

Cybersecurity (Collaborative Specialization)

This section presents the requirements for programs in:

- **M.C.S. Computer Science with Collaborative Specialization in Cybersecurity**
- **M.A.Sc. Electrical and Computer Engineering with Collaborative Specialization in Cybersecurity**
- **M.Eng. Electrical and Computer Engineering with Collaborative Specialization in Cybersecurity**
- **M.Eng. Infrastructure Protection and International Security with Collaborative Specialization in Cybersecurity**
- **M.A.Sc. Digital Media with Collaborative Specialization in Cybersecurity**
- **Master of Networking Technology with Collaborative Specialization in Cybersecurity**
- **M. Infrastructure Protection and International Security with Collaborative Specialization in Cybersecurity**
- **M.A. International Affairs with Collaborative Specialization in Cybersecurity**

Program Requirements

M.C.S. Computer Science with Collaborative Specialization in Cybersecurity (5.0 credits)

Requirements - Research Project pathway (5.0 credits)

| | |
|--|------------|
| 1. 1.0 credit in: | 1.0 |
| CYBR 5000 [1.0] Science and Social Science of Cybersecurity | |
| 2. 3.0 credits in course work. Course work must include a minimum of 1.5 credits of OCICS courses in three different research areas (see OCICS course listing by research areas). | 3.0 |
| 4. 1.0 credit in graduate project. | 1.0 |
| COMP 5903 [1.0] Graduate Project (M.C.S.) (in the area of the specialization) | |

Total Credits **5.0**

Requirements - Thesis pathway (5.0 credits)

| | |
|--|------------|
| 1. 1.0 credit in: | 1.0 |
| CYBR 5000 [1.0] Science and Social Science of Cybersecurity | |
| 2. 1.5 credits in course work. Course work must include a minimum of 1.5 credits of OCICS courses in three different research areas (see OCICS course listing by research areas). | 1.5 |
| 3. 2.5 credits in graduate thesis (Each candidate submitting a thesis will be required to undertake an oral defence of the thesis). | 2.5 |
| COMP 5905 [2.5] M.C.S. Thesis (in the area of the specialization) | |

Total Credits **5.0**

M.A.Sc. Electrical and Computer Engineering with Collaborative Specialization in Cybersecurity (5.0 credits)

Requirements:

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|---|------------|
| 1. 1.0 credit in: | 1.0 |
| CYBR 5000 [1.0] Science and Social Science of Cybersecurity | |
| 3. 1.5 credits in courses | 1.5 |
| 4. 2.5 credits in: | 2.5 |
| SYSC 5909 [2.5] M.A.Sc. Thesis (in the area of cybersecurity) | |
| Total Credits | 5.0 |

M.Eng. Electrical and Computer Engineering with Collaborative Specialization in Cybersecurity (4.5 credits)

Requirements - project pathway (4.5 credits)

| | |
|--|------------|
| 1. 0.5 credit in: | 0.5 |
| SYSC 5902 [0.5] Research Methods for Engineers | |
| 2. 1.0 credit in: | 1.0 |
| CYBR 5000 [1.0] Science and Social Science of Cybersecurity | |
| 4. 2.5 credits in courses | 2.5 |
| 5. 0.5 credit in: | 0.5 |
| SYSC 5900 [0.5] Systems Engineering Project (in the area of cybersecurity) | |
| Total Credits | 4.5 |

Requirements - coursework pathway (4.5 credits)

| | |
|---|------------|
| 1. 0.5 credit in: | 0.5 |
| SYSC 5902 [0.5] Research Methods for Engineers | |
| 1. 1.0 credit in: | 1.0 |
| CYBR 5000 [1.0] Science and Social Science of Cybersecurity | |
| 4. 3.0 credits in courses, including 0.5 credit in approved elective in the area of the specialization | 3.0 |
| Total Credits | 4.5 |

M.Eng. Infrastructure Protection and International Security with Collaborative Specialization in Cybersecurity (5.0 credits)

Requirements - Research project pathway:

| | |
|---|------------|
| 1. 1.0 credit in: | 1.0 |
| CYBR 5000 [1.0] Science and Social Science of Cybersecurity | |
| 2. 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 | |
| 3. 0.5 credit from: | 0.5 |
| 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 5306 [0.5] | Emergency and Business Continuity Management |
| 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.

4. 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 5509 [0.5] | Introduction to Cybersecurity |
| IPIS 5520 [0.5] | Selected Topics in Engineering of Critical Infrastructure |

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

5. 1.0 credit in: 1.0

| | |
|-----------------|--|
| IPIS 5907 [1.0] | Research Project (in the area of the specialization) |
|-----------------|--|

Total Credits 5.0

Requirements - Coursework pathway:

1. 1.0 credit in: 1.0

| | |
|-----------------|---|
| CYBR 5000 [1.0] | Science and Social Science of Cybersecurity |
|-----------------|---|

2. 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 |

3. 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 5306 [0.5] | Emergency and Business Continuity Management |
| 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.

4. 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 5509 [0.5] | Introduction to Cybersecurity |
| IPIS 5520 [0.5] | Selected Topics in Engineering of Critical Infrastructure |

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

5. 0.5 credit in approved electives in the area of the specialization

6. 0.5 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. 0.5

Total Credits 5.0

M.A.Sc. Digital Media with Collaborative Specialization in Cybersecurity (5.0 credits)

Requirements:

1. 1.0 credit in: 1.0

| | |
|-----------------|---|
| CYBR 5000 [1.0] | Science and Social Science of Cybersecurity |
|-----------------|---|

2. 0.5 credit in: 0.5

| | |
|-----------------|---|
| ITEC 5002 [0.5] | Fundamentals of Information Technology Research |
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3. 0.0 credit in:

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|-----------------|---------------------------------|
| ITEC 5001 [0.0] | Information Technology Seminars |
|-----------------|---------------------------------|

4. 1.0 credit from core courses: 1.0

| | |
|-----------------|---|
| ITEC 5200 [0.5] | Entertainment Technologies |
| ITEC 5201 [0.5] | Computer Animation Technologies |
| ITEC 5202 [0.5] | Visual Effects Technologies |
| ITEC 5203 [0.5] | Game Design and Development Technologies |
| ITEC 5204 [0.5] | Emerging Interaction Techniques |
| ITEC 5205 [0.5] | Design and Development of Data-Intensive Applications |
| ITEC 5206 [0.5] | Data Protection and Rights Management |
| ITEC 5207 [0.5] | Data Interaction Techniques |
| ITEC 5208 [0.5] | Virtual Reality and 3D User Interfaces |
| ITEC 5920 [0.5] | Special Topics in Digital Media |

5. 2.5 credits in: 2.5

| | |
|-----------------|---|
| ITEC 5909 [2.5] | Master's Thesis (in the specialization) |
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Total Credits 5.0

Master of Networking Technology with Collaborative Specialization in Cybersecurity (5.0 credits)

Requirements:

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|--|------------|
| 1. 1.0 credit in: | 1.0 |
| CYBR 5000 [1.0] Science and Social Science of Cybersecurity | |
| 2. 0.5 credit in: | 0.5 |
| ITEC 5002 [0.5] Fundamentals of Information Technology Research | |
| 3. 0.0 credit in: | |
| ITEC 5001 [0.0] Information Technology Seminars | |
| 4. 2.0 credits from core courses: | 2.0 |
| ITEC 5100 [0.5] Planning and Design of Computer Networks | |
| ITEC 5101 [0.5] Cross Layer Design for Wireless Multimedia Networks | |
| ITEC 5102 [0.5] Designing Secure Networking and Computer Systems | |
| ITEC 5103 [0.5] Cloud and Datacentre Networking | |
| ITEC 5205 [0.5] Design and Development of Data-Intensive Applications | |
| ITEC 5910 [0.5] Special Topics in Network Technologies | |
| 5. 0.5 credit in the area of the specialization, approved by the graduate supervisor or the Associate Director of Graduate Studies in the School. | 0.5 |
| 6. 1.0 credit in electives at the 5000-level, chosen in consultation with your graduate advisor/supervisor or the Associate Director of Graduate Studies in the School. | 1.0 |
| Total Credits | 5.0 |

M. Infrastructure Protection and International Security with Collaborative Specialization in Cybersecurity (5.0 credits)

Requirements:

| | |
|---|------------|
| 1. 1.0 credit in: | 1.0 |
| CYBR 5000 [1.0] Science and Social Science of Cybersecurity | |
| 2. 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 | |
| 3. 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 5306 [0.5] Emergency and Business Continuity Management | |
| 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. | |
| 4. 0.5 credit from: | 0.5 |
| 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 5509 [0.5] Introduction to Cybersecurity | |
| IPIS 5520 [0.5] Selected Topics in Engineering of Critical Infrastructure | |
| 5. 0.5 credit in elective in the area of the specialization, selected in consultation with, and approved by, the MIPIS Director and Associate Director and associated faculty when necessary. | 0.5 |
| Total Credits | 5.0 |

M.A. International Affairs with Collaborative Specialization in Cybersecurity (5.0 credits)

Requirements - Thesis pathway

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|--|------------|
| 1. 1.0 credit in: | 1.0 |
| CYBR 5000 [1.0] Science and Social Science of Cybersecurity | |
| 2. 1.5 credits in: | 1.5 |
| INAF 5015 [0.5] Research Design and Methods for International Affairs | |
| INAF 5016 [0.5] Statistical Analysis for International Affairs | |
| INAF 5017 [0.25] International Policymaking in Canada: Structure and Process | |
| INAF 5018 [0.25] Law and International Affairs | |
| 3. 0.5 credit in economics, successfully completed by the end of the second term, from (See Note 1, below): | 0.5 |
| INAF 5009 [0.5] International Aspects of Economic Development | |
| INAF 5205 [0.5] Economics of Conflict | |
| INAF 5214 [0.5] Economics for Defence and Security | |
| INAF 5221 [0.5] Economics of Security and Intelligence | |
| INAF 5308 [0.5] International Trade: Theory and Policy | |
| INAF 5309 [0.5] International Finance: Theory and Policy | |
| INAF 5600 [0.5] The Economics of Human Development | |
| INAF 5703 [0.5] International Public Economics | |
| 4. 2.0 credits in: | 2.0 |
| INAF 5909 [2.0] M.A. Thesis (in the specialization) | |

5. Successful completion of second language proficiency examination (See Note 3, below)

Total Credits **5.0**

Requirements - Research essay pathway:

1. 1.0 credit in: 1.0

CYBR 5000 [1.0] Science and Social Science of Cybersecurity

2. 1.5 credit in: 1.5

INAF 5015 [0.5] Research Design and Methods for International Affairs

INAF 5016 [0.5] Statistical Analysis for International Affairs

INAF 5017 [0.25] International Policymaking in Canada: Structure and Process

INAF 5018 [0.25] Law and International Affairs

3. 0.5 credit in economics, successfully completed by the end of the second term, from: (See Note 1, below) 0.5

INAF 5009 [0.5] International Aspects of Economic Development

INAF 5205 [0.5] Economics of Conflict

INAF 5214 [0.5] Economics for Defence and Security

INAF 5221 [0.5] Economics of Security and Intelligence

INAF 5308 [0.5] International Trade: Theory and Policy

INAF 5309 [0.5] International Finance: Theory and Policy

INAF 5600 [0.5] The Economics of Human Development

INAF 5703 [0.5] International Public Economics

4. 1.0 credit in: 1.0

INAF 5908 [1.0] Research Essay (in the specialization)

5. 1.0 credits in Field and Elective courses (See Note 2, below) 1.0

6. Successful completion of second language proficiency examination (see Note 3, below)

Total Credits **5.0**

Requirements - Coursework pathway (5.0 credits)

1. 1.0 credit in: 1.0

CYBR 5000 [1.0] Science and Social Science of Cybersecurity

2. 1.0 credit in: 1.0

INAF 5016 [0.5] Statistical Analysis for International Affairs

INAF 5017 [0.25] International Policymaking in Canada: Structure and Process

INAF 5018 [0.25] Law and International Affairs

3. 0.5 credit in economics, successfully completed by the end of the second term, from: (See Note 1, below) 0.5

INAF 5009 [0.5] International Aspects of Economic Development

INAF 5205 [0.5] Economics of Conflict

INAF 5214 [0.5] Economics for Defence and Security

INAF 5221 [0.5] Economics of Security and Intelligence

INAF 5308 [0.5] International Trade: Theory and Policy

INAF 5309 [0.5] International Finance: Theory and Policy

INAF 5600 [0.5] The Economics of Human Development

INAF 5703 [0.5] International Public Economics

4. 0.5 credit in courses in the area of the specialization and approved by the NPSIA M.A. Program Supervisor or Associate Director as being relevant to the student's program of study. 0.5

5. 2.0 credits in Field and Elective courses (See Note 2, below) 2.0

6. Successful completion of second language proficiency examination (see Note 3, below)

Total Credits **5.0**

1. All students must complete the 0.5 credit economics course for their designated field, or an approved alternate economics course. For students in the IEP field both INAF 5308 and INAF 5309, or approved equivalent, must be completed.
2. For elective courses, 1.5 credits of the total required 5.0 credits may be selected from courses offered in other departments, with a maximum of 1.0 credit from a single department and a maximum of 1.0 credit selected from fourth year undergraduate courses. Any course not identified as an INAF 5000-level course must be approved by the M.A. Program Supervisor.
3. Students must successfully complete an examination in second language proficiency administered by Carleton University's School of Linguistics and Language Studies, or meet the equivalent standard as determined by the School of Linguistics and Language Studies. Details of the language requirement are provided on the School website.

Regulations

See the General Regulations section of this Calendar and the regulations of the participating unit.

Admission Requirements

Admission to the collaborative master's program in Cybersecurity is available to master's students who are admitted in one of the participating master's programs. To apply to one of the participating master's programs, please visit the Faculty of Graduate and Postdoctoral Affairs Admissions page.

Cybersecurity (CYBR) Courses

CYBR 5000 [1.0 credit]

Science and Social Science of Cybersecurity

Overview of legal, governance, and strategic considerations of cybersecurity from a Canadian and international perspective, and the computer science and engineering concepts critical to effective cybersecurity operations.