geotechnical, Transportation, Topography, Sanitary, Hydrology and Water resources, Environmental, and/or Project Management. Each team shall define the project objectives and scope, locate relevant codes and identify related software packages, determine design specifications according to specific local and international standards, formulate a design criteria subject to constraints such as the impact on the local community and the environment, perform project/site analyses for possible alternate solutions, and finally present the preliminary design in the form of a written report and a verbal presentation.

CIVE 390 SENIOR DESIGN II 3.0: 2 cr. E
This course is the second of two-course "Senior Design" sequence that comprises the final year capstone design experience. In this course students working as multi-disciplinary teams shall perform a complete integrated design of a civil engineering project, with all the parameters set forth in the CIVE389 course. Students shall practice team effort and develop communication skills, where each shall take a responsibility in a variety of roles and be able to combine all efforts to produce a final deliverable culminating design project with proper engineering professionalism and ethics. The project shall be presented to the department faculty on the "Projects Day" via a written report and a verbal presentation which include several deliverables such as: Calculations, Drawings, Computer models, Specifications, and/or any other considerations that contributed to the development and the success of the project.
Pre-requisite: CIVE 389

CIVE 401 THEORY OF STRUCTURES II 3.0: 3 cr. E
Approximate analysis of continuous beams, and frames. Parametric studies of some basic structures including towers, buildings and bridges. Estimating deflections. Analysis of beam, truss, and frame structures using the unit load method and the direct stiffness method. Influence lines of determinate and indeterminate continuous beams.

CIVE 403 DEEP FOUNDATIONS 3.0: 3 cr. E
Fundamentals of geotechnics applied to design and analysis of deep soil structure systems, single pile, sheet pile, group of piles, laterally loaded piles, efficiency of group pile, settlement of pile, braced cut, reinforced earth structure.

CIVE 404 HYDRAULICS 3.0: 3 cr. E
The course consists of the design and analysis of water supply networks including transmission and distribution pipes, reservoirs, tanks, pumps and pump selection, using the conservation of mass, momentum, and energy equations; design and analysis of open channels including gradually varied

flows, backwater computations, and water surface profiles using the Manning equation; design and analysis of box culverts with inlet and outlet control.

CIVE 405 PRESTRESSED CONCRETE 3.0: 3 cr. E
Fundamentals of prestressed concrete behavior. Analysis and design of pre-tensioned and post tensioned reinforced concrete members. Prestressed concrete is used to construct light, durable, and economical structures by pre-compressing the concrete that has high compressive strength using high strength pre-stressing steel. Preloading the tensile zone of the structural concrete members results in a self-equilibrating system of internal stresses under expected loads.

CIVE 411 INTRODUCTION TO EARTHQUAKE ENGINEERING and SEISMOLOGY 3.0: 3 cr. E
Earthquake engineering, deals with the effects of earthquakes on people and their environment and with methods reducing those effects. This course is designed to help understand the fundamental principles and practical methods of earthquake engineering. It introduces the basic concepts of seismology, earthquakes, and strong ground motion and introduces procedures of deterministic and probabilistic seismic hazard analysis.

CIVE 428 CONSTRUCTION SAFETY MANAGEMENT 3.0: 3 cr. E
Identification of hazards and risks on construction sites; hazards evaluation; hazard control; fault tree analysis; crane, equipment, universal, access, construction, operation and maintenance hazards; and safety measures application.

CIVE 443 SEISMIC DESIGN OF REINFORCED CONCRETE BUILDINGS 3.0: 3 cr. E
Basic seismology, earthquake characteristics and effect of earthquakes on structures. Seismic base shear calculation using the (IBC-2012) and (UBC-1997). Earthquake resisting structural systems with plan and vertical irregularities. Design and detailing of seismic resistant reinforced concrete shear walls including boundary elements and coupling beams. Design and detailing of Moment Resisting Frames. All designs are based on the ACI-318M-14 (Ch 18) Seismic Provisions as well as the ACI-352 Beam-to-Column Connections. Recommendations.

CIVE 501 THEORY OF STEEL STRUCTURES 3.0: 3 cr. E
The primary objective of the course is to provide the student with solid background in the fundamentals of structural steel design. Steel will be used for typical civil engineering structures such as trusses, bridges, and framed structures. Structural design establishes the configuration, details and dimensions for standard AISC rolled shapes. The course addresses the design of simple structural elements (truss members, beams, and columns in braced frames) and the design of simple connections of structural elements (welded and bolted).

CIVE 503 HIGHWAY DESIGN 3.0: 3 cr. E
The course provides a good understanding of terms and concepts that are used in highway engineering design such as location and geometric design, highway drainage, geotechnical, bituminous materials, design of flexible pavements, design of rigid pavements, operation and maintenance, noise pollution evaluation and control, and introduction to bridges. The course provides a thorough understanding of the role of highway engineering in society and the engineer's role in planning, design and operation of transportation systems, consideration of
system constraints, cost, and basic design criteria.

CIVE 520 PRINCIPLES OF ENVIRONMENTAL ENGINEERING 3.0: 3 cr. E

Man and environment. Sources of environmental pollution. Water pollution and its control. Principles of water and wastewater treatment. Air pollution and its control. Solid wastes and noise problems. Environmental Impact Assessment studies. Case studies.

CIVE 555 SPECIAL TOPICS IN ENGINEERING 3.0: 3 cr. E
Analysis and design of advanced concrete structures: stairways, reinforced concrete water tanks (rectangular and circular), concrete domes, corbels and deep beams, wind load provisions, walls, fiber polymer reinforcement, chimneys and minaret.

ENVE 401 WATER RESOURCES ENGINEERING 3.0: 3 cr. E
Ground-water development. Techniques for analyzing rainfall, runoff, fluid flow, reservoir siting, aquifer and groundwater flows. Design of reservoirs, conduits, water distribution systems, well fields, transmission lines, sewers, and drains. Well pumps. Stresses in pipes; materials and design of pipes; Metallic corrosion. Storage and distributing reservoirs, construction and maintenance. Water supply system appurtenances and special structures. Population growth and its effects on water supply requirements.

CHEM 202
Refer to the Department of Chemistry.

CSIS 206
Refer to the Department of Computer Science.

CSPR 201, 202, 203
Refer to the Civilization Sequence Program.

ENGL 203, Elective
Refer to the Division of English Language and Literature.

GENG 400, 402, 480, 490
Refer to the Faculty of Engineering requirements.

LISP 200
Refer to the Faculty of Library and Information Studies.

MATH 200, 202, 211, 230, 246, 270
Refer to the Department of Mathematics.

MECH 221, 233, 243
Refer to the Department of Mechanical Engineering.

BIOL 207, PHYS 214
Refer to the Faculty of Sciences