Civil Engineering (CIVE)

Civil and Environmental Engineering
Faculty of Engineering

CIVE 1005 [0.5 credit] (formerly 82.105)
Introduction to Technology
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 equilibrium, and mechanics of materials.
Precludes additional credit for ARCC 2103.
Lectures three hours a week, laboratory three hours a week.

CIVE 2004 [0.5 credit] (formerly 82.204)
GIS, Surveying, and Graphics
Engineering geometry and spatial graphics. Structural engineering drawings and computer aided drafting. Fundamentals of surveying, measuring horizontal and vertical distances and angles. Topographic and construction surveys. GPS and electronic surveying. Geographic information systems, data, data structure and processing, spatial referencing, cartographic modeling, application software.
Precludes additional credit for CIVE 1004.
Lectures three hours a week, problem analysis and laboratories three hours a week.

CIVE 2101 [0.5 credit] (formerly 82.211)
Mechanics II
Plane trusses. 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 and ECOR 2101.
Prerequisites: ECOR 1101 and MATH 1004 and MATH 1104.
Lectures three hours a week, problem analysis three hours a week.

CIVE 2200 [0.5 credit] (formerly 82.220)
Mechanics of Deformable Bodies
Stress and strain. Stress-strain relationship: Hooke's law. Torsion of circular shafts. Bending moment and shear force distribution. Flexural stresses. De ection. Shear stress in beams. Stresses in thin- walled cylinders. Transformation of 2D stress and strain: Mohr's circle. Buckling of columns.
Precludes additional credit for MAAE 2202.
Prerequisite: ECOR 1101.
Lectures three hours a week, problem analysis and laboratory three hours a week.

CIVE 2700 [0.5 credit] (formerly 82.270)
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.
Prerequisites: CHEM 1000 CHEM 1101 or equivalent, MATH 1004, and PHYS 1004.
Lectures three hours a week, problem analysis and laboratories three hours a week.

CIVE 3202 [0.5 credit] (formerly 82.322)
Advanced Mechanics
Shear ow. 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.
Precludes additional credit for CIVE 4404 and MAAE 3202.
Prerequisite: CIVE 2200.
Lectures three hours a week, problem analysis three hours alternate weeks.

CIVE 3203 [0.5 credit] (formerly 82.323)
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; in uence lines. Complementary Virtual Work: displacement calculations, indeterminate analysis. Introduction to the Stiffness Method of Analysis.
Prerequisite: CIVE 2200.
Lectures three hours a week, problem analysis three hours alternate weeks.

CIVE 3204 [0.5 credit] (formerly 82.324)
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.
Lectures three hours a week, laboratory and problem analysis three hours alternate weeks.

CIVE 3205 [0.5 credit] (formerly 82.325)
Design of Structural Steel Components
Introduction to CAN/CSA - S16.1, 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. (Also listed as ARCC 3106.)
Precludes additional credit for ARCC 3106.
Prerequisites: CIVE 2200 and CIVE 3204.
Lectures three hours a week, problem analysis three hours alternate weeks.

CIVE 3206 [0.5 credit] (formerly 82.326)
Design of Reinforced Concrete Components
Introduction to CAN/CSA - A23.3; design and behaviour concepts; exural analysis at service loads; shear, bond, Whitney stress block, under and over reinforced behaviour, ultimate strength. Flexural design of singly reinforced, doubly reinforced T-beams, and one-way slabs. Shear design for beams. One-way and two-way slab building systems, columns.
Prerequisites: CIVE 2200 and CIVE 3204.
Lectures three hours a week, problem analysis three hours alternate weeks.

CIVE 3208 [0.5 credit] (formerly 82.328)
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. (Also listed as GEOL 4107).
Prerequisites: GEOL 2404 or equivalent and third-year registration, or permission of the Department.
Lectures three hours a week, laboratory three hours alternate weeks.

CIVE 3304 [0.5 credit] (formerly 82.334)
Transportation Engineering and Planning
Transportation and the socio-economic environment; modal and intermodal systems and components; vehicle motion, human factors, system and facility design; traffic ow; capacity analysis; planning methodology; environmental impacts; evaluation methods. (Also listed as GEOG 4304.)
Prerequisite: third-year registration, or permission of the Department.
Lectures three hours a week, problem analysis three hours alternate weeks.

CIVE 4200 [0.5 credit] (formerly 82.420)
Matrix Analysis of Framed Structures
Review of basic structural concepts. Betti's law and applications. Matrix exibility method, exibility in uence coefficients. Development of stiffness in uence coefficients. Stiffness method of analysis: beams; plane trusses and frames; space trusses and frames. Introduction to the finite element method. (Also listed as ARCC 3104.)
Prerequisite: CIVE 3203.
Lectures three hours a week, problem analysis three hours alternate weeks.

CIVE 4201 [0.5 credit] (formerly 82.421)
Finite Element Methods in Structural Analysis
Introduction to theory of elasticity. Simple finite elements. Virtual Work formulation of equilibrium of structure and element. Lagrange interpolation and basis for displacement shape functions. Considerations in finite element modeling. Plate bending theories and analysis. Shell theories and analysis.
Also offered, at the graduate level with additional or different requirements, as CIVE 5103 for which additional credit is precluded.
Prerequisite: CIVE 4200.
Lectures three hours a week, problem analysis three hours alternate weeks.

CIVE 4202 [0.5 credit] (formerly 82.422)
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. (Also listed as ARCC 4202.)
Prerequisite: fourth-year registration or permission of the Department.
Lectures three hours a week, problem analysis three hours alternate weeks.

CIVE 4208 [0.5 credit] (formerly 82.428)
Geotechnical Engineering
Strength of soils, steady state seepage, ownets and piping. Stress distribution in soils. Earth pressures: at rest, active and passive. Design of exible and rigid retaining structures. Stability of excavations, slopes and embankments. Settlement of foundations. Bearing capacity of footings.
Prerequisite: CIVE 3208.
Lectures three hours a week, problem analysis three hours alternate weeks.

CIVE 4209 [0.5 credit] (formerly 82.429)
Highway Engineering
Highway planning; highway location and geometric design; traffic engineering; highway capacity; soil classifications; subgrade and base materials; highway drainage; frost action; structural design of rigid and exible pavements; highway economics and finance; maintenance and rehabilitation.
Prerequisites: CIVE 2004, CIVE 3304 and CIVE 3208.
Lectures three hours a week, problem analysis three hours alternate weeks.

CIVE 4301 [0.5 credit] (formerly 82.431)
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: CIVE 4208.
Lectures three hours a week, laboratory three hours alternate weeks.

CIVE 4302 [0.5 credit] (formerly 82.432)
Reinforced and Prestressed Concrete Design
Reinforced concrete shear and torsion design by the General Method. Two-way slab design by Direct Design and Equivalent Frame Method. Behaviour and design of slender reinforced concrete columns. Prestressed concrete concepts; exural analysis and design; shear design; anchorage zone design; de ection and prestress loss determination.
Prerequisite: CIVE 3206.
Lectures three hours a week, problem analysis three hours alternate weeks.

CIVE 4303 [0.5 credit] (formerly 82.433)
Urban Planning
A systematic approach to urban planning; urban sprawl; data collection; forecasting; standards; space requirements; land use; zoning; transportation; land development; site selection; land capability; layout; evaluation; housing; urban renewal and new towns. (Also listed as GEOG 4303.)
Prerequisite: third-year registration, or permission of the Department.
Lectures three hours a week, problem analysis three hours alternate weeks.

CIVE 4307 [0.5 credit] (formerly 82.437)
Municipal Hydraulics
Fluid ow fundamentals. Hydraulics of pipe systems. Open channel ow. Prediction of sanitary and storm sewage, ow rates. Design of water distribution systems, culverts, sanitary and storm sewers. Pumps and measuring devices. Hydraulic and ow control structures.
Prerequisite: MAAE 2300.
Lectures three hours a week, problem analysis 1.5 hours each week.

CIVE 4308 [0.5 credit] (formerly 82.438)
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.
Prerequisites: CIVE 3205 and fourth-year registration.
Lectures three hours a week, problem analysis three hours alternate weeks.

CIVE 4400 [0.5 credit] (formerly 82.440)
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. (Also listed as BUSI 4308.)
Prerequisite: fourth-year registration.
Lectures three hours a week, problem analysis three hours alternate weeks.

CIVE 4403 [0.5 credit] (formerly 82.443)
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.
Also offered, at the graduate level with additional or different requirements, as CIVE 5200, for which additional credit is precluded. Prerequisite: fourth-year registration or permission of the Department.
Lectures three hours a week, problem analysis three hours alternate weeks.

CIVE 4407 [0.5 credit] (formerly 82.447)
Municipal Engineering
Introduction to fundamentals of municipal engineering. Water quality: physical, chemical and biological parameters. Water treatment: softening mixing, occulation, sedimentation, filtration, disinfection, uoridation. Biological processes. Wastewater treatment: primary, secondary and tertiary treatment. Sludge disposal and wastewater reuse. Solid

waste management.
Precludes additional credit for CIVE 3307.
Prerequisite: fourth-year registration.
Lectures three hours a week, problem analysis 1.5 hours each week.

CIVE 4500 [0.5 credit] (formerly 82.450)
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.
Prerequisites: ECOR 2606 and fourth-year registration.
Lectures three hours a week, problem analysis three hours alternate weeks.

CIVE 4600 [0.5 credit] (formerly 82.460)
Advanced Building Systems
Architecture as a multi-disciplinary endeavour with emphasis on the architect's role and responsibility. Relationship of design intentions to support, enclosure, services, interior finishes with emphasis on contemporary concerns and means in architecture. Basic concepts of structural analysis and design.
Precludes additional credit for ARCC 2103.
Prerequisites: ARCC 1001 and CIVE 1005.
Lectures three hours a week, laboratory one hour a week.

CIVE 4905 [0.5 credit] (formerly 82.495)
Professional Practice
Presentations by faculty and external lecturers on the Professional Engineers Act, professional ethics and responsibilities practice within the discipline and its relationship with other disciplines and to society, health and safety, environmental stewardship, principles and practice of sustainable development. Communication skills are emphasized.
Precludes additional credit for MAAE 4905, SYSC 3905 and ELEC 3905.
Prerequisite: fourth-year registration.
Lectures three hours a week.

CIVE 4907 [1.0 credit] (formerly 82.497)
Engineering Project
A major project in engineering analysis, design, development or research carried out by individual students or small teams. The objective is to provide an opportunity to develop initiative, self-reliance, creative ability and engineering judgment. A project proposal, an interim report, an oral presentation, and a comprehensive final report are required.

CIVE 4908 [0.5 credit] (formerly 82.498)
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.
Prerequisite: fourth-year registration.
Lectures one hour a week, problem analysis seven hours a week.

Classical Civilization (CLCV)

College of the Humanities
Faculty of Arts and Social Sciences

CLCV 1000 [1.0 credit]
Introduction to Classics
An introduction to the study of Greek and Roman antiquity and to the discipline of Classics and its methodologies. The culture and society will be set in their historical context and studied through readings from representative ancient authors (in English translation) and through the art and architecture of the period.
Precludes additional credit for FYSM 1106, CLCV 1002, CLCV 1003, and CLCV 1109.
Lectures two hours a week.

CLCV 1002 [0.5 credit] (formerly 13.102*)
Survey of Greek Civilization
An introduction to the study of Greek antiquity and the discipline of Classics and its methodologies. The culture and society will be set in their historical context and studied through readings from representative ancient authors (in English translation) and through the art and architecture of the period.
Precludes additional credit for FYSM 1106, CLCV 1000, and CLCV 1109.
Lectures two hours a week.

CLCV 1003 [0.5 credit] (formerly 13.103*)
Survey of Roman Civilization
An introduction to the study of Roman antiquity and the discipline of Classics and its methodologies. The culture and society will be set in their historical context and studied through readings from representative ancient authors (in English translation) and through the art and architecture of the period.
Precludes additional credit for FYSM 1106, CLCV 1000, and CLCV 1109.
Lectures two hours a week.

CLCV 2000 [1.0 credit] (formerly 13.200)
Classical Mythology
A study of classical mythology, emphasizing its use in Greek and Roman literature and its place in classical art and religion. There is some discussion of classical myths in terms of contemporary interpretations of myth. (All texts used are in English).
Precludes additional credit for CLCV 3000.
Prerequisite: second-year standing or registration in the B.Hum. program or permission of the unit.
Lectures and discussion three hours a week.

CLCV 2006 [0.5 credit] (formerly 13.206*)
Plato and Aristotle
An historical and critical study of some central issues in the philosophy of Plato and of Aristotle. (Also listed as PHIL 2006).
Precludes additional credit for PHIL 2005.
Prerequisite: at least 0.5 credit in Philosophy or second-year standing.
Lectures three hours a week.

CLCV 2007 [0.5 credit] (formerly 13.207*)
Western Phil.: 300 BC - AD 1200
The evolution of western philosophy from the fourth through the twelfth century: theories of human nature, knowledge and reality are traced from the Hellenistic philosophers through the early medieval synthesis of reason with Christianity. Several thinkers (e.g. Plotinus, Augustine, and Anselm) are studied in depth. (Also listed as PHIL 2007.)
Precludes additional credit for PHIL 2205.
Prerequisite: CLCV 2006 or permission of the Philosophy department.
Lectures three hours a week.