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)

| 4 | 1.0 orodit in: | | 1 (|
|----------|----------------------|---|-----|
| Re | equirements - Thes | is pathway (5.0 credits) | |
| To | otal Credits | | 5.0 |
| | COMP 5903 [1.0] | Graduate Project (M.C.S.) (in the area of the specialization) | |
| 4. | 1.0 credit in gradua | ate project. | 1.0 |
| mi re | nimum of 1.5 credits | se work. Course work must include a of OCICS courses in three different CICS course listing by research | 3.0 |
| | CYBR 5000 [1.0] | Science and Social Science of Cybersecurity | |
| 1. | 1.0 credit in: | | 1.0 |

| i. i.o create iii. | | 1.0 |
|--------------------|--|-----|
| CYBR 5000 [1.0] | Science and Social Science of | |
| | Cybersecurity | |
| 2 15 credits in co | ourse work. Course work must include a | 1.5 |

- minimum of 1.5 credits of OCICS courses in three different research areas (see OCICS course listing by research
- 3. 2.5 credits in graduate thesis (Each candidate submitting a thesis will be required to undertake an ordal defence of the thesis).

| COMP 5905 [2.5] | M.C.S. Thesis (in the area of the |
|-----------------|-----------------------------------|
| | specialization) |

Total Credits

M.A.Sc. Electrical and Computer Engineering 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 | |
| 3. 1.5 credits in cour | ses | 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 cour | ses | 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 |
| | sework pathway (4.5 credits) | 4.5 |
| | sework pathway (4.5 credits) | 4.5 0.5 |
| Requirements - cour | sework pathway (4.5 credits) Research Methods for Engineers | |
| Requirements - cour 1. 0.5 credit in: | , ,, | |
| Requirements - cour 1. 0.5 credit in: SYSC 5902 [0.5] | , ,, | |

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

elective in the area of the specialization

Total Credits

2.5

Requirements - Research project pathway:

| N | equirements - Nese | arcii project patriway. | |
|----|--------------------|--|-----|
| 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 | |

4.5

| IPIS 5303 [0.5] | Intelligence Statecraft and International Affairs | | | s from the Intelligence and IA) and Security Defence Policy | |
|--|--|-----|--|--|-----|
| IPIS 5304 [0.5] | Intelligence and National Security: Policies and Operations | | (SDP) designated fiel School of International | ds offered by the Norman Paterson al Affairs. | |
| IPIS 5305 [0.5] | National Security Policy and Law | | 4. 1.0 credit from: | | 1.0 |
| IPIS 5306 [0.5] | Emergency and Business Continuity Management | | IPIS 5501 [0.5] | Transportation and Aviation Security | |
| IPIS 5320 [0.5] | Topics in Infrastructure Security | | IPIS 5504 [0.5] | Fundamentals of Fire Safety | |
| | Policy s from the Intelligence and | | IPIS 5505 [0.5] | Natural Hazards in Canada: Risk and Impact | |
| International Affairs (| IIA) and Security Defence Policy | | IPIS 5507 [0.5] | Blast Load Effects on Structures | |
| (SDP) designated fiel School of International | lds offered by the Norman Paterson | | IPIS 5508 [0.5] | Introduction to Explosives and | |
| 4. 1.0 credit from: | ai Alialis. | 1.0 | | Explosion Effects as they relate to Infrastructure and its Components | |
| IPIS 5501 [0.5] | Transportation and Aviation | 1.0 | IPIS 5509 [0.5] | Introduction to Cybersecurity | |
| | Security | | IPIS 5520 [0.5] | Selected Topics in Engineering of | |
| IPIS 5504 [0.5] | Fundamentals of Fire Safety | | or an anginopring ou | Critical Infrastructure | |
| IPIS 5505 [0.5] | Natural Hazards in Canada: Risk and Impact | | Associate Director. | urse approved by the IPIS Director or | |
| IPIS 5507 [0.5] | Blast Load Effects on Structures | | 5. 0.5 credit in appro | oved electives in the area of the | |
| IPIS 5508 [0.5] | Introduction to Explosives and Explosion Effects as they relate to Infrastructure and its Components | | 6. 0.5 credit from gr | aduate courses from the Faculty esign that have been selected in | 0.5 |
| IPIS 5509 [0.5] | Introduction to Cybersecurity | | | approved by, the MIPIS Director and | |
| IPIS 5520 [0.5] | Selected Topics in Engineering of Critical Infrastructure | | Associate Director. Total Credits | | 5.0 |
| or an engineering cou Associate Director. | urse approved by the IPIS Director or | | M.A.Sc. Digital N | | |
| 5. 1.0 credit in: | | 1.0 | | ve Specialization in | |
| IPIS 5907 [1.0] | Research Project (in the area of the | | Cybersecurity (5 | o.o credits) | |
| | specialization) | | Requirements: | | 1.0 |
| Total Credits | | 5.0 | 1. 1.0 credit in: CYBR 5000 [1.0] | Science and Social Science of | 1.0 |
| Requirements - Cou | rsework pathway: | | 0121(0000[1.0] | Cybersecurity | |
| 1. 1.0 credit in: | | 1.0 | 2. 0.5 credit in: | | 0.5 |
| CYBR 5000 [1.0] | Science and Social Science of Cybersecurity | | ITEC 5002 [0.5] | Fundamentals of Information Technology Research | |
| 2. 1.5 credits in: | | 1.5 | 3. 0.0 credit in: | | |
| IPIS 5101 [0.5] | Critical Infrastructure Protection: Issues and Strategies | | ITEC 5001 [0.0] | Information Technology Seminars | |
| IPIS 5105 [0.5] | Critical Infrastructure Risk | | 4. 1.0 credit from co | | 1.0 |
| 11 10 0 100 [0.0] | Assessment | | ITEC 5200 [0.5] | Entertainment Technologies | |
| IPIS 5106 [0.5] | Management of Critical | | ITEC 5201 [0.5] | Computer Animation Technologies | |
| | Infrastructure | | ITEC 5202 [0.5] | Visual Effects Technologies Game Design and Development | |
| 3. 1.0 credit from: | | 1.0 | ITEC 5203 [0.5] | Technologies | |
| IPIS 5104 [0.5] | Terrorism and International Security | | ITEC 5204 [0.5] | Emerging Interaction Techniques | |
| IPIS 5301 [0.5] | Disarmament, Arms Control and Nonproliferation | | ITEC 5205 [0.5] | Design and Development of Data- Intensive Applications | |
| IPIS 5302 [0.5] | Contemporary International Security | | ITEC 5206 [0.5] | Data Protection and Rights Management | |
| IPIS 5303 [0.5] | Intelligence Statecraft and International Affairs | | ITEC 5207 [0.5] | Data Interaction Techniques | |
| IPIS 5304 [0.5] | Intelligence and National Security: Policies and Operations | | ITEC 5208 [0.5] | Virtual Reality and 3D User Interfaces | |
| IPIS 5305 [0.5] | National Security Policy and Law | | ITEC 5920 [0.5] | Special Topics in Digital Media | |
| IPIS 5306 [0.5] | Emergency and Business | | 5. 2.5 credits in: | | 2.5 |
| IPIS 5320 [0.5] | Continuity Management Topics in Infrastructure Security | | ITEC 5909 [2.5] | Master's Thesis (in the specialization) | |
| | Policy | | Total Credits | | 5.0 |

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

Requirements:

| K | equirements. | | |
|----|----------------------|---|-----|
| 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 co | ore 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 | |
| by | | ea of the specialization, approved visor or the Associate Director of e School. | 0.5 |
| CC | nsultation with your | res at the 5000-level, chosen in graduate advisor/supervisor or the Graduate Studies in the School. | 1.0 |

M. Infrastructure Protection and International Security

5.0

with Collaborative Specialization in Cybersecurity (5.0 credits)

Requirements:

Total Credits

| | • | | |
|----|------------------|--|-----|
| 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 | |
| | s from the IIA or SDP designated lorman Paterson School of | |
| 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 | |
| selected in consultation | ive in the area of the specialization, on with, and approved by, the MIPIS e Director and associated faculty | 0.5 |
| Total Credits | | 5.0 |
| M.A. Internationa | al Affaira | |
| | ve Specialization in | |
| Cybersecurity (5 | • | |
| Requirements - The | • | |
| 1. 1.0 credit in: | sis patriway | 1.0 |
| | | 1.0 |
| CYBR 5000 [1.0] | Science and Social Science of Cybersecurity | |
| CYBR 5000 [1.0] 2. 1.5 credits in: | Science and Social Science of Cybersecurity | 1.5 |
| | | 1.5 |
| 2. 1.5 credits in: | Cybersecurity Research Design and Methods for | 1.5 |
| 2. 1.5 credits in: INAF 5015 [0.5] | Cybersecurity Research Design and Methods for International Affairs Statistical Analysis for International | 1.5 |
| 2. 1.5 credits in: INAF 5015 [0.5] INAF 5016 [0.5] | Cybersecurity Research Design and Methods for International Affairs Statistical Analysis for International Affairs International Policymaking in | 1.5 |
| 2. 1.5 credits in: INAF 5015 [0.5] INAF 5016 [0.5] INAF 5017 [0.25] INAF 5018 [0.25] 3. 0.5 credit in econo | Research Design and Methods for International Affairs Statistical Analysis for International Affairs International Policymaking in Canada: Structure and Process | 0.5 |
| 2. 1.5 credits in: INAF 5015 [0.5] INAF 5016 [0.5] INAF 5017 [0.25] INAF 5018 [0.25] 3. 0.5 credit in econo | Research Design and Methods for International Affairs Statistical Analysis for International Affairs International Policymaking in Canada: Structure and Process Law and International Affairs omics, successfully completed by the | |
| 2. 1.5 credits in: INAF 5015 [0.5] INAF 5016 [0.5] INAF 5017 [0.25] INAF 5018 [0.25] 3. 0.5 credit in econdend of the second term | Cybersecurity Research Design and Methods for International Affairs Statistical Analysis for International Affairs International Policymaking in Canada: Structure and Process Law and International Affairs omics, successfully completed by the m, from (See Note 1, below): International Aspects of Economic | |
| 2. 1.5 credits in: INAF 5015 [0.5] INAF 5016 [0.5] INAF 5017 [0.25] INAF 5018 [0.25] 3. 0.5 credit in econd end of the second tender INAF 5009 [0.5] | Research Design and Methods for International Affairs Statistical Analysis for International Affairs International Policymaking in Canada: Structure and Process Law and International Affairs omics, successfully completed by the m, from (See Note 1, below): International Aspects of Economic Development | |
| 2. 1.5 credits in: INAF 5015 [0.5] INAF 5016 [0.5] INAF 5017 [0.25] INAF 5018 [0.25] 3. 0.5 credit in econdend of the second tender INAF 5009 [0.5] | Research Design and Methods for International Affairs Statistical Analysis for International Affairs International Policymaking in Canada: Structure and Process Law and International Affairs omics, successfully completed by the m, from (See Note 1, below): International Aspects of Economic Development Economics of Conflict Economics for Defence and | |
| 2. 1.5 credits in: INAF 5015 [0.5] INAF 5016 [0.5] INAF 5017 [0.25] INAF 5018 [0.25] 3. 0.5 credit in econdend of the second tent INAF 5009 [0.5] INAF 5205 [0.5] INAF 5214 [0.5] | Research Design and Methods for International Affairs Statistical Analysis for International Affairs International Policymaking in Canada: Structure and Process Law and International Affairs omics, successfully completed by the m, from (See Note 1, below): International Aspects of Economic Development Economics of Conflict Economics for Defence and Security Economics of Security and | |
| 2. 1.5 credits in: INAF 5015 [0.5] INAF 5016 [0.5] INAF 5017 [0.25] INAF 5018 [0.25] 3. 0.5 credit in econdend of the second tentor in the second tentor in the second in | Research Design and Methods for International Affairs Statistical Analysis for International Affairs International Policymaking in Canada: Structure and Process Law and International Affairs omics, successfully completed by the m, from (See Note 1, below): International Aspects of Economic Development Economics of Conflict Economics for Defence and Security Economics of Security and Intelligence International Trade: Theory and | |
| 2. 1.5 credits in: INAF 5015 [0.5] INAF 5016 [0.5] INAF 5017 [0.25] INAF 5018 [0.25] 3. 0.5 credit in econd end of the second tender in INAF 5009 [0.5] INAF 5205 [0.5] INAF 5214 [0.5] INAF 5221 [0.5] INAF 5308 [0.5] | Research Design and Methods for International Affairs Statistical Analysis for International Affairs International Policymaking in Canada: Structure and Process Law and International Affairs omics, successfully completed by the m, from (See Note 1, below): International Aspects of Economic Development Economics of Conflict Economics for Defence and Security Economics of Security and Intelligence International Trade: Theory and Policy International Finance: Theory and | |
| 2. 1.5 credits in: INAF 5015 [0.5] INAF 5016 [0.5] INAF 5017 [0.25] INAF 5018 [0.25] 3. 0.5 credit in econd end of the second term INAF 5009 [0.5] INAF 5205 [0.5] INAF 5214 [0.5] INAF 5221 [0.5] INAF 5308 [0.5] INAF 5309 [0.5] | Research Design and Methods for International Affairs Statistical Analysis for International Affairs International Policymaking in Canada: Structure and Process Law and International Affairs omics, successfully completed by the m, from (See Note 1, below): International Aspects of Economic Development Economics of Conflict Economics for Defence and Security Economics of Security and Intelligence International Trade: Theory and Policy International Finance: Theory and Policy The Economics of Human | |
| 2. 1.5 credits in: INAF 5015 [0.5] INAF 5016 [0.5] INAF 5017 [0.25] INAF 5018 [0.25] 3. 0.5 credit in econd end of the second tender in the second tender in the second tender in the second in the se | Research Design and Methods for International Affairs Statistical Analysis for International Affairs International Policymaking in Canada: Structure and Process Law and International Affairs omics, successfully completed by the m, from (See Note 1, below): International Aspects of Economic Development Economics of Conflict Economics for Defence and Security Economics of Security and Intelligence International Trade: Theory and Policy International Finance: Theory and Policy The Economics of Human Development | |

| 5. Successful completion of second language proficiency examination (See Note 3, below) | | | |
|--|---|-----|--|
| Total Credits | | 5.0 | |
| • | earch essay pathway: | 4.0 | |
| 1. 1.0 credit in: CYBR 5000 [1.0] | Science and Social Science of | 1.0 | |
| CTBR 3000 [1.0] | Cybersecurity | | |
| 2. 1.5 credit in: | · | 1.5 | |
| INAF 5015 [0.5] | Research Design and Methods for | | |
| 1114 = =0.40.70 =1 | 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 | 0.5 | |
| 3. 0.5 credit in economics, successfully completed by the end of the second term, from: (See Note 1, below) | | | |
| 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) | | | |
| 6. Successful completion of second language proficiency examination (see Note 3, below) | | | |
| Total Credits | | 5.0 | |
| Requirements - Cour | sework 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) | | | |
| 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 | | |
| | | | |

| Total Credits | | | 5.0 |
|--|-----------------|--|-----|
| 6. Successful completion of second language proficiency examination (see Note 3, below) | | | |
| 5. 2.0 credits in Field and Elective courses (See Note 2, below) | | | 2.0 |
| 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 |
| | INAF 5703 [0.5] | International Public Economics | |
| | INAF 5600 [0.5] | The Economics of Human Development | |
| | INAF 5309 [0.5] | International Finance: Theory and Policy | |
| | INAF 5308 [0.5] | International Trade: Theory and Policy | |

- 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.