Data Science, Analytics, and Artificial Intelligence

This section presents the requirements for programs in:

- **M.A.Sc. Data Science, Analytics, and Artificial Intelligence**
- **M.C.S. Data Science, Analytics, and Artificial Intelligence**
- **M.Eng. Data Science, Analytics, and Artificial Intelligence**
- **M.I.T. Data Science, Analytics, and Artificial Intelligence**
- **M.Sc. Data Science, Analytics, and Artificial Intelligence**
- **Ph.D. Data Science, Analytics, and Artificial Intelligence**

M.A.Sc. Data Science, Analytics, and Artificial Intelligence (5.0 credits)

M.A.Sc. Data Science, Analytics, and Artificial Intelligence - thesis pathway (5.0 credits)		
1. 1.0 credit in:		1.0
DATA 5000 [0.5]	Introduction to Data Science	
DATA 5001 [0.5]	Fundamentals in Data Science and Analytics	
2. 0.5 credit in approved SYSC electives (see DSAAI program website for list of applicable electives)		0.5
3. 0.5 credit in approved electives not in SYSC (see DSAAI program website for list of applicable electives)		0.5
4. 0.5 credit in elective from any participating DSAAI unit		0.5
Note: 0.5 credit from above electives must be in applications of artificial intelligence or machine learning (see DSAAI program website for list of applicable electives)		
5. 2.5 credits in:		2.5
DATA 5929 [2.5]	Thesis - MASc	
Total Credits		**5.0**

M.C.S. Data Science, Analytics, and Artificial Intelligence (5.0 credits)

Requirements - thesis pathway (5.0 credits)		
1. 1.0 credit in:		1.0
DATA 5000 [0.5]	Introduction to Data Science	
DATA 5001 [0.5]	Fundamentals in Data Science and Analytics	
2. 0.5 credit in approved COMP electives (see DSAAI program website for list of applicable electives)		0.5
3. 0.5 credit in approved electives not in COMP (see DSAAI program website for list of applicable electives)		0.5
4. 0.5 credit in elective from any participating DSAAI unit		0.5
5. 0.5 credit from above electives must be in applications of artificial intelligence or machine learning (See DSAAI program website for list)		
6. 2.5 credits in:		2.5
DATA 5939 [2.5]	Thesis - MCS	
Total Credits		**5.0**

Requirements - coursework pathway (5.0 credits)		
1. 1.0 credit in:		1.0
DATA 5000 [0.5]	Introduction to Data Science	
DATA 5001 [0.5]	Fundamentals in Data Science and Analytics	
2. 2.0 credits in approved COMP electives (see DSAAI program website for list of applicable electives)		2.0
3. 1.0 credit in approved electives from two units not in COMP (see DSAAI program website for list of applicable electives)		1.0
4. 1.0 credit in electives from any participating DSAAI unit		1.0
Note: 0.5 credit from the above electives must be in applications of artificial intelligence or machine learning (see DSAAI program website for list)		
Total Credits		**5.0**

M.Eng. Data Science, Analytics, and Artificial Intelligence (4.5 credits)

M.Eng. Data Science, Analytics, and Artificial Intelligence - coursework pathway (4.5 credits)		
1. 1.0 credit in:		1.0
DATA 5000 [0.5]	Introduction to Data Science	
DATA 5001 [0.5]	Fundamentals in Data Science and Analytics	
2. 1.0 credit in approved SYSC electives (see DSAAI program website for list of applicable electives)		1.0
3. 0.5 credit in any graduate-level SYSC course		0.5
4. 1.0 credit in approved electives from two units not in SYSC (see DSAAI program website for list of applicable electives)		1.0
5. 1.0 credit in electives from any participating DSAAI unit		1.0
Note: 0.5 credit from above electives must be in application of artificial intelligence or machine learning (see DSAAI program website for list of applicable electives)		
Total Credits		**4.5**

M.Eng. Data Science, Analytics, and Artificial Intelligence - project pathway (4.5 credits)		
1. 1.0 credit in:		1.0
DATA 5000 [0.5]	Introduction to Data Science	
DATA 5001 [0.5]	Fundamentals in Data Science and Analytics	
2. 1.0 credit in approved SYSC electives (see DSAAI program website for list of applicable electives)		1.0
3. 1.0 credit in approved electives from two units not in SYSC (see DSAAI program website for list of applicable electives)		1.0
4. 0.5 credit in elective from any participating DSAAI unit		0.5
Note: 0.5 credit from above electives must be in applications of artificial intelligence and machine learning (see DSAAI program website for list of applicable electives)		
5. 1.0 credit in:		1.0
DATA 5928 [1.0]	Project - MEng	
Total Credits		**4.5**

M.I.T. Data Science, Analytics, and Artificial Intelligence (5.0 credits)

M.I.T. Data Science, Analytics, and Artificial Intelligence - thesis pathway (5.0 credits)

1. 1.0 credit in:		1.0
DATA 5000 [0.5]	Introduction to Data Science	
DATA 5001 [0.5]	Fundamentals in Data Science and Analytics	
2. 0.5 credit in approved ITEC electives (see DSAAI program website for list of applicable electives)		0.5
3. 0.5 credit in approved electives not in ITEC (see DSAAI program website for list of applicable electives)		0.5
4. 0.5 credit in elective from any participating DSAAI unit		0.5
Note: 0.5 credit from above electives must be in applications of artificial intelligence or machine learning (see DSAAI program website for list of applicable electives)		
5. 2.5 credits in:		2.5
DATA 5919 [2.5]	Thesis - MIT	
Total Credits		**5.0**

M.I.T. Data Science, Analytics, and Artificial Intelligence - project pathway (5.0 credits)

1. 1.0 credit in:		1.0
DATA 5000 [0.5]	Introduction to Data Science	
DATA 5001 [0.5]	Fundamentals in Data Science and Analytics	
2. 1.0 credit in approved ITEC electives (see DSAAI program website for list of applicable electives)		1.0
3. 1.0 credit in approved electives from two units not in ITEC (see DSAAI program website for list of applicable electives)		1.0
4. 0.5 credit in elective from any participating DSAAI unit		0.5
Note: 0.5 credit from above electives must be in applications of artificial intelligence or machine learning (see DSAAI program website for list of applicable electives)		
5. 1.5 credits in:		1.5
DATA 5918 [1.5]	Project - MIT	
Total Credits		**5.0**

M.I.T. Data Science, Analytics, and Artificial Intelligence - coursework pathway (5.0 credits)

1. 1.0 credit in:		1.0
DATA 5000 [0.5]	Introduction to Data Science	
DATA 5001 [0.5]	Fundamentals in Data Science and Analytics	
2. 2.0 credits in approved ITEC electives (see DSAAI program website for list of applicable electives)		2.0
3. 1.0 credit in approved electives from two units not in ITEC (see DSAAI program website for list of applicable electives)		1.0
4. 1.0 credit in electives from any participating DSAAI unit		1.0
Note: 0.5 credit from above electives must be in applications of artificial intelligence or machine learning (see DSAAI program website for list of applicable electives)		
Total Credits		**5.0**

M.Sc. Data Science, Analytics, and Artificial Intelligence (5.0 credits)

M.Sc. Data Science, Analytics and Artificial Intelligence - thesis pathway (5.0 credits)

1. 1.0 credit in:		1.0
DATA 5000 [0.5]	Introduction to Data Science	
DATA 5001 [0.5]	Fundamentals in Data Science and Analytics	
2. 0.5 credit in approved MATH or STAT elective (see DSAAI program website for list of applicable electives)		0.5
3. 0.5 credit in approved electives not in MATH or STAT (see DSAAI program website for list of applicable electives)		0.5
4. 0.5 credit in elective from any participating DSAAI unit		0.5
Note: 0.5 credit from above electives must be in applications of artificial intelligence or machine learning (see DSAAI program website for list of applicable electives)		
5. 2.5 credits in:		2.5
DATA 5909 [2.5]	Thesis - MSc	
Total Credits		**5.0**

M.Sc. Data Science, Analytics, and Artificial Intelligence - project pathway (5.0 credits)

1. 1.0 credit in:		1.0
DATA 5000 [0.5]	Introduction to Data Science	
DATA 5001 [0.5]	Fundamentals in Data Science and Analytics	
2. 1.0 credit in approved MATH or STAT electives (see DSAAI program website for list of applicable electives)		1.0
3. 1.0 credit in approved electives from two units not in MATH OR STAT (see DSAAI program website for list of applicable electives)		1.0
4. 0.5 credit in elective from any participating DSAAI unit		0.5
Note: 0.5 credit from above electives must be in applications of artificial intelligence or machine learning (see DSAAI program website for list of applicable electives)		
5. 1.5 credits in:		1.5
DATA 5908 [1.5]	Project - MSc	
Total Credits		**5.0**

M.Sc. Data Science, Analytics and Artificial Intelligence - coursework pathway (5.0 credits)

1. 1.0 credit in:		1.0
DATA 5000 [0.5]	Introduction to Data Science	
DATA 5001 [0.5]	Fundamentals in Data Science and Analytics	
2. 2.0 credits in approved MATH OR STAT electives (see DSAAI program website for list of applicable electives)		2.0
3. 1.0 credit in approved electives from two units not in MATH OR STAT (see DSAAI program website for list of applicable electives)		1.0
4. 1.0 credit in elective from any participating DSAAI unit		1.0
Note: 0.5 credit from above electives must be in applications of artificial intelligence or machine learning (see DSAAI program website for list of applicable electives)		
Total Credits		**5.0**

Ph.D. Data Science, Analytics, and Artificial Intelligence (1.5 credits)

Requirements (1.5 credits):

1. 0.5 credit in:		0.5
DATA 5001 [0.5]	Fundamentals in Data Science and Analytics	
2. 1.0 credit in elective, approved by supervisor (see DSAAI program website for list of applicable electives)		1.0
3. 0.0 credit in:		
DATA 6907 [0.0]	Doctoral Comprehensive	
4. 0.0 credit in:		
DATA 6908 [0.0]	Doctoral Proposal	
5. 0.0 credit in:		0.0
DATA 6909 [0.0]	Thesis - PhD	
Total Credits		**1.5**

Regulations

See the General Regulations section of this Calendar.

Regularly Scheduled Break

For immigration purposes, the summer term (May to August) for master's programs in Data Science, Analytics, and Artificial Intelligence is considered a regularly scheduled break approved by the University. Students should resume full-time studies in September.

Note: a Regularly Scheduled Break as described for immigration purposes does not supersede the requirement for continuous registration in Thesis, Research Essay, or Independent Research Project as described in Section 8.2 of the Graduate General Regulations.

Admission

M.A.Sc.

The normal requirement for admission to the M.A.Sc. Data Science, Analytics, and Artificial Intelligence is a bachelor's degree in electrical engineering, software engineering, computer systems engineering, or a related discipline with an average of at least B+.

M.C.S.

The normal requirement for admission to the M.C.S. Data Science, Analytics and Artificial Intelligence is an honours bachelor's degree in computer science or equivalent with an average of at least B+. An equivalent degree would include at least twelve computer science half-credits, two of which must be at the 4000-level, and eight half-credits in mathematics, one of which must be at the 3000- or 4000-level.

M.Eng.

The normal requirement for admission to the M.Eng. Data Science and Analytics is a bachelor's degree in electrical engineering, software engineering, computer systems engineering, or a related discipline with an average of at least B+.

M.I.T.

The normal requirement for admission to the M.I.T. Data Science, Analytics, and Artificial Intelligence is an undergraduate degree in information technology, computer science, computer systems engineering, electrical engineering, arts, humanities, psychology, communication, and business, or a related discipline with an average of at least B+. Intermediate programming and data science (statistics, data analysis, or related) courses are expected.

M.Sc.

The normal requirement for admission to the M.Sc. Data Science, Analytics, and Artificial Intelligence is an honours bachelor's degree in mathematics, statistics or the equivalent, with an average of B+ or higher in the honours subject and B- or higher overall.

Admission (Ph.D.)

See the General Regulations section of this Calendar for detailed admission requirements. The normal requirement for admission to the DSAAI Ph.D. program is a master's degree in data science or in a discipline relevant to the home unit of the supervisor, or the equivalent, including demonstrated significant research ability, with at least B+ standing.

For information about how to apply for the Co-op program and how the Co-op program works, visit the Co-op website.

All graduate students participating in the Co-op program are governed by this Graduate Co-operative Education Policy.

Application Requirements

Graduate students are encouraged to apply to the Co-op Program during their first term of studies. Alternatively, students may delay their participation until later on, provided that they have mandatory credits remaining for degree completion.

Participation Requirements

Graduate students:

- must be registered as full-time before they begin their co-op job search and their co-op work term.
- will be registered in a Co-op Work Term course while at work. This course does not carry academic course credit, but is noted on academic transcripts.
- may register in a 0.5 credit during a work term, provided the course is offered during the evening or is offered asynchronously online.
- are not permitted to hold a Teaching Assistantship while on a co-op work term. Where eligible, Teaching Assistantships will be deferred to a later term.
- in receipt of internal or external scholarships should contact Graduate Studies to discuss the possible funding implications of being on a co-op work term
- must have mandatory courses left to complete following their final co-op work term. In cases where the graduate student has just a 0.5 credit left, he or she may request permission of the Co-op Office to complete this course during the work term.

Co-op Participation Agreement

All graduate students must adhere to the policies found within the Co-op Participation Agreement.

Communication with the Co-op Office

Graduate students must maintain regular contact with the Co-op Office during their job search and while on a work term. All email communication will be conducted via the student's Carleton email account.

Graduation with the Co-op Designation

In order to graduate with the Co-op Designation, graduate students must satisfy all requirements of the degree program in addition to the successful completion of two work terms. Students found in violation of the Co-op Participation Agreement may have the Co-op Designation withheld.

Employment

Although every effort is made to ensure a sufficient number of job postings for all Co-op students, no guarantee of employment can be made. The Co-op job search process is competitive, and success is dependent upon factors such as current market conditions, academic performance, skills, motivation, and level of commitment to the job search. It is the student's responsibility to apply for positions via the Co-op job board in addition to actively conducting a self-directed job search. Students who do not obtain a co-op work term are expected to continue with their academic studies. It should be noted that hiring priority for positions within the Federal Government of Canada is given to Canadian citizens.

Work Term Assessment and Evaluation

Work Term Evaluation

Employers are responsible for submitting to Carleton University final performance evaluations for their Co-op students at the end of their work terms.

Work Term Assessment

In order to successfully complete the co-op work term, graduate students must receive a Satisfactory (SAT) grade on their Co-op Work Term Report, which they must submit at the completion of each four-month work term.

Voluntary Withdrawal from the Co-op Option

Students who are currently on a co-op work term or who have already committed to a co-op work term either verbally or in writing may not leave the position and/or withdraw from the co-op option until they have completed the requirements of the work term.

Involuntary or Required Withdrawal from the Co-op Option

Graduate students may be removed from the Co-op Program for any of the following reasons:

1. Failure to attend all interviews for positions to which the student has applied;
2. Declining more than one job offer during the job search;
3. Reneging on a co-op position that the student has accepted either verbally or in writing;
4. Continuing a job search after accepting a co-op position;
5. Dismissal from a work term by the co-op employer;
6. Leaving a work term without approval from the Co-op Management Team;
7. Receipt of an unsatisfactory work term evaluation;
8. Receiving a grade of UNS on the work term report;

International Students

All Graduate International Students are required to possess a Co-op Work Permit issued by Immigration, Refugees and Citizenship Canada before they can begin working. The Co-operative Education Office will provide students with a letter of support to accompany their Co-op Work Permit application. Students are advised to discuss the application process and application requirements with the International Student Services Office.

Co-op Fees

All participating Co-op students are required to pay Co-op fees. For full details, please see the Co-op website.

Data Science, Analytics, and Artificial Intelligence Co-operative Education Option

Students are encouraged to apply for admission to the Co-operative Education Program by the end of their first term of academic study.

To be eligible for admission to Co-op, students must:

1. be enrolled in the M.A.S.c., M.C.S., M.Eng., M.I.T., or M.Sc. in Data Science, Analytics, and Artificial Intelligence;
2. have completed, by the start-date of the first work term, DATA 5000 and/or DATA 5001;
3. have achieved, by the start-date of the first work term, a minimum grade of A- in at least four 5000-level courses;
4. be registered as a full-time student in each academic term prior to a work term;
5. be eligible to work in Canada (for off-campus work terms).

For more information, please refer to the Co-operative Education Policy.

Data Science (DATA) Courses

DATA 5000 [0.5 credit]
Introduction to Data Science
Machine learning; statistics; data science; data ethics; data cleaning; data preparation; data visualization; communication skills to explain advanced analytics. Students work on an interdisciplinary project in data science.

DATA 5001 [0.5 credit]
Fundamentals in Data Science and Analytics
Ethics in Data Science and Analytics, visualization and knowledge discovery in massive datasets; unsupervised learning: clustering algorithms; dimension reduction; supervised learning: pattern recognition, smoothing techniques, classification.
Precludes additional credit for STAT 5703.

DATA 5002 [0.5 credit]
Data Science, Ethics & Society
The ethical, social, political, and environmental implications of data science including the roles and responsibilities of data scientists in contemporary and emerging technological systems and the impact these systems may have at multiple scales, individual, group, institution, across sectors and nation-states.
Includes: Experiential Learning Activity
Also listed as COMS 5225.
Precludes additional credit for COMS 5225, ITEC 5206.

DATA 5900 [0.5 credit]
Special Topics in Data Science
Special topics, not covered by other graduate courses. Details will be available at the time of registration.

DATA 5901 [0.5 credit]
Directed Studies in DSAAI (Master's)
A course of independent study under the supervision of a faculty member in the Data Science, Analytics, and Artificial Intelligence program.

DATA 5908 [1.5 credit]
Project - MSc

DATA 5909 [2.5 credits]
Thesis - MSc

DATA 5913 [0.0 credit]
Co-operative Work Term
Includes: Experiential Learning Activity
Prerequisite(s): registration in the Co-operative Education Option in the Data Science, Analytics, and Artificial Intelligence program.

DATA 5918 [1.5 credit]
Project - MIT

DATA 5919 [2.5 credits]
Thesis - MIT

DATA 5928 [1.0 credit]
Project - MEng

DATA 5929 [2.5 credits]
Thesis - MASc

DATA 5939 [2.5 credits]
Thesis - MCS

DATA 6901 [0.5 credit]
Directed Studies in DSAAI (PhD)
A course of independent study under the supervision of a faculty member in the Data Science, Analytics, and Artificial Intelligence program.

DATA 6907 [0.0 credit]
Doctoral Comprehensive
Serves as starting point for the PhD literature survey and selection of a research topic. Student submits a document focusing on the problem statement, literature review, and gap analysis for the comprehensive exam. The student defends their submission in an oral exam.

DATA 6908 [0.0 credit]
Doctoral Proposal
Written proposal outlines a specific problem, connects it to current literature, and presents the hypothesis and goals. Summarizes preliminary results and details the research methodology and validation procedures(s). Proposal is defended in an oral exam, highlighting completed work and what is expected in final dissertation.

DATA 6909 [0.0 credit]
Thesis - PhD