# COGNITIVE SCIENCE – SPECIALIZATION (COMPUTING) – BACHELOR OF COMPUTING (HONOURS)

**COGS-P-BCH** (Cognitive Science)  
**COGS-I-BCH** (Cognitive Science with Professional Internship)

**Subject:** Administered by the School of Computing in cooperation with the Departments of Languages, Literatures and Cultures, Philosophy and Psychology.

**Plan:** Consists of 96.00 units as described below.

**Program:** The Plan, with sufficient electives to total 120.00 units, will lead to a Bachelor of Computing (Honours) Degree.

**Note:** Requirements for this program have been modified. Please consult the 2022-2023 [Calendar](https://www.queensu.ca/academic-calendar/archive/2022-2023/arts-science/) for the previous requirements.

<table>
<thead>
<tr>
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<tbody>
<tr>
<td></td>
<td><strong>A. Complete the following:</strong></td>
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<tr>
<td>CISC 121</td>
<td>Introduction to Computing Science I</td>
<td>3.00</td>
</tr>
<tr>
<td>CISC 124</td>
<td>Introduction to Computing Science II</td>
<td>3.00</td>
</tr>
<tr>
<td></td>
<td><strong>B. Complete 6.00 units from the following:</strong></td>
<td>6.00</td>
</tr>
<tr>
<td>CISC 102 &amp; MATH 112</td>
<td>Discrete Mathematics for Computing I &amp; Linear Algebra</td>
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</tr>
<tr>
<td>CISC 102 &amp; MATH 111</td>
<td>Discrete Mathematics for Computing I &amp; Linear Algebra</td>
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<tr>
<td>MATH 110</td>
<td>Linear Algebra</td>
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<tr>
<td>COGS 100</td>
<td>Introduction to Cognitive Science</td>
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<td><strong>D. Complete the following:</strong></td>
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<tr>
<td>COGS 201</td>
<td>Cognition and Computation</td>
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<tr>
<td>CISC 203</td>
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<td>CISC 204</td>
<td>Logic for Computing Science</td>
<td>3.00</td>
</tr>
<tr>
<td>CISC 221</td>
<td>Computer Architecture</td>
<td>3.00</td>
</tr>
<tr>
<td>CISC 235</td>
<td>Data Structures</td>
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<td><strong>F. Complete 3.00 units from the following:</strong></td>
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<tr>
<td>STAT 263</td>
<td>Introduction to Statistics</td>
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</tr>
<tr>
<td>STAT 268</td>
<td>Statistics and Probability I</td>
<td></td>
</tr>
<tr>
<td>STAT 351</td>
<td>Probability I</td>
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<td>STAT_Options</td>
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<td></td>
<td><strong>G. Complete the following:</strong></td>
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<tr>
<td>CISC 360</td>
<td>Programming Paradigms</td>
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<td></td>
<td><strong>H. Complete 9.00 units from the following:</strong></td>
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CISC_Artificial_Intelligence
CISC 352 Artificial Intelligence
COGS 400 Neural and Genetic Cognitive Models

**I. Complete the following:**

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<tr>
<td>CISC 497</td>
<td>Social, Ethical and Legal Issues in Computing</td>
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**J. Complete 3.00 units from the following:** 3.00

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<th>Code</th>
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<td>CISC 495</td>
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<td>CISC 500</td>
<td>Undergraduate Thesis</td>
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<tr>
<td>COGS 499</td>
<td>Advanced Undergraduate Project</td>
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**2. Option**

**A. Complete 30.00 units from two of the following option lists:** 30.00

i. Linguistics  
ii. Philosophy  
iii. Psychology

**B. Complete 9.00 units from the following course list:** 9.00

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<thead>
<tr>
<th>Code</th>
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<th>Units</th>
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<tr>
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<tr>
<td>COGS_Linguistics</td>
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<tr>
<td>COGS_Philosophy</td>
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<tr>
<td>COGS_Psychology</td>
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**Electives**

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<td>Elective Courses</td>
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**Total Units** 120.00

**Option Lists**

i. Linguistics

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<tr>
<td>a. Complete the following:</td>
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<tr>
<td>LING 100</td>
<td>Introduction to Linguistics</td>
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<tr>
<td>b. Complete 3.00 units from the following:</td>
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</tr>
<tr>
<td>LING 310</td>
<td>Phonetics</td>
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</tr>
<tr>
<td>LING 320</td>
<td>Phonology</td>
<td></td>
</tr>
<tr>
<td>LING 330</td>
<td>Morphology</td>
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<td>c. Complete the following:</td>
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</tr>
<tr>
<td>LING 340</td>
<td>Syntax</td>
<td>3.00</td>
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queensu.ca/academic-calendar
d. Complete the following:

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<tr>
<td>LING 415</td>
<td>Semantics</td>
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Total Units: 15.00

ii. Philosophy

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<tbody>
<tr>
<td>a.</td>
<td>Complete 6.00 units from the following: 6.00</td>
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</tr>
<tr>
<td>PHIL 111</td>
<td>What is Philosophy?</td>
<td></td>
</tr>
<tr>
<td>PHIL 115</td>
<td>Fundamental Questions</td>
<td></td>
</tr>
<tr>
<td>b.</td>
<td>Complete the following:</td>
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<tr>
<td>PHIL 250</td>
<td>Epistemology and Metaphysics</td>
<td>6.00</td>
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<td>c.</td>
<td>Complete 3.00 units from the following: 3.00</td>
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<tr>
<td>PHIL 261</td>
<td>Philosophy of Mathematics</td>
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<tr>
<td>PHIL 270</td>
<td>Minds and Machines</td>
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<tr>
<td>PHIL 311</td>
<td>Philosophy of Psychology</td>
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<tr>
<td>PHIL 351</td>
<td>Philosophy of Mind</td>
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<tr>
<td>PHIL 359</td>
<td>Philosophy of Language</td>
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<tr>
<td>PHIL 381</td>
<td>Philosophy of the Natural Sciences</td>
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Total Units: 15.00

iii. Psychology

<table>
<thead>
<tr>
<th>Code</th>
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<tr>
<td>a.</td>
<td>Complete the following:</td>
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<tr>
<td>PSYC 100</td>
<td>Principles of Psychology</td>
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<tr>
<td>b.</td>
<td>Complete the following:</td>
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<tr>
<td>PSYC 221</td>
<td>Cognitive Psychology</td>
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<tr>
<td>c.</td>
<td>Complete 3.00 units from the following: 3.00</td>
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<tr>
<td>PSYC 203</td>
<td>Research Methods in Psychology</td>
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</tr>
<tr>
<td>PSYC 271</td>
<td>Brain and Behaviour I</td>
<td></td>
</tr>
<tr>
<td>d.</td>
<td>Complete 3.00 units from the following course list: 3.00</td>
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<tr>
<td></td>
<td>COGS_Psychology at the 300-level or above</td>
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Total Units: 15.00

3. Substitutions

A. Students may be permitted to substitute PSYC 501 for COGS 499 and 6.00 additional units of the Plan, provided they have taken PSYC 203 and (PSYC 301 and PSYC 302) meet the minimum grade requirements for PSYC 501, and have the support of a supervisor in PSYC.

B. Students in the internship version of this Plan will substitute 3.00 units from COMP at the 300-level for requirement 1.J. (COGS 499). In addition, the B.Cmp.(Hons.) Program requirements will be increased by 6.00 units from COMP at the 300-level, for a total of 126.00 units if the student is taking a 12-month internship, or by 9.00 units from COMP at the 300-level, for a total of 129.00 units if the student is taking a 16-month internship.

4. Notes

A. Students with no programming experience should review the Introductory Courses (https://www.queensu.ca/academic-calendar/arts-science/schools-departments-programs/computing/) paragraph included on the School of Computing overview page in the Calendar.

B. As COGS is a multi-disciplinary subject, several first-year courses are required. With the exception of CISC 121 and MATH 111, 100-level courses may be deferred to later years depending upon the planned progression of subsequent courses. With approval of an advisor, COGS 100 may be taken in Year 2 of the Plan.

C. Many upper-year courses in CISC, LING, PHIL, and PSYC have prerequisites outside the courses required for COGS, and students should take this into account in planning for their optional and elective units. Not all upper-year courses are offered every year.

D. The Plan allows 24.00 units for elective courses. Many disciplines are narrowly focused, and electives are essential to allow students to broaden their education. In the case of COGS, the Plan is already very broad, and students are encouraged to use their electives to further pursue the area(s) of Cognitive Science in which they are most interested.

E. With the approval of the Undergraduate Chair, students who take CISC 500 working on a project directly related to Cognitive Science may count 3.00 units towards COGS_Computing.

F. A maximum of 6.00 units from courses offered by other Faculties and Schools may be counted toward the program and/or Plan requirements. This includes courses in BMED, COMM, GLPH, HSCI, LAW, NURS, and courses in the Faculty of Engineering and Applied Science.

Cognitive Science Course Lists

The following lists contain courses offered through other Departments. In accordance with Academic Regulation 2.6 (Access to Classes), students do not have enrolment priority in all of these courses. Access to these courses may only be made available during the Open Enrolment period, and then only if space permits.

CISC_Artificial_Intelligence

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Units</th>
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<tr>
<td>Artificial Intelligence Options</td>
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<tr>
<td>CISC 351</td>
<td>Advanced Data Analytics</td>
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<tr>
<td>Code</td>
<td>Title</td>
<td>Units</td>
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<tr>
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<tr>
<td>CISC 371</td>
<td>Nonlinear Data Analysis</td>
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<tr>
<td>CISC 372</td>
<td>Advanced Data Analytics</td>
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</tr>
<tr>
<td>CISC 451</td>
<td>Topics in Data Analytics</td>
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</tr>
<tr>
<td>CISC 452</td>
<td>Neural and Genetic Computing</td>
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</tr>
<tr>
<td>CISC 453</td>
<td>Topics in Artificial Intelligence</td>
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</tr>
<tr>
<td>CISC 455</td>
<td>Evolutionary Optimization and Learning</td>
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<tr>
<td>CISC 467</td>
<td>Fuzzy Logic</td>
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<tr>
<td>CISC 473</td>
<td>Deep Learning</td>
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<tr>
<td>CISC 474</td>
<td>Reinforcement Learning</td>
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### COGS_Computing

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<tbody>
<tr>
<td>CISC 220</td>
<td>System Level Programming</td>
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<td>CISC 223</td>
<td>Software Specifications</td>
<td>3.00</td>
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<tr>
<td>CISC 226</td>
<td>Game Design</td>
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<td>CISC 271</td>
<td>Linear Data Analysis</td>
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<tr>
<td>CISC 325</td>
<td>Human-Computer Interaction</td>
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<tr>
<td>CISC 332</td>
<td>Database Management Systems</td>
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<td>CISC 340</td>
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<td>CISC 365</td>
<td>Algorithms I</td>
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<td>CISC 425</td>
<td>Advanced User Interface Design</td>
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<td>CISC 454</td>
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<td>CISC 457</td>
<td>Image Processing and Computer</td>
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<td>CISC 465</td>
<td>Semantics of Programming Languages</td>
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<td>CISC 486</td>
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<td>COGS 300</td>
<td>Programming Cognitive Models</td>
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### COGS_Linguistics

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<td>LING 310</td>
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<td>LING 320</td>
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<td>LING 330</td>
<td>Morphology</td>
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<td>LING 340</td>
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### COGS_Philosophy

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<td>PHIL 111</td>
<td>What is Philosophy?</td>
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<td>PHIL 115</td>
<td>Fundamental Questions</td>
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<td>PHIL 250</td>
<td>Epistemology and Metaphysics</td>
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<td>PHIL 261</td>
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<td>PHIL 359</td>
<td>Philosophy of Language</td>
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<td>PHIL 381</td>
<td>Philosophy of the Natural Sciences</td>
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<td>PHIL 452</td>
<td>Current Issues in Metaphysics</td>
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### COGS_Psychology

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<td>PSYC 271</td>
<td>Brain and Behaviour I</td>
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<td>PSYC 305</td>
<td>Introduction to Comparative Cognition</td>
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<td>PSYC 320</td>
<td>Selected Topics in Cognitive Neuroscience</td>
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<td>Cognitive and Language Development</td>
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<td>Comparative Cognition: Cognitive Origins Laboratory</td>
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<td>PSYC 422</td>
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<td>PSYC 423</td>
<td>Visual Cognition in the Real World</td>
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