Cognitive Science

This section presents the requirements for programs in:

- **Master of Cognitive Science**
- **Master of Cognitive Science with Collaborative Specialization in Data Science**
- **Master of Cognitive Science with Collaborative Specialization in Digital Humanities**
- **Ph.D. Cognitive Science**

Program Requirements

Master of Cognitive Science (5.0 credits)

Requirements - Thesis pathway (5.0 credits)

1. 0.5 credit in:		0.5
CGSC 5100 [0.5]	Issues in Cognitive Science	
2. 0.5 credit from:		0.5
CGSC 5101 [0.5]	Experimental Methods and Statistics	
or CGSC 5103 [0.5]	Formal Methods	
3. 1.5 credits in cognitive science or other courses, from at least two different cognitive disciplines, selected with approval of the thesis supervisor and the graduate supervisor.		1.5
4. 2.5 credits in:		2.5
CGSC 5909 [2.5]	M. Cog. Thesis	
5. Students are required to present their research at the Cognitive Science Student Spring Conference (in either year).		
Total Credits		**5.0**

Requirements - Research Project pathway (5.0 credits)

1. 0.5 credit in:		0.5
CGSC 5100 [0.5]	Issues in Cognitive Science	
2. 0.5 credit in:		0.5
CGSC 5101 [0.5]	Experimental Methods and Statistics	
or CGSC 5103 [0.5]	Formal Methods	
3. 1.5 credits from:		1.5
CGSC 5001 [0.5]	Cognition and Artificial Cognitive Systems	
CGSC 5002 [0.5]	Experimental Research in Cognition	
CGSC 5003 [0.5]	Language and Cognition	
CGSC 5004 [0.5]	Cognition and Conceptual Issues	
CGSC 5005 [0.5]	Cognition and Neuroscience	
4. 1.0 credit in:		1.0
CGSC 5908 [1.0]	Research Project	
5. 1.5 credits in cognitive science or other courses selected with approval of the project supervisor and graduate supervisor.		1.5
6. Students are required to present their research at the Cognitive Science Student Spring Conference (in either year)		
Total Credits		**5.0**

Guidelines for Completion of the M.Cog.Sc. Degree
The degree is expected to take no more than six terms to complete. Students will enroll in courses while also conducting research.

Master of Cognitive Science with Collaborative Specialization in Data Science (5.0 credits)

Requirements - Thesis pathway (5.0 credits)

1. 0.5 credit in:		0.5
DATA 5000 [0.5]	Introduction to Data Science	
2. 0.5 credit in:		0.5
CGSC 5100 [0.5]	Issues in Cognitive Science	
3. 0.5 credit in:		0.5
CGSC 5101 [0.5]	Experimental Methods and Statistics	
4. 1.0 credit in CGSC or other approved courses, from two different cognitive disciplines, selected in consultation with the graduate supervisor.		1.0
5. 2.5 credits in:		2.5
CGSC 5909 [2.5]	M. Cog. Thesis (The thesis must be approved as fulfilling the data science requirement and be supervised by a faculty member working in a data science related field.)	
6. Preparation of research for presentation at the Carleton Cognitive Science Spring Conference.		
Total Credits		**5.0**

Requirements - Research Project pathway (5.0 credits)

1. 0.5 credit in:		0.5
DATA 5000 [0.5]	Introduction to Data Science	
2. 0.5 credit in:		0.5
CGSC 5100 [0.5]	Issues in Cognitive Science	
3. 0.5 credit in:		0.5
CGSC 5101 [0.5]	Experimental Methods and Statistics	
4. 1.5 credits from:		1.5
CGSC 5001 [0.5]	Cognition and Artificial Cognitive Systems	
CGSC 5002 [0.5]	Experimental Research in Cognition	
CGSC 5003 [0.5]	Language and Cognition	
CGSC 5004 [0.5]	Cognition and Conceptual Issues	
CGSC 5005 [0.5]	Cognition and Neuroscience	
5. 1.0 credit in CGSC or other approved courses selected in consultation with the graduate supervisor.		1.0
6. 1.0 credit in:		1.0
CGSC 5908 [1.0]	Research Project (Project must be approved as fulfilling the data science requirement and be supervised by a faculty member working in a data science related field.)	
7. Preparation of research for presentation at the Cognitive Science Spring Conference.		
Total Credits		**5.0**

Master of Cognitive Science with Collaborative Specialization in Digital Humanities (6.0 credits)

Requirements - Thesis pathway (6.0 credits)

1. 0.5 credit in:		0.5
CGSC 5100 [0.5]	Issues in Cognitive Science	
2. 0.5 credit from:		0.5
CGSC 5101 [0.5]	Experimental Methods and Statistics	
or CGSC 5103 [0.5]	Formal Methods	
3. 1.5 credits in CGSC or other courses, from at least two different cognitive disciplines, selected with approval of the thesis supervisor and the graduate supervisor.		1.5
4. 0.5 credit in:		0.5
DIGH 5000 [0.5]	Issues in the Digital Humanities	
5. 0.5 credit from:		0.5
DIGH 5011 [0.5]	Graduate Practicum in Digital Humanities	
DIGH 5012 [0.5]	Directed Readings and Research in Digital Humanities	
or annually-listed DIGH course		
6. 0.0 credit in:		
DIGH 5800 [0.0]	Digital Humanities: Professional Development	
7. 2.5 credits in:		2.5
CGSC 5909 [2.5]	M. Cog. Thesis (in the specialization)	
8. Students are required to present their research at the Cognitive Science Student Spring Conference (in either year)		
Total Credits		**6.0**

Requirements - Research Project pathway (6.0 credits)

1. 0.5 credit in:		0.5
CGSC 5100 [0.5]	Issues in Cognitive Science	
2. 0.5 credit in:		0.5
CGSC 5101 [0.5]	Experimental Methods and Statistics	
or CGSC 5103 [0.5]	Formal Methods	
3. 1.5 credits from:		1.5
CGSC 5001 [0.5]	Cognition and Artificial Cognitive Systems	
CGSC 5002 [0.5]	Experimental Research in Cognition	
CGSC 5003 [0.5]	Language and Cognition	
CGSC 5003 [0.5]	Language and Cognition	
CGSC 5004 [0.5]	Cognition and Conceptual Issues	
CGSC 5005 [0.5]	Cognition and Neuroscience	
4. 1.5 credits in CGSC or other courses selected with approval of the project supervisor and graduate supervisor.		1.5
5. 0.5 credit in:		0.5
DIGH 5000 [0.5]	Issues in the Digital Humanities	
6. 0.5 credit from:		0.5
DIGH 5011 [0.5]	Graduate Practicum in Digital Humanities	
DIGH 5012 [0.5]	Directed Readings and Research in Digital Humanities	
or annually-listed DIGH course		
7. 0.0 credit in:		
DIGH 5800 [0.0]	Digital Humanities: Professional Development	
8. 1.0 credit in:		1.0
CGSC 5908 [1.0]	Research Project (in the specialization)	
9. Students are required to present their research at the Cognitive Science Student Spring Conference (in either year)		
Total Credits		**6.0**

Ph.D. Cognitive Science (3.5 credits)

Requirements:

1. 0.5 credit in:		0.5
CGSC 5100 [0.5]	Issues in Cognitive Science	
2. 0.5 credit in:		0.5
CGSC 6801 [0.5]	Proseminar in Cognitive Science	
3. 0.5 credit in:		0.5
CGSC 6002 [0.5]	Methodology Rotation I	
4. 0.5 credit in:		0.5
CGSC 6003 [0.5]	Methodology Rotation II	
5. 0.0 credits in:		0.0
CGSC 6909 [0.0]	Ph.D. Thesis	
6. 1.5 credits in cognition from two different cognitive disciplines, including at least 0.5 credit in cognitive neuroscience if not already completed.		1.5
Total Credits		**3.5**

- Students are expected to present their research at the Cognitive Science Student Spring Conference during the first three years of their program.
- Course selection is with the approval of the Thesis Supervisor and the Graduate Supervisor of Cognitive Science.
- Any student planning a dissertation with an applied cognitive emphasis is required to work for at least one term at a facility approved by the student's research supervisor and the Director of the Cognitive Science Program. Such a facility may include any institution, governmental laboratory, corporation, hospital or educational centre conducting research in the area of the student's specialization. Students should complete this work while registered in either option:

Methodology Rotation	
CGSC 6002 [0.5]	Methodology Rotation I
CGSC 6003 [0.5]	Methodology Rotation II
Ph.D. Thesis	
CGSC 6909 [0.0]	Ph.D. Thesis

Methodology Rotation

The methodology rotation consists of two parts. Students spend one term in each of two laboratories or other research venues using two different methods for studying cognition (behavioural, linguistic-theoretic, computational, conceptual, neuroscientific).

The purpose of the methodology rotation is to give students sufficient background in two different approaches to cognition to allow the student to use work from these approaches in his or her own research.

Assignments will be as specified by each rotation supervisor. Each rotation will be graded separately by the rotation supervisor as either Satisfactory(S)/Unsatisfactory (U). In the event of a grade of U the student may repeat a rotation only once.

Prospectus, Prospectus Defence, Thesis and Defence

When a student is ready to begin work on a thesis, the Graduate Supervisor approves a thesis committee which includes the thesis supervisor or co-supervisors, plus at least two additional members. The committee should include members from at least two different approaches to cognition. The Director of the Department of Cognitive Science is an ex officio member of the committee. Preparation of the thesis has two stages. First the student prepares a prospectus, which is examined at a prospectus defence on the subject matter of the thesis. Then the student prepares the thesis, which is defended at a public oral examination.

Prospectus

The prospectus must describe the proposed research and review the relevant literature in the field of the research. The prospectus must be sufficiently detailed to allow the examining committee to judge the likelihood of a successful thesis ensuing from it. Preparation of the prospectus will follow the practices common in the Thesis Supervisor's area of research. The committee may add further requirements.

Prospectus Defence

The prospectus is examined orally by a board consisting of the members of the thesis committee. The committee may add further examiners. The examination is a comprehensive examination of the thesis subject matter, to ensure that the student has a sound understanding of the context of his or her proposed research, and of appropriate methods, ethical considerations, and so on. The examining board will also consider the research that the student is proposing, which must be of sufficiently high quality and described in sufficient detail to allow the committee to judge whether, if completed successfully, it would be likely that the student would be awarded the degree. Should a student's prospectus be unacceptable, or the student fails the prospectus defence, the student may resubmit the prospectus and be reexamined once.

Thesis

The completed thesis is examined orally by an examining board consisting at minimum of the thesis committee, an examiner at arm's length to the project from within Carleton University (the internal examiner) and an examiner from another university who is at arm's length to the student and the committee and who is a recognized expert in the area of the thesis (the external examiner). All university regulations apply.

Residence Requirement

All Ph.D. candidates must be registered full-time in a minimum of six terms to satisfy the residence requirement.

Language Requirement

A second language is required when relevant to the student's program of research. Whether a second language is required and the level of proficiency expected is determined at the time of admission, based on the student's description of his or her proposed area of thesis research.

Milestones (to be completed by the end of the specified year)

First year: Completion of CGSC 6801* and CGSC 5100, and elective coursework. Spring Conference presentation.

Second year: Completion of remaining program coursework and the methodology rotations (CGSC 6002) and (CGSC 6003). Begin work on Prospectus. Spring Conference presentation.
Third year: Prospectus defence. Continue to work on thesis CGSC 6909 Ph.D. Thesis . Spring Conference Presentation.
Fifth Year: Thesis completion (CGSC 6909 Ph.D. Thesis) and defence.

*Please note CGSC 6801 is offered in alternate years. Course to be completed in second year if it is not offered in the first year of program.

Regulations

See the General Regulations section of this Calendar.

Admission

The requirement for admission into the M.Cog.Sc. program is an honours bachelor's degree with an average of at least A-.

Applicants whose first language is not English, or who have not completed a previous degree at an English-language university, must demonstrate fluency in English as outlined in the General Regulations.

To be admitted, a candidate must submit a description of his or her proposed area of thesis research and a member of the core faculty must indicate in writing that he or she is willing to supervise the student.

Admission

- Master's degree (or the equivalent) from one of the participating disciplines. An average of at least A- in courses in cognition is normally required.
- Applicants with a master's degree in one of the participating disciplines are normally admitted to a 10.0-credit program.
- Students eligible for admission to the 10.0 -credit program but with deficiencies may be required to take additional courses or may be directed to apply for the M. Cog.Sc.
- An overall score of 70 on the Canadian Academic English Language (CAEL) Assessment
- A TOEFL score of 230 CBT (computer-based test) or 580; or 86 IBT overall with a minimum score in each component of writing (22), speaking (22), reading (20) and listening (20).
- An overall IELTS score of 6.5, with a minimum of 6.0 in each band score; or

- An acceptable certification that the language of instruction in your most recently completed undergraduate or graduate degree was English.
- To be admitted, a candidate must submit a description of his or her proposed area of thesis research and a member of the core faculty must indicate in writing that he or she is willing to supervise the student.

Cognitive Science (CGSC) Courses

CGSC 5001 [0.5 credit]
Cognition and Artificial Cognitive Systems
An introduction to the contribution of artificial intelligence and computer modeling of cognitive processes to cognitive science.

CGSC 5002 [0.5 credit]
Experimental Research in Cognition
An introduction to the contribution of experimental psychology to cognitive science.

CGSC 5003 [0.5 credit]
Language and Cognition
An introduction to the contribution of theoretical linguistics and linguistic research to cognitive science.
Includes: Experiential Learning Activity
Also listed as ALDS 5301 and LING 5608.

CGSC 5004 [0.5 credit]
Cognition and Conceptual Issues
An introduction to the contribution of philosophy of mind, philosophy of language, and other conceptual investigations to cognitive science.

CGSC 5005 [0.5 credit]
Cognition and Neuroscience
An introduction to the contribution of neuroscience to cognitive science.

CGSC 5100 [0.5 credit]
Issues in Cognitive Science
A survey of the central problems and issues of cognitive research to start the process of acquiring the interdisciplinary breadth required to understand research in cognitive science.

CGSC 5101 [0.5 credit]
Experimental Methods and Statistics
An introduction to the design of experiments and the statistics needed to interpret data in cognitive science.
Also listed as HCIN 5400.

CGSC 5103 [0.5 credit]
Formal Methods
The class introduces students to various formal methods relevant to cognitive science, possibly including (but not limited to) formal logic, the theory of computation, probability theory, decision theory.
Precludes additional credit for CGSC 5102.
Prerequisite(s): permission of the department.
Seminar.

CGSC 5303 [0.5 credit]
Linguistic Analysis, Culture and Cognition
Universals of language from a cross-cultural perspective. Study of lesser-known languages leading to critical understanding of universal human concepts and communication practices in culture-specific configurations. Cross-linguistic analysis as a means to general understanding of diversity and universality in human cognition.

CGSC 5601 [0.5 credit]
Cognitive Architectures
Cognitive architectures and how to evaluate them against human data; how to create cognitive models using cognitive architectures such as ACT-R.
Precludes additional credit for CGSC 5106 (no longer offered), CGSC 6004 (no longer offered).
Also offered at the undergraduate level, with different requirements, as CGSC 4601, for which additional credit is precluded.

CGSC 5605 [0.5 credit]
Hyperdimensional Cognitive Models
Modelling cognition using artificial intelligence techniques such as reinforcement learning, vector-symbolic models, neural networks, and/or machine learning.
Also offered at the undergraduate level, with different requirements, as CGSC 4605, for which additional credit is precluded.

CGSC 5901 [0.5 credit]
Special Topics in Cognitive Science
Seminar on current, important issues related to Cognition and Neuroscience, Philosophy, Computer Science, Linguistics and/or Psychology. Topics will vary from year to year.

CGSC 5907 [0.5 credit]
Independent Research
Permission to register and approval of research plan must be obtained from the graduate supervisor. A final research report must be filed in the departmental office prior to submission of course grade. The course may be repeated for credit.
Includes: Experiential Learning Activity

CGSC 5908 [1.0 credit]
Research Project
Students may enroll in multiple sections of this course (as necessary) to complete their Research credits.
Includes: Experiential Learning Activity

CGSC 5909 [2.5 credits]
M. Cog. Thesis
Includes: Experiential Learning Activity

CGSC 6002 [0.5 credit]
Methodology Rotation I
Students spend one term in a laboratory or other research venue using a method for studying cognition (behavioural, linguistic-theoretic, computational, conceptual, neuroscientific). Assignments will be as specified by each rotation supervisor.
Includes: Experiential Learning Activity

CGSC 6003 [0.5 credit]
Methodology Rotation II
Students spend one term in a laboratory or other research venue using a different method for studying cognition (behavioural, linguistic-theoretic, computational, conceptual, neuroscientific). Assignments will be as specified by each rotation supervisor.
Includes: Experiential Learning Activity

CGSC 6101 [0.5 credit]
Advanced Statistics for Cognitive Science
Topics may include data wrangling, data visualization, advanced regression, mixed effects models, and procedures for seeing structure in data (e.g., clustering, multidimensional scaling).
Includes: Experiential Learning Activity
Prerequisite(s): CGSC 5101 or permission of the department.

CGSC 6501 [0.5 credit]
Special Topics in Cognitive Science
Seminar course on a topic of interest to students in Cognitive Science. Topics will vary from year to year. Lectures three hours per week.

CGSC 6801 [0.5 credit]
Proseminar in Cognitive Science
A survey of the central problems and issues of natural and artificial cognition and a brief examination of contemporary neuroscience.
Precludes additional credit for CGSC 6800 (no longer offered).

CGSC 6901 [0.5 credit]
Directed Studies in Cognitive Science I

CGSC 6902 [0.5 credit]
Directed Studies in Cognitive Science II

CGSC 6909 [0.0 credit]
Ph.D. Thesis
Includes: Experiential Learning Activity