

Infrastructure Protection and International Security

- **M. Infrastructure Protection and International Security**
- **M. Eng. Infrastructure Protection and International Security**

M. Infrastructure Protection and International Security

About the Program

The Infrastructure Protection and International Security program is designed to offer students a cross-disciplinary understanding of critical infrastructure protection (CIP) challenges.

M. I.P.I.S.

Students with a policy background will complete a program of study that reinforces their national security policy, intelligence, and terrorism expertise with an understanding of infrastructure engineering design and mitigation.

M.Eng. I.P.I.S.

Students with an engineering background will complete a program of study that combines traditional engineering courses related to infrastructure protection (such as infrastructure engineering design or systems engineering and security) with more general courses on CIP risk management and security from a social science and policy perspective.

Academic Regulations

See the General Regulations section of this Calendar.

Admission Requirements

Students who have not successfully completed an engineering economics course (equivalent to Carleton's ECOR 3800 Engineering Economics) at the time of their application will be required to either successfully complete ECOR 3800 (or an equivalent) prior to registration or as part of their first year of study. If required, completion of an engineering economics course is extra to the degree requirements.

M. Infrastructure Protection and International Security

The minimum requirement for admission into the Master's program is a B.A. Honours degree in a discipline related to International Affairs or a Bachelor's degree in Science or Engineering. Students will normally be expected to have a B+ average (or higher) to be considered for admission into the program.

Students without a background in engineering or science will be required to complete an in-program course (IPIS 5001) covering basic mathematics, physics and engineering principles; this course will be in addition to the regular degree requirements. IPIS 5001 is a prerequisite

for the required course in Infrastructure Engineering Principles, and for other engineering electives.

M. Eng. Infrastructure Protection and International Security

The minimum requirement for admission into the M.Eng (IPIS) program is a B.Eng degree or equivalent. Students will normally be expected to have a B+ average (or higher) to be considered for admission into the program.

Proficiency in English is necessary to pursue graduate studies at Carleton University. All applicants whose first language is not English must satisfy this requirement as per the General Regulations.

Program Requirements

Additional requirements may be stipulated, depending on the background of the individual student.

M. Infrastructure Protection and International Security (5.0 credits)

1. 2.0 credits in:		2.0
IPIS 5101 [0.5]	Critical Infrastructure Protection: Issues and Strategies	
IPIS 5103 [0.5]	Infrastructure Engineering Principles	
IPIS 5105 [0.5]	Critical Infrastructure Risk Assessment	
IPIS 5106 [0.5]	Management of Critical Infrastructure	
2. 1.0 credit from:		1.0
IPIS 5104 [0.5]	Terrorism and International Security	
IPIS 5301 [0.5]	Disarmament, Arms Control and Nonproliferation	
IPIS 5302 [0.5]	Contemporary International Security	
IPIS 5303 [0.5]	Intelligence Statecraft and International Affairs	
IPIS 5304 [0.5]	Intelligence and National Security: Policies and Operations	
IPIS 5305 [0.5]	National Security Policy and Law	
IPIS 5320 [0.5]	Topics in Infrastructure Security Policy	
3. 1.0 credit from:		1.0
IPIS 5501 [0.5]	Transportation and Aviation Security	
IPIS 5504 [0.5]	Fundamentals of Fire Safety	
IPIS 5505 [0.5]	Natural Hazards in Canada: Risk and Impact	
IPIS 5507 [0.5]	Blast-load Effects on Structures	
IPIS 5520 [0.5]	Selected Topics in Engineering of Critical Infrastructure	
4. 1.0 credit normally comprised of courses with CIVE, INAF or IPIS course designations, but may also be chosen from related programs with approval from the Graduate Supervisor in consultation with the Program Director and associated faculty when necessary.		1.0

Total Credits **5.0**

M.Eng. Infrastructure Protection and International Security (5.0 credits)

1. 1.5 credits in: **1.5**

IPIS 5101 [0.5]	Critical Infrastructure Protection: Issues and Strategies	
IPIS 5105 [0.5]	Critical Infrastructure Risk Assessment	
IPIS 5106 [0.5]	Management of Critical Infrastructure	
2. 1.0 credit from:		1.0
IPIS 5301 [0.5]	Disarmament, Arms Control and Nonproliferation	
IPIS 5302 [0.5]	Contemporary International Security	
IPIS 5303 [0.5]	Intelligence Statecraft and International Affairs	
IPIS 5304 [0.5]	Intelligence and National Security: Policies and Operations	
IPIS 5305 [0.5]	National Security Policy and Law	
IPIS 5320 [0.5]	Topics in Infrastructure Security Policy	

or a non-engineering course approved by the IPIS Director or Associate Director.

3. 1.5 credit from:		1.5
IPIS 5501 [0.5]	Transportation and Aviation Security	
IPIS 5504 [0.5]	Fundamentals of Fire Safety	
IPIS 5505 [0.5]	Natural Hazards in Canada: Risk and Impact	
IPIS 5507 [0.5]	Blast-load Effects on Structures	
IPIS 5520 [0.5]	Selected Topics in Engineering of Critical Infrastructure	

or an engineering course approved by the IPIS Director or Associate Director.

4. 1.0 credit remaining may be selected as follows: **1.0**

Coursework Program Option:

- 1.0 credit from graduate courses from the Faculty of Engineering and Design that have been selected in consultation with, and approved by, the MIPIS Director and Associate Director

Research Project Option:

1.0 credit in:

IPIS 5907 [0.5]	Research Project	
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Total Credits **5.0**

Co-op Option

Full-time IPIS students who have completed 1.5 credits in their first term, including 1.0 credits from the core compulsory courses and either of and ECOR 3800 Engineering Economics or IPIS 5001 if required, may select a co-op option to start in their third term. Registration in subsequent co-op terms will require the successful completion of all core program requirements.

The 0.0 credit IPIS 5913 [0.0] Co-operative Work Term is in addition to the 5.0 credits required for the IPIS program - Two (2) co-ops terms must be successfully completed before the student is eligible to receive a co-op designation on their academic transcript. Students will be registered in the co-op course IPIS 5913 [0.0] Co-operative Work Term once they are successful in their co-op job search, and are restricted from taking more than 0.5 credit at the same time. If a student opts to undertake 0.5

credit while on a co-op work term, the credit must be taken outside of regular working hours.

Work terms are four months in duration, and typically students are employed at the junior officer level in government departments or other organizations. Information and procedures can be obtained from the Carleton University Co-op Office.

IPIS 5001 [0.5 credit]

Mathematics and Engineering Primer for non-Engineers

Provides a review and application of basic mathematics, physics and engineering principles required to prepare non-engineers and other students without a previous background in mathematics for the required course in Infrastructure Engineering Principles (IPIS 5103) and other engineering courses.

IPIS 5101 [0.5 credit]

Critical Infrastructure Protection: Issues and Strategies

Examines critical infrastructure, its interdependencies, vulnerabilities, and security requirements; intentional and natural risks; policy responses to threat and vulnerability assessments; risk management approaches, prevention and protective security, emergency management and damage mitigation measures; continuity of critical operations and resilience planning.

IPIS 5103 [0.5 credit]

Infrastructure Engineering Principles

Introduction to infrastructure engineering: civil, municipal/environmental, energy, communications, and military infrastructure systems; engineering principles; design, analysis and construction techniques; lifecycle performance, maintenance and retrofit strategies; optimization, asset-management; decision-making and decision support tools.

Prerequisite(s): IPIS 5001 or equivalent approved by the IPIS Graduate Supervisor.

IPIS 5104 [0.5 credit]

Terrorism and International Security

Contemporary international terrorism in comparative perspective; religious and ideological parameters motivating terrorism; sociology of recruitment and participation; evolving structure and dynamics of terror networks; terrorism finance, operations and related activities; impact of counter-terrorism measures; examples are drawn from international and domestic terrorism. Also listed as INAF 5244.

IPIS 5105 [0.5 credit]

Critical Infrastructure Risk Assessment

Risk-assessment techniques and methodologies relevant for the identification of threats. Assessment of vulnerabilities and evaluating the impact on infrastructures or systems considering the probability of such threats being realized.

IPIS 5106 [0.5 credit]**Management of Critical Infrastructure**

Management of critical infrastructure (CI) and its relationship to facility and asset management; asset maintenance, rehabilitation, and restoration; tools, systems and approaches to effective CI management, integration and linkages across CI and consequent challenges to managers of critical infrastructure systems. Precludes additional credit for CIVE 5809 (2005-2007), CIVE 5404 and IPIS 5102 (2010-2014).

IPIS 5301 [0.5 credit]**Disarmament, Arms Control and Nonproliferation**

Origins, theory and practice, with a focus on so-called weapons of mass destruction and current controversies. Emphasis on treaty negotiation and implementation, including monitoring, verification, facilitation and enforcement of compliance. Also listed as INAF 5201.

IPIS 5302 [0.5 credit]**Contemporary International Security**

The evolving strategic and security environment since the end of the Cold War, encompassing both traditional and non-traditional concepts. Topics include hegemonism; the rise of new powers; terrorism; multilateralism; human security; and new security threats, including climate change. Also listed as INAF 5202.

IPIS 5303 [0.5 credit]**Intelligence Statecraft and International Affairs**

The role of intelligence in foreign and security policy after the Cold War. Evolution of intelligence as regards strategic and policy requirements, the capabilities of selected services, interactions within government and civil society. Emphasis on the structure and functions of Canada's intelligence community. Also listed as INAF 5204.

IPIS 5304 [0.5 credit]**Intelligence and National Security: Policies and Operations**

The roles and activities of intelligence services of selected countries. Their performance will be assessed in the light of historical experience, and in the context of the policy, legal and ethical constraints. Also listed as INAF 5224.

IPIS 5305 [0.5 credit]**National Security Policy and Law**

The international legal and policy implications of identifying and responding to national security threats. Topics include: intelligence gathering; verification regimes; military and counter-terrorism operations; criminal prosecution; and, balancing human rights and security concerns. Also listed as INAF 5234.

IPIS 5320 [0.5 credit]**Topics in Infrastructure Security Policy**

Courses in special topics related to infrastructure security, not covered by other graduate courses; course topics will be available prior to registration.

IPIS 5501 [0.5 credit]**Transportation and Aviation Security**

Canadian Public Security Strategy and Transportation System security environment; Civil Aviation security and operations: trends, impacts, and implications of evolving policies, operations, and technologies; security vulnerabilities in the transportation system; transportation of hazardous materials; secure movements on roads, highways and railways.

IPIS 5504 [0.5 credit]**Fundamentals of Fire Safety**

The fire safety system; social, economic and environmental issues; description of the fire safety regulatory system and the governing building codes and standards. This includes the global fire safety system in a facility and active fire protection systems; detection, suppression, smoke management. Precludes additional credit for CIVE 5707 (2001-2003), CIVE 5609.

IPIS 5505 [0.5 credit]**Natural Hazards in Canada: Risk and Impact**

Earthquakes and ground motion, tsunamis, landslides, liquefaction; soil properties for ground response analysis: laboratory tests, in-situ tests; dams and embankments, slope stability, seismic effects on slope stability, retaining structures. Precludes additional credit for EARTH 5215.

IPIS 5507 [0.5 credit]**Blast-load Effects on Structures**

Threats, risk analysis, vulnerability assessment; explosives: types and mechanisms; load determination; response of structural elements under blast loads, analysis and design for blast loads; blast mitigation, retrofit of structures; post-event assessment. Also listed as CIVE 5507. Precludes additional credit for CIVE 5707 (2007-2008).

IPIS 5520 [0.5 credit]**Selected Topics in Engineering of Critical Infrastructure**

Courses in special topics related to infrastructure security, not covered by other graduate courses; course topics will be available prior to registration.

IPIS 5907 [0.5 credit]**Research Project**

Students may be given permission to undertake an approved research project that will conduct a study, analysis or design project that relates to the protection and security of infrastructure under the general supervision of an engineer approved by the MIPIS Director or Graduate Supervisor.

Requires permission of the MIPIS Program Director or Graduate Supervisor.

IPIS 5908 [0.5 credit]**Research Paper**

Students may be given permission to conduct independent research under the general guidance of a research supervisor, examining an approved policy-relevant topic that integrates the infrastructure, engineering and security elements of their program of study.

Prerequisite(s): permission of the MIPIS Program Director or Graduate Supervisor.

IPIS 5909 [1.0 credit]**Infrastructure Engineering Project**

Students enrolled in the MIPIS Engineering field may be given permission to undertake a project that will conduct a study, analysis or design that relates to the protection and security of infrastructure. The student's supervisor must be approved by the MIPIS Director or Graduate Supervisor.

Requires permission of the MIPIS Program Director or Graduate Supervisor.

IPIS 5913 [0.0 credit]**Co-operative Work Term**

Prerequisite(s): eligibility for registration in the Co-operative Education Option in the Master of Infrastructure Protection and International Security Program requires successful completion of 1.5 credits from core courses, all additional course requirements (IPIS 5001 or ECOR 3800), and 1.5 credits in additional program electives. Requires permission from the MIPIS Program Director and Associate Director.

Summer session: some of the courses listed in this Calendar are offered during the summer. Hours and scheduling for summer session courses will differ significantly from those reported in the fall/winter Calendar. To determine the scheduling and hours for summer session classes, consult the class schedule at central.carleton.ca

Not all courses listed are offered in a given year. For an up-to-date statement of course offerings for the current session and to determine the term of offering, consult the class schedule at central.carleton.ca