# MASTER OF APPLIED SCIENCE CIVIL ENGINEERING SPECIALIZATION IN SCIENCE, SOCIETY AND POLICY

## Summary

- Degree offered: Master of Applied Science (MASc)
- Registration status options: Full-time; Part-time
- Language of instruction: English
- Primary program: MASc in Civil Engineering
- Collaborative specialization: Science, Society and Policy
- Program option (expected duration of the program):
  - within two years of full-time study
- Academic units: Faculty of Engineering (http://engineering.uottawa.ca), Department of Civil Engineering (http://engineering.uottawa.ca/civil), Ottawa-Carleton Institute of Civil Engineering (http://www.ocice.ca), Institute for Science, Society and Policy (http://issp.uottawa.ca/en)

## Program Description

**Ottawa-Carleton Joint Program**

Established in 1984, the Ottawa-Carleton Institute of Civil Engineering (OCICE) combines the research strengths and resources of the Departments of Civil and Environmental Engineering at Carleton University with that of the Department of Civil Engineering at the University of Ottawa.

The Institute offers graduate programs leading to the degrees of Master of Applied Science (MASc), Master of Engineering (MEng) and Doctor of Philosophy (PhD) in Civil Engineering.

The Institute is one of the participating units in the collaborative program in Science, Society and Policy (master's level only).

Research facilities are shared between the two campuses. Students have access to the professors, courses and facilities at both universities, however, they must enroll at the "home university" of the thesis supervisor.

## Collaborative Program Description

The collaborative program in Science, Society and Policy allows students enrolled in one of the participating master's programs to specialize in science and innovation policy.

The objective of the collaborative program is to provide students with the knowledge and skills needed to evaluate the challenges confronting decision-making at the interface of science and policy. Students will have an opportunity to explore how evidence is used in decision-making, how current policies shape the scientific enterprise, and how emerging technologies interact with society.

The degree awarded specifies the primary program and indicates "Specialization in Science, Society and Policy."

## Main Areas of Research

- Construction engineering and management
- Environmental engineering
- Geotechnical engineering
- Structural engineering
- Sustainable Materials and Construction
- Water resources engineering

## Other Programs Offered Within the Same Discipline or in a Related Area

- Master of Applied Science in Civil Engineering (MASc)
- Master of Applied Science in Environmental Engineering (MASc)
- Master of Applied Science in Environmental Engineering Specialization in Environmental Sustainability (MASc)
- Master of Engineering in Civil Engineering (MEng)
- Master of Engineering in Environmental Engineering (MEng)
- Doctorate in Philosophy in Civil Engineering (PhD)
- Doctorate in Philosophy in Environmental Engineering (PhD)

## Fees and Funding

- Program fees

  The estimated amount for university fees (https://www.uottawa.ca/university-fees) associated with this program are available under the section Finance your studies (http://www.uottawa.ca/graduate-studies/programs-admission/finance-studies).

  International students enrolled in a French-language program of study may be eligible for a differential tuition fee exemption (https://www.uottawa.ca/university-fees/differential-tuition-fee-exemption).

- To learn about possibilities for financing your graduate studies, consult the Awards and financial support (https://www.uottawa.ca/graduate-studies/students/awards) section.

## Notes

- Research activities can be conducted in either English or French or both depending on the language used by the professor and the members of the research group.
- The program is governed by the regulations and procedures for Joint Graduate Programs and the general regulations (http://www.uottawa.ca/graduate-studies/students/general-regulations) in effect for graduate studies at each of the two universities.
- In accordance with the University of Ottawa regulation, students have the right to complete their assignments, examinations, research papers, and theses in French or in English.

## Program Contact Information

Graduate Studies Office, Faculty of Engineering (https://engineering.uottawa.ca/graduate-studies-office)

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Twitter | Faculty of Engineering (https://twitter.com/uOttawaGenie?lang=en)

Facebook | Faculty of Engineer (https://www.facebook.com/uottawa.engineering)

# Twitter | Institute for Science, Society and Policy (https://twitter.com/issp_uottawa?lang=en)

# Facebook | Institute for Science, Society and Policy (https://www.facebook.com/uOttawaISSP)

## Admission Requirements

For the most accurate and up to date information on application deadlines, language tests and other admission requirements, please visit the specific requirements (https://www.uottawa.ca/graduate-studies/programs-admission/apply/specific-requirements) webpage.

## To be eligible, candidates must:

- Hold a bachelor's degree with specialization or a major in civil engineering, or in the sub-disciplines normally considered to be part of civil engineering with a minimum average of B (70%).

  Note: International candidates must check the admission equivalencies (https://www.uottawa.ca/graduate-studies/international/study-uottawa/admission-equivalencies) for the diploma they received in their country of origin.

- Applicants holding an honours bachelor's (or major) degree in an engineering discipline other than civil engineering or in science may be considered for admission to a qualifying program with the following conditions:
- Graduates from honours engineering or science programs with a mathematics content equivalent to that of the civil engineering undergraduate program will have to take a minimum of four undergraduate civil engineering courses in their area of graduate specialty.
- Graduates from other science programs (i.e. those without the mathematical content covered in a civil engineering undergraduate program) will have to take all the core engineering undergraduate mathematics courses in addition to four qualifying undergraduate civil engineering courses in their area of specialty.
- Undergraduate civil engineering courses will not be accepted towards a graduate degree. Graduate students may still be required to take undergraduate courses for units to fulfill the admission requirements.
- Demonstrate strong academic performance in previous studies as shown by official transcripts, research reports, abstracts or any other documents demonstrating research skills.
- Identify at least one professor who is willing to supervise your research and thesis.
  - We recommend that you contact potential thesis supervisors as soon as possible.
  - To register, you need to have been accepted by a thesis supervisor.
  - The supervisor's name is required at the time of application.
  - The choice of research supervisor will determine the primary campus location of the student. It will also determine which university awards the degree.

## Language Requirements

Applicants must be able to understand and fluently speak the language of instruction (French or English) in the program to which they are applying. Proof of linguistic proficiency may be required.

Applicants whose first language is neither French nor English must provide proof of proficiency in the language of instruction.

Note: Candidates are responsible for any fees associated with the language tests.

## Notes

- To be accepted into the collaborative program candidates must be admitted to the master's program in Civil Engineering.
- Students must indicate in their initial application for admission to the master's program in Civil Engineering that they wish to be accepted into a collaborative specialization in Science, Society and Policy.
- The admission requirements listed above are minimum requirements and do not guarantee admission to the program.
- Admissions are governed by the general regulations (http://www.uottawa.ca/graduate-studies/students/general-regulations) in effect for graduate studies and by the general regulations of the Ottawa-Carleton Institute of Civil Engineering (OCICE).

## Documents Required for Admission

In addition to the documents required (http://www.uottawa.ca/graduate-studies/programs-admission/apply/required-documents) for graduate and postdoctoral studies, candidates must submit the following documents:

- A resume
- A letter of intent

  Letter outlining your professional goals and proposed research area.

- Two confidential letters of recommendation from professors who have known the applicant and are familiar with the student work.

  It is highly recommended that you contact your referee prior to submitting your application to confirm their email address and their availability to complete your letter of recommendation.

- Transcripts from all universities attended:
  - Official transcripts from all universities attended must be submitted (mandatory).
    This applies to all courses and programs at any university you attended, including regular programs (completed or not), exchanges, letters of permission, online or correspondence courses, courses taken as a special student or visiting student, etc.

  - If the transcript and degree certificate are not in English or French, a certified translation (signed and stamped/sealed) must be submitted.
- A preference form (http://engineering.uottawa.ca/downloads/pdf/OCICE_Preference.pdf)
- A collaborative program enrollment form (http://issp.uottawa.ca/en/education/SSPcollaborative)

  The collaborative enrollment form must be signed by the student's thesis supervisor, as consent to participate in the collaborative program.

- 1-page cover letter (http://issp.uottawa.ca/en/education/SSPcollaborative) (500 words maximum) outlining your interest in the collaborative program and how their research topic or area aligns with the scope of inquiry at the Institute for Science, Society and Policy.

Note: Documents that are not required for admission will not be consulted, conserved or returned to the student. These documents will be destroyed according to our administrative procedures.

# Program Requirements
# Master's with Collaborative Specialization

Requirements for this program have been modified. Please consult the 2018-2019 calendars (http://catalogue.uottawa.ca/en/archives) for the previous requirements.

Students must meet the following requirements for the master's with collaborative specialization:

| | | |
|---|---|---|
| **Compulsory Courses (CVG):** | | |
| 15 optional course units in civil engineering (CVG) at the graduate level | | 15 Units |
| **Compulsory Course (ISP):** | | |
| ISP 5101 | Decision at the Interface of Science and Policy | 3 Units |
| **Seminar:** | | |
| CVG 5366 | Master's Seminar in Civil Engineering | |
| **Thesis:** | | |
| THM 7999 | Master's Thesis [1] | |

Note(s)

1. Presentation and defence of a thesis on a research topic relating to science, society and policy, carried out under the supervision of a professor who is a member of the Civil Engineering program and/or of the collaborative program. The Science, Society and Policy Graduate Committee will determine whether or not the topic of the thesis is appropriate for the designation of "Specialization in Science, Society and Policy." At least one of the thesis advisory committee members and thesis examiners must be recommended by the Science, Society and Policy Graduate Committee.
2. Students are responsible for ensuring they have met all of the thesis requirements (http://www.uottawa.ca/graduate-studies/students/theses).

# Minimum Requirements

The passing grade in all courses is B.

A student who has incurred two failures is withdrawn from the program.

# Fast-Track from Master's to PhD

Students enrolled in the master's program in civil engineering at the University of Ottawa may be eligible to fast-track directly into the doctoral program without writing a master's thesis. For additional information, please consult the "Admission Requirements" section of the PhD program.

# Research
# Research Fields & Facilities

Located in the heart of Canada's capital, a few steps away from Parliament Hill, the University of Ottawa is among Canada's top 10 research universities.

uOttawa focuses research strengths and efforts in four Strategic Areas of Development in Research (SADRs):

- Canada and the World
- Health
- e-Society
- Molecular and Environmental Sciences

With cutting-edge research, our graduate students, researchers and educators strongly influence national and international priorities.

# Research at the Faculty of Engineering

Areas of research:

- Chemical and Biological Engineering
- Civil Engineering
- Electrical Engineering and Computer Science
- Mechanical Engineering

For more information, refer to the list of faculty members and their research fields on **Uniweb**.

**IMPORTANT: Candidates and students looking for professors to supervise their thesis or research project can also consult the website of the faculty or department** (https://www.uottawa.ca/graduate-studies/students/academic-unit-contact-information) **of their program of choice. Uniweb does not list all professors authorized to supervise research projects at the University of Ottawa.**

# Courses

Not all of the following courses are necessarily given each year.

**CVG 5100 Deep Foundations (3 units)**
Deep foundation types in North American practice (driven or bored piles, and slurry trench techniques); axial and lateral capacity and settlement analysis for single piles and pile groups; field inspection methods; pile dynamics; performance and analysis of static test loading. This course is equivalent to CIVJ 5000 at Carleton University.
**Course Component:** Lecture

**CVG 5106 Site Improvements (3 units)**
Description, design procedures and usage of current site improvement techniques, including preloading, earth reinforcement, dynamic consolidation, vibrocompaction, blasting densification, lime treatment, drains, and geotechnical fabrics. This course is equivalent to CIVJ 5006 at Carleton University.
**Course Component:** Lecture

**CVG 5111 Hydraulic Structures (3 units)**
Classification and function of hydraulic structures; analysis and design of hydraulic works for gravity dams, arch dams, earth fill and rock-fill dams; ancillary works including water intakes, various types of spillways, control structures, energy dissipation and stilling basin, bottom outlets. Advanced topic in channel design including transitions; hydraulic transients, free surface and free surge analysis; water towers and compensation basins; penstocks. Navigation locks. Coastal protection works and maritime structures. This course is equivalent to CIVJ 5501 at Carleton University.
**Course Component:** Lecture

**CVG 5112 Computational Hydrodynamics (3 units)**
Finite volume methods for advection, diffusion and shallow water equations using structured and unstructured grids, finite volume methods for incompressible Navier-Stokes equations (SIMPLE, SIMPLEC, PISO), error analysis: numerical diffusion and dispersion, truncation errors and Fourier analysis, introduction to turbulence modeling, introduction to methods for tracking free surfaces and moving beds, introduction to other methods in hydrodynamics: finite element, finite difference, Chebyshev and Fourier spectra, semi Lagrangian and vortex methods inhydrodynamics. This course is equivalent to CIVJ 5502 at Carleton University.
**Course Component:** Lecture

**CVG 5120 Water Resources Systems (3 units)**
Conservation of water resources. Multi-purpose project planning: study of domestic and foreign water development projects. Techniques for simulation, optimization, linear and dynamic programming. This course is equivalent to CIVJ 5506 at Carleton University.
**Course Component:** Lecture

**CVG 5123 Advanced Topics in Hydrology (3 units)**
Selected topics of current interest in surface and groundwater hydrology. This course is equivalent to CIVJ 5509 at Carleton University.
**Course Component:** Lecture

**CVG 5124 Coastal Engineering (3 units)**
Key concepts in coastal engineering: (1) wave mechanics and coastal hydrodynamics, (2) sediment transport and coastal morphodynamics and (3) coastal structures and coastal zone management. Wave mechanics and coastal hydrodynamics to include small-amplitude wave theory, finite amplitude wave theories (Stokes, Cnoidal and solitary wave), wave generation, wave transformations, development and prediction, hydrodynamics of coastal circulation. Sediment transport and coastal morphodynamics to include: wave and current-induced sediment transport, coastal sediment processes, longshore and cross-shore beach morphologic transformations, etc. Coastal structures and coastal zone management to include: beach erosion control, coastal structures (dikes, breakwaters, groins, seawalls), beach nourishment, coastal pollution and control, nearshore area development. This course is equivalent to CIVJ 5605 at Carleton University.
**Course Component:** Lecture

**CVG 5125 Statistical Methods Hydrology (3 units)**
Concepts of probability and random variables applied to hydrology. Statistical distributions, their approximation and analysis. Statistical inference, including tests of significance and estimation theory. Linear and multivariate correlation and regression techniques. Data generation and simulation techniques for design of water-resource systems. Introduction to hydrologic and meteorologic time series. This course is equivalent to CIVJ 5601 at Carleton University.
**Course Component:** Lecture

**CVG 5130 Wastewater Treatment Process Design (3 units)**
The physical, chemical and biological processes involved in the treatment of domestic and industrial wastes. Waste characteristics, stream assimilation, biological oxidation, aeration, sedimentation, anaerobic digestion, sludge disposal. This course is equivalent to ENVJ 5900 at Carleton University.
**Course Component:** Lecture

**CVG 5132 Unit Operations of Water Treatment (3 units)**
Unit operations and unit processes involved in the treatment of a water supply for various uses. Topics included are water quality, water microbiology, sedimentation, chemical treatment, disinfection, water chemistry, flocculation. This course is equivalent to ENVJ 5901 at Carleton University.
**Course Component:** Lecture

**CVG 5133 Solid Waste Disposal (3 units)**
Collection and disposal of solid wastes. Sanitary landfill, composting, incineration and other methods of disposal. Material and energy recovery. This course is equivalent to ENVJ 5906 at Carleton University.
**Course Component:** Lecture

**CVG 5134 Chemistry for Environmental Engineering (3 units)**
Dilute aqueous solution chemistry of water and wastewater treatment. Chemical kinetics and equilibrium. Carbonate, phosphate and chlorine chemistry. Precipitation and complex formation. Corrosion. Analytical techniques and applications. This course is equivalent to ENVJ 5907 at Carleton University.
**Course Component:** Lecture

**CVG 5137 Water and Wastewater Treatment Process Analysis (3 units)**
Mass balancing in complex systems. Reaction kinetics and kinetic data analysis: classical and computer based methods. Reactor design: ideal reactors and real reactors. Analysis of tracer tests. Interfacial mass transfer: common theories. Mass transfer models. This course is equivalent to ENVJ 5905 at Carleton University.
**Course Component:** Lecture

**CVG 5137S Water and Wastewater Treatment Process Analysis (3 crédits / 3 units)**
**Volet / Course Component:** Cours magistral / Lecture

**CVG 5138 Advanced Water Treatment (3 units)**
Scope, limitations and design procedures for water treatment processes for the removal of toxic and non-standard contaminants. Current water treatment problems and regulations, activated carbon treatment, ion exchange, disinfection practices and oxidation via advanced oxidation processes (ozonation and UV oxidation), iron and manganese removal, recent developments in coagulation, membranes, air stripping. This course is equivalent to ENVJ 5902 at Carleton University.
**Course Component:** Lecture

**CVG 5139 Environmental Assessment of Civil Engineering Projects (3 units)**
Procedures and methods for systematic evaluation of the environmental impact of civil engineering projects including wastewater disposal systems, solid waste disposal systems, and water resource development systems. This course is equivalent to ENVJ 5700 at Carleton University.
**Course Component:** Lecture

**CVG 5142 Advanced Structural Dynamics (3 units)**
Dynamic behaviour of civil engineering structures under excitations due to earthquakes, wind, waves, etc. Advanced methods in dynamic analysis of structures. Prediction of structural response. Design considerations. This course is equivalent to CIVJ 5201 at Carleton University.
**Course Component:** Lecture

**CVG 5143 Advanced Structural Steel Design (3 units)**
Analysis of thin-walled beams; design applications including members under combined forces; analysis and design of beams under non-uniform torsion; limit state design methodology; comparative study of modern structural steel standards; formulating elastic and plastic interaction relations for members under combined forces; designing columns, beams, and beam columns for cross-sectional strengths; local buckling and global stability considerations; design of bracing systems. This course is equivalent to CIVJ 5202 at Carleton University.
**Course Component:** Lecture

**CVG 5144 Advanced Reinforced Concrete (3 units)**
Study of the elastic and inelastic response of reinforced concrete structures under monotonic and cyclic loading. Methods for predicting structural behaviour of concrete elements. The relationship between recent research results and building codes. This course is equivalent to CIVJ 5300 at Carleton University.
**Course Component:** Lecture

**CVG 5145 Theory of Elasticity (3 units)**
Stress-strain relations. Theories of plane stress and plane strain. Use of stress functions, energy and variational methods in the analysis of elastostatic problems. This course is equivalent to CIVJ 5203 at Carleton University.
**Course Component:** Lecture

**CVG 5146 Numerical Methods of Structural Analysis (3 units)**
Numerical procedures and methods of successive approximations for the solution of structural problems. Virtual work, principles of minimum potential and complementary energy. Applications of variation and finite difference techniques to the solutions of complicated problems in beams, plates and shells. This course is equivalent to CIVJ 5302 at Carleton University.
**Course Component:** Lecture

**CVG 5147 Theory of Plates and Shells (3 units)**
Stress distribution in flat plates of various shapes. Large deflection theory, numerical methods. Membrane theory, bending theory for cylindrical shells, bending theory for shells of revolution. This course is equivalent to CIVJ 5204 at Carleton University.
**Course Component:** Lecture

**CVG 5148 Prestressed Concrete Design (3 units)**
Materials, methods of prestressing, prestress losses, and anchorage zone stresses. Elastic analysis, design and behaviour of simple and continuous prestressed concrete beams, frames and slabs. Discussion of current design specifications. Ultimate strength of members. This course is equivalent to CIVJ 5305 at Carleton University.
**Course Component:** Lecture

**CVG 5149 Structural Stability (3 units)**
Elastic, inelastic, and torsional buckling of columns, beam column behaviour, plane and space frame stability, lateral torsional buckling of beams, global buckling of truss systems, plate and shell buckling, local buckling in tubulars, use of energy methods, matrix analysis, and finite element analysis in modeling stability problems, bracing requirements, standard provisions and design considerations in structural stability. This course is equivalent to CIVJ 5304 at Carleton University.
**Course Component:** Lecture

**CVG 5150 Advanced Concrete Technology (3 units)**
Cement: types, hydration, physical properties; aggregate: classification, grading, properties; fresh concrete: influence of basis constituents and admixtures on workability, mixing, placing; strength of hardened concrete; nature of strength, influence of constituents, curing methods; durability; chemical attack, frost action, thermal effects; elasticity, shrinkage and creep; special concrete; lightweight, high density; mix design; approaches, weigh batching, volume proportioning, special mixes; field and laboratory test methods. This course is equivalent to CIVJ 5206 at Carleton University.
**Course Component:** Lecture

**CVG 5151 Structural Design in Timber (3 units)**
Characteristic values for timber and engineered wood products, modification factors used in design; design of members subjected to compression, bending, bi-axial bending and combined bending and axial loading; design of curved glued laminated beams, lateral design for wind and seismic loading; connection design.
**Course Component:** Lecture

**CVG 5153 Wind Engineering (3 units)**
The structure and climate of wind; wind loading on structures; wind induced dynamic problems of structures; environmental aerodynamics; dispersion of pollutant; analysis of wind data; experimental investigations. This course is equivalent to CIVJ 5209 at Carleton University.
**Course Component:** Lecture

**CVG 5154 Random Vibration (3 units)**
Descriptions of random data. Frequency domain analysis and time domain analysis. Stochastic response of structures; wind and earthquake excitation, etc. Data analysis techniques. Prediction for design purposes. Simulation of random processes. Special topics. This course is equivalent to CIVJ 5308 at Carleton University.
**Course Component:** Lecture

**CVG 5155 Earthquake Engineering (3 units)**
Nature and characteristics of earthquake motions. Non-linear response of single and multi-degree-of-freedom structures to seismic excitations. Modal superposition technique. Simplified procedures for dynamic structural analysis. Principles of earthquake resistant design. Strength, stiffness, ductility and energy absorption requirements of structures for seismic forces. Response spectra analysis. Current design procedures for aseismic design. Recent research on earthquake engineering. This course is equivalent to CIVJ 5306 at Carleton University.
**Course Component:** Lecture

**CVG 5156 Finite Element Methods (3 units)**
Review of basic matrix methods. Structural idealizations. The displacement versus the force method. Stiffness properties of structural elements. Finite elements in beam bending, plane stress and plate bending. This course is equivalent to CIVJ 5301 at Carleton University.
**Course Component:** Lecture

**CVG 5157 Finite Element Methods (3 units)**
Application of finite elements to folded plates, shells and continua. Convergence criteria and order of accuracy. Inertial and initial stress properties. Dynamic and buckling problems. Non-linear deflections and plasticity. This course is equivalent to CIVJ 5303 at Carleton University.
**Course Component:** Lecture

**CVG 5158 Elements of Bridge Engineering (3 units)**
Introduction; limit state design; highway bridge design loads; analysis and design of concrete decks; impact and dynamics; load capacity rating of existing bridges and construction in cold climate. This course is equivalent to CIVJ 5307 at Carleton University.
**Course Component:** Lecture

**CVG 5159 Long Span Structures (3 units)**
Mechanics of cables. Suspension bridges and cable-stayed bridges. Space structures. Design and construction of long span structures. Dynamics of long span bridges. Case studies. Future of long span structures. This course is equivalent to CIVJ 5309 at Carleton University.
**Course Component:** Lecture

**CVG 5160 Sediment Transport (3 units)**
An introduction to particle transport, with special emphasis on river engineering applications, including natural channel design. Sediment properties, initiation of motion, bed load, suspended load, fluvial dunes, alluvial channels, bank erosion and protection, natural channel design. Special topics include contaminated sediments, local scour, morphodynamic modelling, fluvial habitat. This course is equivalent to CIVJ 5503 at Carleton University.
**Course Component:** Lecture

**CVG 5161 Mechanics of Unsaturated Soils (3 units)**
Introduction to unsaturated soils, phases of an unsaturated soil, phase properties and relations, stress state variables for saturated and unsaturated soils. Measurement of soil suction: theory of soil suction, capillarity, measurements of total suction and matric suction. Flow Laws: flow of water and measurement of permeability, shear strength theory: history, failure envelope for unsaturated soils, triaxial and direct shear tests, typical results, simple testing procedures, volume change behavior including expansive soils behavior. Soil-water characteristic curve: its behavior and use in predicting the engineering properties of unsaturated soils, practical applications of the principles of unsaturated soils. This course is equivalent to CIVJ 5106 at Carleton University.
**Course Component:** Lecture

**CVG 5162 River Hydraulics (3 units)**
Advanced concepts of river hydraulics, with an emphasis on field measurement techniques and application of numerical models. Navier-Stokes equations, turbulence, flow resistance, numerical modelling of simplified momentum and continuity equations, field-based measurement and statistical analysis of velocity fields. Special topics include contaminant transport, morphodynamic modelling. This course is equivalent to CIVJ 5504 at Carleton University.
**Course Component:** Lecture

**CVG 5175 Numerical Methods for Geotechnical Engineers (3 units)**
Non-linear analysis of stresses and deformations using the effective stress concept; analysis of consolidation using the excess pore water pressure concept; flow through porous media; finite element, discrete element and finite difference methods; applications to foundations of structures, retaining walls, dams, tunnels, pipelines, human-made and natural slopes in rock and soil. This course is equivalent to CIVJ 5105 at Carleton University.
**Course Component:** Lecture

**CVG 5178 Ice Mechanics (3 units)**
Ice conditions in the Arctic; ice physics; classification of ice; mechanical properties of ice; mathematical modelling of creep and fracture behaviour of ice; offshore structures in arctic environments; ice forces acting on structures; ice induced vibrations; iceberg impact loads; physical modelling of ice-structure interaction; ice as a construction material; case histories. This course is equivalent to CIVJ 5108 at Carleton University.
**Course Component:** Lecture

**CVG 5179 Anaerobic Digestion (3 units)**
Advanced theoretical, biological, and practical aspects of anaerobic digestion processes. Principles to be applied to the design and application of conventional and advanced anaerobic processes used for treatment of municipal and industrial wastewaters. Topics to include microbiology and biochemistry fundamentals, techniques for monitoring anaerobic digestion performance, municipal sludge stabilization, anaerobic composting, anoxic/anaerobic bioremediation, Andrew's dynamic model. Design of the following: two-phase digestion; Downflow Stationary Fixed Film (DSFF) reactors; Upflow Anaerobic Sludge Blanket (UASB); Upflow Blanket Filter (UBF) reactors; and Anaerobic Sequencing Batch Reactors (ASBR). This course is equivalent to ENVJ 5908 at Carleton University.
**Course Component:** Lecture

**CVG 5180 Biological Nutrient Removal (3 units)**
Advanced theoretical, biological, and practical aspects of biological nutrient removal (BNR) (nitrification, denitrification and excess biological phosphorus) processes. Principles to be applied to the design and application of conventional and advanced BNR processes used for treatment of municipal and industrial wastewaters. Topics are as follows: microbiology and biochemistry fundamentals of BNR, nitrification process design of suspended growth and fixed film growth systems, denitrification process design of suspended growth and fixed film growth systems, excess biological phosphorus removal design including prefermentation. Design of 2, 3, 4 and 5 stage BNR systems. General activated sludge model and Simworks for BNR systems. Retrofit of exiting plants and pilot plant testing for BNR. This course is equivalent to ENVJ 5909 at Carleton University.
**Course Component:** Lecture

**CVG 5232 Unit Operations of Water Treatment Lab (1.5 unit)**
Bench-scale and pilot-scale experiments required to: a) assess the suitability of different physicochemical processes for particular applications, and b) design a full-scale facility. Conventional analytical techniques used in water treatment (pH, alkalinity, hardness, turbidity, color, spectrophotometric analysis). Process analysis techniques for process evaluation and scale-up including: zone sedimentation, batch flux settling tests, coagulation with iron and aluminum salts, flocculent sedimentation, filtration and fluidization, flotation. This course is equivalent to ENVJ 5911 at Carleton University.
**Course Component:** Lecture
CVG 5132 is corequisite to CVG 5232.

**CVG 5238 Advanced Water Treatment Process Lab (1.5 unit)**
Bench-scale and pilot-scale experiments required to: a) assess the suitability of different physicochemical processes for the removal of toxic and non-standard contaminants, and b) design a full-scale facility. Tracer tests and non-ideal reactor behaviour, activated carbon adsorption equilibria and kinetics, aeration. Total organic carbon analysis, spectrophotometry. Process analysis, techniques for process evaluation and scale-up including: aeration, analysis of non-ideal flow conditions. Tracer study of three basins, adsorption isotherm tests, activated carbon mini-column tests, oxidation kinetic tests. This course is equivalent to ENVJ 5912 at Carleton University.
**Course Component:** Lecture
CVG 5138 is corequisite to CVG 5238.

**CVG 5311 Bridge Design (3 units)**
Design of highway bridges according to the Canadian Highway Bridge Design Code (CHBDC). Comparisons with other bridge codes (e.g., the American Code - AASHTO, the European, the New Zealand, and the British bridge codes). The topics covered include the following: main structural components of highway bridges; types of highway bridges; serviceability and ultimate limit state design requirements; design loads (dead loads, traffic loads, seismic loads, and wind loads); load combinations; code specifications for loading due to traffic (design lane, characteristics of design truck, positions of design truck on bridge, etc.); dynamic effects due to traffic loads; practical approaches specified in CHBDC for determining forces and deflections in structural embers; principles of capacity design in highway bridges. This course is equivalent to CIVJ 5310 at Carleton University.
**Course Component:** Lecture

**CVG 5312 Durability of Concrete Structures (3 units)**
i) Properties of cementitious materials (constituents of concrete; hydration of cement; structure of hardened concrete; transport processes in concrete); ii) deterioration of concrete (built-in problems; construction defects; cracking; dimensional stability; alkali-aggregate reaction; sulphate attack; corrosion of reinforcing steel; freezing-thawing cycles); (iii) evaluation of concrete structures (inspection; in-situ testing; laboratory testing); (iv) repair and maintenance of concrete (repair materials; repair procedures and techniques; prevention, protection and maintenance); and, (v) durability design (philosophy; modelling of deterioration processes; service life prediction; life-cycle cost analysis.) This course is equivalent to CIVJ 5311 at Carleton University.
**Course Component:** Lecture

**CVG 5313 Seismic Analysis and Design of Concrete Structures (3 units)**
Review of seismic hazards in Canada, building code provisions for earthquake loads, uniform hazard spectra, linear elastic modal response spectrum analysis, linear elastic time history analysis, equivalent static force procedure, advanced state-of-the-art nonlinear modeling techniques including the finite element method and fiber modeling, emerging methods such as performance-based earthquake engineering and displacement-based design, ductility concepts, plastic hinge formulations, capacity design philosophy for seismic resistance, seismic analysis and design of common seismic force resisting systems including slender and squat shear walls, moment resisting frames, coupled shear walls, and coupling beams, shear wallmoment resisting frame interaction, and lessons learned from recent earthquakes. This course is equivalent to CIVJ 5312 at Carleton University.
**Course Component:** Lecture

**CVG 5314 Geotechnical Hazards (3 units)**
Understanding of assessment, prevention, and mitigation of geotechnical hazards, overview of natural and man-made geo-hazards; concepts of hazards, disasters, vulnerability and risks; geotechnical hazards induced by problem soils: fundamentals, assessment, and mitigation; landslide hazards and risk assessment: fundamentals, solutions (prevention, stabilization) for landslides and slope instability; monitoring of landslides and slope; mining geotechnical hazards: hazards related to surface mining geotechnical facilities; hazards related to underground mining geotechnical facilities.
**Course Component:** Lecture

**CVG 5320 Fire Behaviour of Materials (3 units)**
Fundamentals and scientific aspects of the behaviour of materials during fires and the fire hazards of materials. Topics to be covered include material specifications, thermal and mechanical properties, structural fire response, residual strength, failure criteria, mechanisms of flame retardancy, and standards and testing protocols. This course is equivalent to CIVE 5615 at Carleton University.
**Course Component:** Lecture

**CVG 5321 Finite Elements in Field Problems (3 units)**
Use of Galerkin and Ritz finite element formulation to solve one and two dimensional field problems, steady state and time-dependent phenomena involving potentials, heat transfer, fluid flow, diffusion, and dispersion with emphasis on practical applications. Courses EVG 7402 CVG 5321 cannot be combined for units. This course is equivalent to CIVE 5107 at Carleton University.
**Course Component:** Lecture
Prerequisite: Basic knowledge of third year-level undergraduate engineering mathematics. Courses EVG 7402, CVG 5321 cannot be combined for units.

**CVG 5331 Sludge Utilization and Disposal (3 units)**
Introduction to sludge processing technology and procedures to be used in the planning and design of sludge treatment processes. Evaluate the economics and performance of sludge unit process operations. Selection of methods for final disposition of sludge. This course is equivalent to ENVJ 5902 at Carleton University.
**Course Component:** Lecture

**CVG 5366 Master's Seminar in Civil Engineering**
Attendance and participation in the monthly seminar. All students must make one presentation and continue to attend throughout the program. Graded S (Satisfactory) / NS (Not satisfactory).
**Course Component:** Seminar

**CVG 6000 Projet en génie civil / Civil Engineering Report (6 crédits / 6 units)**
Ce cours est équivalent à CIVE 5900 à la Carleton University. / This course is equivalent to CIVE 5900 at Carleton University.
**Volet / Course Component:** Recherche / Research

**CVG 6108 Directed Studies I (3 units)**
Special courses set up for one student on an exceptional basis. Limited to one in the Master's level and to two total Master's plus PhD. This course is equivalent to CIVE 5906 at Carleton University.
**Course Component:** Research
Permission of the Department is required.

**CVG 6109 Directed Studies II (3 units)**
Special courses set up for one student on an exceptional basis. Limited to one in the Master's level and to two total Master's plus PhD. This course is equivalent to CIVE 5907 at Carleton University.
**Course Component:** Research
Permission of the Department is required.

**CVG 6301 Special Topics in Civil Engineering (3 units)**
This course is equivalent to CIVJ 6001 at Carleton University.
**Course Component:** Lecture

**CVG 6303 Special Topics in Civil Engineering (3 units)**
This course is equivalent to CIVJ 6003 at Carleton University.
**Course Component:** Lecture

**CVG 6304 Special Topics in Civil Engineering (3 units)**
This course is equivalent to CIVJ 6004 at Carleton University.
**Course Component:** Lecture

**CVG 6305 Special Topics in Civil Engineering (3 units)**
This course is equivalent to CIVJ 6005 at Carleton University.
**Course Component:** Lecture

**CVG 6306 Special Topics in Civil Engineering (3 units)**
This course is equivalent to CIVJ 6006 at Carleton University.
**Course Component:** Lecture

**CVG 6307 Special Topics in Civil Engineering (3 units)**
This course is equivalent to CIVJ 6007 at Carleton University.
**Course Component:** Lecture

**CVG 6308 Special Topics in Civil Engineering (3 units)**
This course is equivalent to CIVJ 6008 at Carleton University.
**Course Component:** Lecture

**CVG 6309 Special Topics in Civil Engineering (3 units)**
This course is equivalent to CIVJ 6009 at Carleton University.
**Course Component:** Lecture

**CVG 6310 Special Topics in Civil Engineering (3 units)**
This course is equivalent to CIVJ 6010 at Carleton University.
**Course Component:** Lecture

**CVG 6311 Special Topics in Civil Engineering (3 units)**
This course is equivalent to CIVJ 6011 at Carleton University.
**Course Component:** Lecture

**CVG 6312 Special Topics in Civil Engineering (3 units)**
This course is equivalent to CIVJ 6012 at Carleton University.
**Course Component:** Lecture

**CVG 6313 Special Topics in Civil Engineering (3 units)**
This course is equivalent to CIVJ 6013 at Carleton University.
**Course Component:** Lecture

**CVG 6314 Special Topics in Civil Engineering (3 units)**
This course is equivalent to CIVJ 6014 at Carleton University.
**Course Component:** Lecture

**CVG 6315 Special Topics in Civil Engineering (3 units)**
This course is equivalent to CIVJ 6015 at Carleton University.
**Course Component:** Lecture

**CVG 6316 Special Topics in Civil Engineering (3 units)**
This course is equivalent to CIVJ 6016 at Carleton University.
**Course Component:** Lecture

**CVG 6317 Special Topics in Civil Engineering (3 units)**
This course is equivalent to CIVJ 6017 at Carleton University.
**Course Component:** Lecture

**CVG 6318 Special Topics in Civil Engineering (3 units)**
This course is equivalent to CIVJ 6018 at Carleton University.
**Course Component:** Lecture

**CVG 6319 Special Topics in Civil Engineering (3 units)**
**Course Component:** Lecture

**CVG 6320 Special Topics in Civil Engineering (3 units)**
This course is equivalent to CIVJ 6020 at Carleton University.
**Course Component:** Lecture

**CVG 6508 Études dirigées I (3 crédits)**
Cours individuels créés seulement pour les cas exceptionnels. Un étudiant peut en suivre un au niveau de la maîtrise ou un total de deux pour les études de maîtrise et de doctorat.
**Volet :** Cours magistral

**CVG 6509 Études dirigées II (3 crédits)**
Cours individuels créés seulement pour les cas exceptionnels. Un étudiant peut en suivre un au niveau de la maîtrise ou un total de deux pour les études de maîtrise et de doctorat.
**Volet :** Cours magistral

**CVG 7100 Case Studies in Geotechnical (3 units)**
This course is equivalent to CIVE 5209 at Carleton University.
**Course Component:** Lecture

**CVG 7101 Advanced Soil Mechanics I (3 units)**
This course is equivalent to CIVE 5300 at Carleton University.
**Course Component:** Lecture

**CVG 7102 Advanced Soil Mechanics II (3 units)**
**Course Component:** Lecture

**CVG 7103 Pavement and Materials (3 units)**
This course is equivalent to CIVE 5303 at Carleton University.
**Course Component:** Lecture

**CVG 7104 Earth Retaining Structures (3 units)**
This course is equivalent to CIVE 5500 at Carleton University.
**Course Component:** Lecture

**CVG 7105 Foundation Engineering (3 units)**
This course is equivalent to CIVE 5501 at Carleton University.
**Course Component:** Lecture

**CVG 7106 In Situ Meth in Geomechanics (3 units)**
This course is equivalent to CIVE 5502 at Carleton University.
**Course Component:** Lecture

**CVG 7107 Numerical Methods in Geomechanics (3 units)**
This course is equivalent to CIVE 5503 at Carleton University.
**Course Component:** Lecture

**CVG 7108 Seepage and Water Flow Through Soils (3 units)**
This course is equivalent to CIVE 5504 at Carleton University.
**Course Component:** Lecture

**CVG 7109 Geotechnical Earthquake Engineering (3 units)**
This course is equivalent to CIVE 5505 at Carleton University.
**Course Component:** Lecture

**CVG 7120 Introductory Elasticity (3 units)**
This course is equivalent to CIVE 5101 at Carleton University.
**Course Component:** Lecture

**CVG 7121 Advanced Elasticity (3 units)**
This course is equivalent to CIVE 5102 at Carleton University.
**Course Component:** Lecture

**CVG 7122 Finite Element Methods Stress Analysis (3 units)**
This course is equivalent to CIVE 5103 at Carleton University.
**Course Component:** Lecture

**CVG 7123 Earthquake Analysis and Design of Structures (3 units)**
This course is equivalent to CIVE 5104 at Carleton University.
**Course Component:** Lecture

**CVG 7124 Advanced Finite Element Analysis in Structural Mechanics (3 units)**
This course is equivalent to CIVE 5105 at Carleton University.
**Course Component:** Lecture

**CVG 7125 Theory of Structural Stability (3 units)**
This course is equivalent to CIVE 5203 at Carleton University.
**Course Component:** Lecture

**CVG 7126 Behaviour of Steel Structure (3 units)**
This course is equivalent to CIVE 5204 at Carleton University.
**Course Component:** Lecture

**CVG 7127 Analysis of Elastic Structures (3 units)**
This course is equivalent to CIVE 5205 at Carleton University.
**Course Component:** Lecture

**CVG 7128 Prestressed Concrete (3 units)**
This course is equivalent to CIVE 5206 at Carleton University.
**Course Component:** Lecture

**CVG 7129 Advanced Structural Design (3 units)**
**Course Component:** Lecture

**CVG 7130 Advanced Reinforced Concrete (3 units)**
This course is equivalent to CIVE 5208 at Carleton University.
**Course Component:** Lecture

**CVG 7131 Project Management (3 units)**
This course is equivalent to CIVE 5600 at Carleton University.
**Course Component:** Lecture

**CVG 7132 Computer-Aided Design of Building Structures (3 units)**
**Course Component:** Lecture

**CVG 7137 Dynamics of Structures (3 units)**
This course is equivalent to CIVE 5106 at Carleton University.
**Course Component:** Lecture

**CVG 7138 Engineered Masonry Behaviour and Design (3 units)**
This course is equivalent to CIVE 5200 at Carleton University.
**Course Component:** Lecture

**CVG 7139 Behaviour and Design of Steel Structures (3 units)**
**Course Component:** Lecture

**CVG 7140 Statistics, Probabilities and Decision-Making (3 units)**
This course is equivalent to CIVE 5601 at Carleton University.
**Course Component:** Lecture

**CVG 7141 Advanced Methods in Computer-Aided Design (3 units)**
This course is equivalent to CIVE 5602 at Carleton University.
**Course Component:** Lecture

**CVG 7142 Engineering Management (3 units)**
**Course Component:** Lecture

**CVG 7143 Design of Steel Bridges (3 units)**
This course is equivalent to CIVE 5605 at Carleton University.
**Course Component:** Lecture

**CVG 7144 Design of Concrete Bridges (3 units)**
This course is equivalent to CIVE 5606 at Carleton University.
**Course Component:** Lecture

**CVG 7145 Introduction to Bridge Design (3 units)**
This course is equivalent to CIVE 5607 at Carleton University.
**Course Component:** Lecture

**CVG 7150 Intercity Transportation, Planning and Management (3 units)**
This course is equivalent to CIVE 5304 at Carleton University.
**Course Component:** Lecture

**CVG 7151 Traffic Engineering (3 units)**
This course is equivalent to CIVE 5305 at Carleton University.
**Course Component:** Lecture

**CVG 7152 Highway Materials (3 units)**
This course is equivalent to CIVE 5306 at Carleton University.
**Course Component:** Lecture

**CVG 7153 Urban Transportation and Management (3 units)**
This course is equivalent to CIVE 5307 at Carleton University.
**Course Component:** Lecture

**CVG 7154 Geometric Design (3 units)**
This course is equivalent to CIVE 5308 at Carleton University.
**Course Component:** Lecture

**CVG 7155 Intercity Transportation Supply (3 units)**
This course is equivalent to CIVE 5309 at Carleton University.
**Course Component:** Lecture

**CVG 7156 Transportation Economics and Policy (3 units)**
This course is equivalent to CIVE 5401 at Carleton University.
**Course Component:** Lecture

**CVG 7158 Airport Planning (3 units)**
This course is equivalent to CIVE 5403 at Carleton University.
**Course Component:** Lecture

**CVG 7159 Transportation Terminal (3 units)**
This course is equivalent to CIVE 5402 at Carleton University.
**Course Component:** Lecture

**CVG 7160 Biofilm Processes in Waste-Water Treatment (3 units)**
This course is equivalent to ENVE 5001 at Carleton University.
**Course Component:** Lecture

**CVG 7161 Traffic Related Air Pollution (3 units)**
This course is equivalent to ENVE 5102 at Carleton University.
**Course Component:** Lecture

**CVG 7162 Ambient Air Quality and Pollution Modelling (3 units)**
This course is equivalent to ENVE 5103 at Carleton University.
**Course Component:** Lecture

**CVG 7163 Case Studies in Hydrogeology (3 units)**
This course is equivalent to ENVE 5302 at Carleton University.
**Course Component:** Lecture

**CVG 7164 Multiphase Flow and Contaminant Transport Modelling (3 units)**
**Course Component:** Lecture

**CVG 7170 Fundamentals of Fire Safety Engineering (3 units)**
This course is equivalent to CIVE 5609 at Carleton University.
**Course Component:** Lecture

**CVG 7171 Fire Dynamics I (3 units)**
This course is equivalent to CIVE 5610 at Carleton University.
**Course Component:** Lecture

**CVG 7172 Fire Dynamics II (3 units)**
This course is equivalent to CIVE 5613 at Carleton University.
**Course Component:** Lecture

**CVG 7173 People in Fires (3 units)**
This course is equivalent to CIVE 5611 at Carleton University.
**Course Component:** Lecture

**CVG 7174 Fire Modelling (3 units)**
This course is equivalent to CIVE 5612 at Carleton University.
**Course Component:** Lecture

**CVG 7175 Design for Fire Resistance (3 units)**
This course is equivalent to CIVE 5614 at Carleton University.
**Course Component:** Lecture

**CVG 7300 Special Topics in Civil Engineering (3 units)**
This course is equivalent to CIVE 5705 at Carleton University.
**Course Component:** Lecture

**CVG 7301 Special Topics in Civil Engineering (3 units)**
**Course Component:** Lecture

**CVG 7302 Special Topics in Civil Engineering (3 units)**
**Course Component:** Lecture

**CVG 7303 Special Topics in Civil Engineering (3 units)**
**Course Component:** Lecture

**CVG 7304 Special Topics in Civil Engineering (3 units)**
**Course Component:** Lecture

**CVG 7305 Special Topics in Civil Engineering (3 units)**
**Course Component:** Lecture

**CVG 7306 Special Topics in Civil Engineering (3 units)**
**Course Component:** Lecture

**CVG 7307 Special Topics in Civil Engineering (3 units)**
**Course Component:** Lecture

**CVG 7308 Special Topics in Civil Engineering (3 units)**
**Course Component:** Lecture

**CVG 7309 Special Topics in Civil Engineering (3 units)**
**Course Component:** Lecture

**CVG 7310 Special Topics in Civil Engineering (3 units)**
**Course Component:** Lecture

**CVG 7311 Special Topics in Civil Engineering (3 units)**
**Course Component:** Lecture

**CVG 7312 Special Topics in Civil Engineering (3 units)**
**Course Component:** Lecture

**CVG 7313 Special Topics in Civil Engineering (3 units)**
**Course Component:** Lecture

**CVG 7314 Special Topics in Civil Engineering (3 units)**
**Course Component:** Lecture

**CVG 7315 Special Topics in Civil Engineering (3 units)**
**Course Component:** Lecture

**CVG 7316 Special Topics in Civil Engineering (3 units)**
**Course Component:** Lecture

**CVG 7317 Special Topics in Civil Engineering (3 units)**
**Course Component:** Lecture

**CVG 7318 Special Topics in Civil Engineering (3 units)**
**Course Component:** Lecture

**CVG 7319 Special Topics in Civil Engineering (3 units)**
**Course Component:** Lecture

**CVG 7320 Special Topics in Civil Engineering (3 units)**
**Course Component:** Lecture

**CVG 8366 Doctoral Seminar in Civil Engineering**
Attendance and participation in the monthly seminar. All students must make one presentation and continue to attend throughout the program. Graded S (Satisfactory) / NS (Not satisfactory).
**Course Component:** Seminar

**CVG 9998 Examen général de doctorat / Comprehensive Examination (Phd)**
Ce cours est équivalent à CIVE 6902 à la Carleton University. / This course is equivalent to CIVE 6902 at Carleton University.
**Volet / Course Component:** Recherche / Research

**ISP 5101 Decision at the Interface of Science and Policy (3 units)**
This course explores a number of critical issues in the design and implementation of science (or, more generally, evidence)-based policy. Topics will include: the nature of scientific evidence; who has standing in the provisioning of scientific evidence; the science and non-science of risk assessment; ethical dimensions of policy design and implementation; the role of science in policy design and implementation; the policy making process; and science policy performance evaluation.
**Course Component:** Lecture

**ISP 5102 Science andTechnology Governance and Communication (3 units)**
This course explores a number of critical issues in the governance of science and technology (S&T) in democratic societies, with particular emphasis on the Canadian context. Topics will include the following: the history of S&T governance and communication in both Canada and abroad; an overview of the Canadian S&T policy and regulatory landscape; the role of government, the private sector and civil society in S&T governance; policy and regulatory experiments in fostering innovation (and the success thereof); the evolution of public S&T communication strategies and governance of emerging technologies.
**Course Component:** Lecture

**ISP 5103 Capstone Seminar in Science, Society and Policy (3 units)**
Involves partnering with organization(s) working on an issue relating to science, society and policy. In consultation with a member of the organization, students analyze the issue and complete a written report, either singly or in interdisciplinary teams, under the direction of the seminar professor who is responsible for evaluating the report.
**Course Component:** Lecture

**ISP 5501 Prise de décision à l'interface de la science et des politiques (3 crédits)**
Ce cours approfondit un certain nombre d'enjeux critiques liés à la conception et à la mise en oeuvre de politiques scientifiques (ou, de façon plus générale, fondées sur des preuves). Les sujets abordés incluent les suivants : la nature de la preuve scientifique; qui a qualité pour fournir des preuves scientifiques; le côté scientifique et le côté non scientifique de l'évaluation des risques; les dimensions éthiques de la conception et de la mise en oeuvre des politiques publiques; le rôle de la science dans la conception et la mise en oeuvre des politiques publiques; le processus d'élaboration des politiques publiques; et l'évaluation du rendement des politiques publiques en matière de sciences.
**Volet :** Cours magistral

**ISP 5502 Gouvernance et communication en science et technologie (3 crédits)**
Ce cours approfondit un certain nombre d'enjeux critiques liés à la gouvernance des sciences et de la technologie (S et T) dans les sociétés démocratiques et, en particulier, dans le contexte canadien. Les sujets abordés incluent les suivants : l'histoire de la gouvernance et de la communication en sciences et technologie au Canada et à l'étranger; un aperçu du paysage réglementaire et politique canadien ayant trait aux sciences et à la technologie; le rôle du gouvernement, du secteur privé et de la société civile dans la gouvernance des sciences et de la technologie; les expériences relatives aux politiques et à la réglementation menées en vue de favoriser l'innovation (et leur réussite); l'évolution des stratégies de communication publique concernant les sciences et la technologie et la gouvernance des nouvelles technologies.
**Volet :** Cours magistral

**ISP 5503 Séminaire d'intégration en science, société et politique publique (3 crédits)**
Involves partnering with organization(s) working on an issue relating to science, society and policy. In consultation with a member of the organization, students analyze the issue and complete a written report, either singly or in interdisciplinary teams, under the direction of the seminar professor who is responsible for evaluating the report.
**Volet :** Cours magistral