Civil Engineering (CIVE)

Civil Engineering (CIVE) Courses

CIVE 2004 [0.5 credit]
GIS, Surveying, CAD and BIM
Engineering geometry and spatial graphics. Fundamentals of surveys. Digital surveying tools; total station, GPS. Computer-Aided Drafting (CAD). Geographic Information Systems (GIS). Spatial referencing. Building Information Modelling (BIM). Integrated design using digital tools. Field exercises using software to process and evaluate spatial data.
Includes: Experiential Learning Activity
Prerequisite(s): Second-year status in Engineering or (GEOM 1004 for students in BSc in Geomatics).
Lectures three hours a week, problem analysis and laboratories three hours a week.

CIVE 2005 [0.5 credit]
Architectural Technology 2
Technical issues involved in architectural design of buildings from ancient times to the present. Technological innovation and materials related to structural developments, and the organization and design of structures. Basic concepts of calculus, equilibrium, and mechanics of materials.
Precludes additional credit for ARCH 2222. Not eligible for use for Bachelor of Engineering degree requirements.
Prerequisite(s): ARCC 2202.
Lectures three hours a week, laboratory three hours a week.

CIVE 2101 [0.5 credit]
Engineering Mechanics
Virtual work. Friction. Relative motion of particles. Kinematics of a rigid body: translation, rotation; general plane motion; absolute and relative motion. Kinetics of a rigid body: equations of motion; work-energy; impulse-momentum; conservation of momentum and energy. Conservative forces and potential energy.
Precludes additional credit for MAAE 2101.
Prerequisite(s): MATH 1004, MATH 1104 and second-year status in Engineering.
Lectures three hours a week, problem analysis three hours a week.

CIVE 2200 [0.5 credit]
Mechanics of Solids I
Stress and strain. Stress-strain relationship: Hooke's law. Torsion of circular shafts. Bending moment and shear force distribution. Flexural stresses. Deflection. Shear stress in beams. Stresses in thin- walled cylinders. Transformation of 2D stress and strain: Mohr's circle. Buckling of columns.
Includes: Experiential Learning Activity
Precludes additional credit for MAAE 2202.
Prerequisite(s): MATH 1004 and second-year status in Engineering for B.Eng.
Lectures three hours a week, problem analysis and laboratory three hours a week.

CIVE 2700 [0.5 credit]
Civil Engineering Materials
Introduction to material science. Structure of atoms. Crystallography. Crystal Imperfections. Characteristics, behaviour and use of Civil Engineering materials: steel, concrete, asphalt, wood, polymers, composites. Specifications. Physical, chemical and mechanical properties. Quality control and material tests. Fatigue. Corrosion. Applications in construction and rehabilitation of structures.
Includes: Experiential Learning Activity
Precludes additional credit for MAAE 2700.
Prerequisite(s): Second year status for students in an Engineering program.
Lectures three hours a week, problem analysis and laboratory three hours a week.

CIVE 3202 [0.5 credit]
Mechanics of Solids II
Shear flow. Definition of shear centre, Saint Venant and warping torsional constants. Behaviour, governing differential equations and solutions for torsion, beam-columns, lateral torsional buckling of doubly symmetric beams, axially loaded doubly symmetric, singly symmetric and asymmetric columns. Failure criterion, fatigue and fracture.
Includes: Experiential Learning Activity
Precludes additional credit for MAAE 3202.
Prerequisite(s): CIVE 2200.
Lectures three hours a week, laboratory/problem analysis three hours alternate weeks.

CIVE 3203 [0.5 credit]
Introduction to Structural Analysis
Concepts and assumptions for structural analysis: framed structures; joints; supports; compatibility and equilibrium; stability and determinacy; generalized forces and displacements. Principle of Virtual Work: unknown force calculations; influence lines. Complementary Virtual Work: displacement calculations, indeterminate analysis. Introduction to the Stiffness Method of Analysis.
Prerequisite(s): CIVE 2200 and MATH 1004.
Lectures three hours a week, problem analysis three hours alternate weeks.

CIVE 3204 [0.5 credit]
Introduction to Structural Design
Building systems and structural form. Design Philosophy and design process. Limit states design. National Building Code of Canada. Determination of dead, live, snow, wind, and earthquake loads.
Prerequisite(s): CIVE 2200.
Lectures three hours a week, problem analysis three hours alternate weeks.

CIVE 3205 [0.5 credit]
Design of Structural Steel Components
Introduction to CAN/CSA - S16, design and behaviour concepts; shear lag, block shear, local plate buckling, lateral torsional buckling, instantaneous centre, inelastic strength and stability. Design of tension members, axially loaded columns, beams, beam-columns, simple bolted and welded connections.
Prerequisite(s): CIVE 2200 and CIVE 2700.
Recommended prerequisite: CIVE 3204.
Lectures three hours a week, problem analysis three hours alternate weeks.

CIVE 3206 [0.5 credit]
Design of Reinforced Concrete Components
Introduction to CAN/CSA - A23.3; design and behaviour concepts; flexural analysis at service loads; shear, bond, Whitney stress block, under, over reinforced behaviour, ultimate strength. Flexural design of singly reinforced, doubly reinforced T-beams, one-way slabs. Shear design for beams. One-way, two-way slab systems, columns.
Prerequisite(s): CIVE 2200 and CIVE 2700.
Recommended prerequisite: CIVE 3204.
Lectures three hours a week, problem analysis three hours alternate weeks.

CIVE 3207 [0.5 credit]
Historic Site Recording and Assessment
Methods of heritage documentation including hand recording, photography, rectified photography, total station, gps, photogrammetry, and laser scanning. Non-destructive testing techniques; environmental assessment tools for determining air quality and energy efficiency. Multidisciplinary teams for all project work.
Includes: Experiential Learning Activity
Also listed as ACSE 3207, ARCH 3881.
Precludes additional credit for ARCN 4100.
Prerequisite(s): third-year status in B.Eng. in Architectural Conservation and Sustainability Engineering.
Lectures three hours a week, lab or field work two hours a week.

CIVE 3208 [0.5 credit]
Geotechnical Mechanics
Soil composition and soil classification. Soil properties, compaction, seepage and permeability. Concepts of pore water pressure, capillary pressure and hydraulic head. Principle of effective stress, stress-deformation and strength characteristics of soils, consolidation, stress distribution with soils, and settlement. Laboratory testing.
Includes: Experiential Learning Activity
Also listed as ERTH 4107.
Prerequisite(s): third-year status in Engineering, or permission of the department. Additional recommended background: ERTH 2404 or equivalent.
Lectures three hours a week, laboratory three hours alternate weeks.

CIVE 3209 [0.5 credit]
Building Science
Building envelope design and analysis; applied heat transfer and moisture transport; solar radiation; hygrothermal modelling; control of rain, air, vapour, and heat; materials for wall, window, curtain wall, roof, and foundation systems; building envelope retrofit case studies; building code; envelope construction.
Includes: Experiential Learning Activity
Also listed as ACSE 3209.
Prerequisite(s): MAAE 2400 and third-year status in B. Eng. Civil Engineering.
Lectures three hours a week, problem analysis three hours alternate weeks.

CIVE 3210 [0.5 credit]
Geotechnical Engineering
Strength of soils, steady state seepage, flownets and piping. Stress distribution in soils. Earth pressures: at rest, active and passive. Design of flexible and rigid retaining structures. Stability of excavations, slopes and embankments. Settlement of foundations. Bearing capacity of footings.
Also listed as CIVE 4208.
Prerequisite(s): CIVE 3208.
Lectures three hours a week, problem analysis three hours alternate weeks.

CIVE 3304 [0.5 credit]
Transportation Engineering and Planning
Transportation and the socio-economic environment; modal and intermodal systems and components; vehicle motion, human factors, considerations for different modes of travel; sight distance requirements; fundamentals of traffic flow theory; transportation planning and travel demand; environmental impacts; traffic safety.
Precludes additional credit for GEOG 4304.
Prerequisite(s): third-year status in Engineering, or permission of the Department.
Lectures three hours a week, problem analysis three hours alternate weeks.

CIVE 3305 [0.5 credit]
Highway Engineering
Road functional classification, human factors of road design; geometric design; traffic engineering; highway capacity and level of service; highway materials; frost action; pavement mix design; structural design of rigid and flexible pavements; maintenance and rehabilitation.
Also listed as CIVE 4209.
Prerequisite(s): CIVE 3304 or permission of the Department.
Lectures three hours a week, problem analysis three hours alternate weeks.

CIVE 3407 [0.5 credit]
Municipal Engineering
Introduction to fundamentals of municipal engineering. Water quality: physical, chemical and biological parameters. Water treatment: softening mixing, flocculation, sedimentation, filtration, disinfection, fluoridation. Biological processes. Wastewater treatment: primary, secondary and tertiary treatment. Sludge disposal and wastewater reuse. Solid waste management.
Also listed as CIVE 4407.
Prerequisite(s): third-year status in Engineering.
Lectures three hours a week, problem analysis one and a half hours a week

CIVE 3999 [0.0 credit]
Co-operative Work Term
Includes: Experiential Learning Activity
Precludes additional credit for ACSE 3999.

CIVE 4200 [0.5 credit]
Matrix Analysis of Framed Structures
Review of basic structural concepts. Betti's law and applications. Matrix flexibility method, flexibility influence coefficients. Development of stiffness influence coefficients. Stiffness method of analysis: beams; plane trusses and frames; space trusses and frames. Introduction to the finite element method.
Prerequisite(s): CIVE 3203.
Lectures three hours a week, problem analysis three hours alternate weeks.

CIVE 4201 [0.5 credit]
Finite Element Methods in Civil Engineering
Introduction to the theory and application of finite element methods. The relationship with virtual work, Rayleigh-Ritz, system of linear equations, polynomial interpolation, numerical integration, and theory of elasticity is explored. Isoparametric formulations of structural and plane elements are examined. Geotechnical and nonlinear problems are introduced.
Prerequisite(s): fourth-year status in engineering.
Also offered at the graduate level, with different requirements, as CIVE 5103, for which additional credit is precluded.
Lectures three hours a week, problem analysis three hours alternate weeks.

CIVE 4202 [0.5 credit]
Wood Engineering
Structural design in timber. Properties, anatomy of wood, wood products, factors affecting strength and behaviour, strength evaluation and testing. Design of columns, beams and beam-columns. Design of trusses, frames, glulam structures, plywood components, formwork, foundations, connections and connectors. Inspection, maintenance and repair.
Prerequisite(s): CIVE 2200, CIVE 2700 and third-year status in B.Eng.
Lectures three hours a week, problem analysis three hours alternate weeks.

CIVE 4204 [0.5 credit]
Pavement Design
Pavement design methods, flexible pavement materials and mix designs, stresses and strains in flexible pavements; fatigue and rutting design considerations; traffic loading and design loads; design of flexible pavements using AASHTO, M-E and AI methods; rigid pavement designs, design of overlays.
Includes: Experiential Learning Activity
Prerequisite(s): Fourth year status and CIVE 4209.
Lectures three hours a week, problem analysis three hours alternate weeks.

CIVE 4205 [0.5 credit]
Traffic Engineering
Introduction to principles of traffic engineering. Traffic operation concepts. Travel modes and modal characteristics. Traffic stream characteristics and queuing theory. Capacity and level of service analysis of roads and intersections.
Includes: Experiential Learning Activity
Prerequisite(s): Fourth year status in engineering; and (CIVE 4209 or CIVE 3305).
Also offered at the graduate level, with different requirements, as CIVE 5305, for which additional credit is precluded.
Lectures three hours a week, problem analysis three hours alternate weeks.

CIVE 4208 [0.5 credit]
Geotechnical Engineering
Strength of soils, steady state seepage, flownets and piping. Stress distribution in soils. Earth pressures: at rest, active and passive. Design of flexible and rigid retaining structures. Stability of excavations, slopes and embankments. Settlement of foundations. Bearing capacity of footings.
Also listed as CIVE 3210.
Prerequisite(s): CIVE 3208.
Lectures three hours a week, problem analysis three hours alternate weeks.

CIVE 4209 [0.5 credit]
Highway Engineering
Road functional classification, human factors of road design; geometric design; traffic engineering; highway capacity and level of service; highway materials; frost action; pavement mix design; structural design of rigid and flexible pavements; maintenance and rehabilitation.
Also listed as CIVE 3305.
Prerequisite(s): CIVE 3304 or permission of the Department.
Lectures three hours a week, problem analysis three hours alternate weeks.

CIVE 4301 [0.5 credit]
Foundation Engineering
A critical study of the theories in soil mechanics and their application to the solution of geotechnical engineering problems. Field investigations, laboratory and field testing, shallow foundations, special footings, mat foundations, pile foundations and excavations. Discussion of new methods and current research.
Prerequisite(s): CIVE 4208.
Lectures three hours a week, laboratory three hours alternate weeks.

CIVE 4302 [0.5 credit]
Reinforced and Prestressed Concrete Design
Reinforced concrete shear and torsion design. Two-way slab design by Direct Design and Equivalent Frame Method. Behaviour and design of slender reinforced concrete columns. Prestressed concrete concepts; flexural analysis and design; shear design; anchorage zone design; deflection and prestress loss determination.
Prerequisite(s): CIVE 3203 and CIVE 3206.
Lectures three hours a week, problem analysis three hours alternate weeks.

CIVE 4303 [0.5 credit]
Urban Systems
A systematic approach to urbanism; Sustainability in urban systems; Urban sprawl; Urban form; Urban theory, Population projections; Zoning; Integration of urban infrastructure components (waste, electricity water, transportation and buildings); Analysis of issues in Canadian urban areas; The future of cities.
Prerequisite(s): fourth-year status in Engineering, second-year standing in B.A.S. (Urbanism), or permission of the Department.
Lectures three hours a week, problem analysis three hours alternate weeks.

CIVE 4307 [0.5 credit]
Municipal Hydraulics
Fluid flow fundamentals. Hydraulics of pipe systems. Open channel flow. Prediction of sanitary and storm sewage, flow rates. Design of water distribution systems, culverts, sanitary and storm sewers. Pumps and measuring devices. Hydraulic and flow control structures.
Prerequisite(s): MAAE 2300.
Lectures three hours a week, problem analysis one and a half hours a week.

CIVE 4308 [0.5 credit]
Behaviour and Design of Steel Structures
Behaviour and design of open web steel joists, steel and composite decks, composite beams and columns, stud girders, and plate girders. Design of moment connections, base plates and anchor bolts, and bracing connections. Stability of rigid and braced frames. Design for lateral load effects.
Prerequisite(s): CIVE 3205 and fourth-year status in Engineering.
Lectures three hours a week, problem analysis three hours alternate weeks.

CIVE 4400 [0.5 credit]
Construction/Project Management
Systems approach to project planning and control. Analysis of alternative network planning methods: CPM, precedence and PERT; planning procedure; computer techniques and estimating; physical, economic and financial feasibility; implementation feedback and control; case studies.
Prerequisite(s): fourth-year status in Engineering.
Lectures three hours a week, problem analysis three hours alternate weeks.

CIVE 4403 [0.5 credit]
Masonry Design
Introduction to structural design in masonry. Properties of masonry materials and assemblages. Behaviour and design of beams, walls and columns. Selected topics including veneer wall systems, differential movement, workmanship, specifications, inspection, maintenance and repair. Lowrise and highrise building design.
Prerequisite(s): CIVE 3204, CIVE 3206 and fourth-year status in Engineering or permission of the Department.
Also offered at the graduate level, with different requirements, as CIVE 5200, for which additional credit is precluded.
Lectures three hours a week, problem analysis three hours alternate weeks.

CIVE 4407 [0.5 credit]
Municipal Engineering
Introduction to fundamentals of municipal engineering. Water quality: physical, chemical and biological parameters. Water treatment: softening mixing, flocculation, sedimentation, filtration, disinfection, fluoridation. Biological processes. Wastewater treatment: primary, secondary and tertiary treatment. Sludge disposal and wastewater reuse. Solid waste management.
Also listed as CIVE 3407.
Prerequisite(s): third-year status in Engineering.
Lectures three hours a week, problem analysis one and a half hours a week

CIVE 4500 [0.5 credit]
Computer Methods in Civil Engineering
Advanced software development for Civil Engineering applications. Examples may be chosen from surveying, transportation, geotechnical and/or structural engineering. Software technologies include object-oriented programming, data base management, Internet-based applications and graphical user interfaces.
Prerequisite(s): Fourth-year status in Engineering.
Also offered at the graduate level, with different requirements, as CIVE 5602, for which additional credit is precluded.
Lectures three hours a week, problem analysis three hours alternate weeks.

CIVE 4601 [0.5 credit]
Building Pathology and Rehabilitation
Deterioration mechanisms for concrete, timber, steel and masonry structures. Identification of design deficiencies; criteria for selection and design of rehabilitation systems. Design techniques to reduce deterioration in new construction and historical structures.
Includes: Experiential Learning Activity
Also listed as ACSE 4601, ARCN 4200.
Prerequisite(s): CIVE 3207 and fourth-year status in B.Eng. in Architectural Conservation and Sustainability Engineering.
Lectures three hours a week, lab/field work two hours a week.

CIVE 4614 [0.5 credit]
Building Fire Safety
Understanding fire-structure interaction and the concepts of fire severity and resistance; behaviour of steel, concrete, and timber buildings exposed to fires; compartment fire dynamics; correlations and computer models to predict fire dynamics; fire retardants; laboratory-scale fire experiments; performance-based approach for building fire safety design.
Prerequisite(s): MAAE 2400 and fourth-year status in Engineering, or permission of the Department.
Lectures three hours a week, problem analysis and laboratories one and one-half hours per week.

CIVE 4907 [1.0 credit]
Engineering Research Project
A research project in engineering analysis, design or development carried out by individual students or small teams, for an opportunity to develop initiative, self-reliance, creative ability and engineering judgment and is normally intended for students with high CGPAs and an interest in graduate studies.
Includes: Experiential Learning Activity
Precludes additional credit for ACSE 4907, ACSE 4917, CIVE 4917.
Prerequisite(s): fourth-year status in Engineering and permission of the department.

CIVE 4917 [0.5 credit]
Undergraduate Directed Study
Student carries out a study, analysis, and solution of an engineering problem which results in a written final report. Carried out under close supervision of a faculty member. Intended for students interested in pursuing graduate studies. Requires supervising faculty member and proposal from student.
Includes: Experiential Learning Activity
Precludes additional credit for ACSE 4907, ACSE 4917, CIVE 4907.
Prerequisite(s): permission of the Department and completion of, or concurrent registration in, CIVE 4918.
Self study.

CIVE 4918 [1.0 credit]
Design Project
Teams of students develop professional level experience through a design project that incorporates fundamentals acquired in previous mathematics, science, engineering, and complementary studies courses. A final report and oral presentations are required.
Includes: Experiential Learning Activity
Precludes additional credit for ACSE 4918, ENVE 4918.
Prerequisite(s): ECOR 3800 and fourth-year status in Engineering. Certain projects may have additional requirements.
Lectures two hours alternate weeks, problem analysis three hours a week.