

Infrastructure Protection and International Security

- **M. Infrastructure Protection and International Security**
- **M. Eng. Infrastructure Protection and International Security**
- **Graduate Diplomas in Infrastructure Protection and International Security**

M. Infrastructure Protection and International Security

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	

Or 5000-level courses from the IIA or SDP designated fields offered by the Norman Paterson School of International Affairs.

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 5508 [0.5]	Introduction to Explosives and Explosion Effects as they relate to Infrastructure and its Components	
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 that have been selected in consultation with, and approved by, the MIPIS Director and Associate Director and associated faculty when necessary.

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 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	
Or 5000-level courses from the Intelligence and International Affairs (IIA) and Security Defence Policy (SDP) designated fields offered by the Norman Paterson School of International Affairs.		
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 5508 [0.5]	Introduction to Explosives and Explosion Effects as they relate to Infrastructure and its Components	
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 [1.0]	Research Project	
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-op 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.

Master's Level Graduate Diploma 2 Concurrent Master's Level Graduate Diploma 3 Direct Entry Academic Regulations

See the General Regulations section of this Calendar.

Admission Requirements

The minimum requirement for admission into the master's level graduate diplomas is a B.A. (Honours) degree in a discipline related to International Affairs or a Bachelor's degree in 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 the regular degree requirements. IPIS 5001 is a prerequisite for the required course in Infrastructure Engineering Principles, and for other engineering electives.

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.

Graduate Diplomas in Infrastructure Protection and International Security (Type 2 and Type 3)

Graduate Diplomas in Infrastructure Protection and International Security (3.0 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. 1.5 credits in:		1.5
a) for students without a B.Eng. in Civil Engineering (or equivalent),		
0.5 credit in:		
IPIS 5103 [0.5]	Infrastructure Engineering Principles	
and 1.0 credits from electives		
b) for students with a B.Eng. in Civil Engineering (or equivalent), 1.5 credits from electives:		
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	
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 5508 [0.5]	Introduction to Explosives and Explosion Effects as they relate to Infrastructure and its Components	
IPIS 5520 [0.5]	Selected Topics in Engineering of Critical Infrastructure	
Total Credits		3.0

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.
Also listed as 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 5508 [0.5 credit]**Introduction to Explosives and Explosion Effects as they relate to Infrastructure and its Components**

Properties and effects of explosives, propellants and pyrotechnics, detonation, deflagration and consequence of confinement, commercial and military applications including areas of terrorism and entertainment, sensitivities and hazards in transport, storage and use, specialized charges, explosion effects and indicators, and bombings and accident investigations.
Precludes additional credit for IPIS 5520.

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 5901 [0.5 credit]**Tutorials in Infra Protection and Intl Security**

To be selected in consultation with Director and/or Associate Director.

IPIS 5907 [1.0 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.
Prerequisite(s): permission of the MIPIS Program Director or Graduate Supervisor.

IPIS 5908 [1.0 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 5913 [0.0 credit]**Co-operative Work Term**

Prerequisite(s): enrolment in M.IPIS or M.Eng. IPIS and 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.