COMPREHENSIVE COURSE REQUIREMENT FORM

Student Information

Name: 
Email: 
Advisor/Supervisor: 
Degree: 

Five Breadth Courses (Courses taken outside the department must be approved by a faculty in a related area of research.)

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<th>COURSE # &amp; TITLE</th>
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One course from Theory (see attached)

One course from Computer Systems and Design (see attached)

One course in at least three of the areas: (see attached)

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<th>AREA</th>
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When proposing breadth courses taken outside UBC, students must provide a detailed course description (calendar description, course outline, course objectives, topics covered, textbooks used, description of projects and prerequisites).

Additional Courses (Courses must satisfy the “depth requirement” for PhD students or the “supplemental course requirement” for Breadth Master’s. These courses must be chosen in consultation with your advisor or supervisor. For courses taken outside UBC, your supervisor or advisor’s approval is needed.)

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Breadth MSc only:

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Advisor’s/Supervisor’s Approval

Approval of Graduate Affairs Committee:

Signature (Advisor(s) / Supervisor(s))

Date:
COMPREHENSIVE COURSE REQUIREMENT

All M.Sc. students who have selected the Breadth (essay) option and all Ph.D. students must fulfill the comprehensive course requirement. The objective of the comprehensive course requirement is to ensure that the student obtains a breadth of knowledge of computer science and sufficient depth in the field.

Proposals must adhere to the following guidelines:

To fulfill the comprehensive course requirement, the student must have completed:

- **Breadth Requirement**: 5 graded courses equivalent to 15 credits; and
- **Additional Courses**:
  - Depth Requirement (PhD students should complete 3 graded courses equivalent to 9 credits)
    These 3 courses should be chosen by the student in consultation with the student’s supervisor(s) to ensure that the student has the appropriate depth in their area to conduct their research.
  - Supplemental Course Requirement (MSc students taking the Breadth Master's (essay) option should complete 4 graded courses equivalent to 12 credits). Student must obtain approval for the program from their supervisor or advisor if he or she wishes to take courses outside the department.

Students must submit a proposal for how they intend to fulfill their comprehensive course requirement. It must be approved in two ways:

1. The advisor/supervisor(s) must approve the proposal for submission to the Graduate Affairs Committee.
2. The Graduate Affairs Committee must approve that the proposal satisfies the breadth requirement.

### Breadth Requirement

**One course from Theory (Faculty contact: Dr. Joel Friedman)**

- 420: Advanced Algorithm Design & Analysis
- 421: Introduction to Theory of Computing
- 500: Fundamentals of Algorithm Design and Analysis
- 501: Theory of Automata, Formal Languages and Computability
- 506: Complexity of Computation

**One course from Computer Systems and Design (Faculty contact: Dr. Mike Feeley)**

- 415: Advanced Operating Systems
- 416: Distributed Systems
- 417: Computer Networking
- 418: Advanced Computer Architectures
- 508: Operating Systems
- 521: Parallel Algorithms and Architectures
- 527: Computer Communication Protocols
- 538: Topics in Computer Systems: Computer Architecture offered by Mark Greenstreet may be counted towards the breadth for Computer Systems and Design. Students should refer to the course schedule or the instructor to determine whether 538 offered in a particular year can be counted

**One course in at least three of the following areas:**

- **Computational Intelligence (Faculty contact: Dr. Alan Mackworth)**
  - 422: Intelligent Systems
  - 502: Artificial Intelligence I
  - 503: Computational Linguistics I
  - 522: Artificial Intelligence II

- **Data Management and Analysis (Faculty contact: Dr. Rachel Pottinger)**
  - 340: Machine Learning and Data Mining
  - 504: Data Management
  - 540: Machine Learning
  - 564: Data Mining
Graphics and Vision (Faculty contact for Graphics: Dr. Wolfgang Heidrich; Faculty of Vision: Dr. Jim Little)
- 314: Computer Graphics (previously numbered as 414)
- 424: Geometric Modeling
- 426: Computer Animation
- 505: Image Understanding I: Image Analysis
- 514: Computer Graphics: Rendering
- 524: Computer Graphics: Modeling
- 526: Computer Animation

HCI (Faculty contact: Dr. Kellogg Booth)
- 344: Introduction to Human Computer Interaction Methods
- 543: Physical User Interface Design and Evaluation
- 544: Human-Computer Interaction
- 554M: Topics in HCI (as indicated on the graduate course schedule)
- 444: Advanced Methods for Human Computer Interaction (may be counted on an individual case-by-case basis. Students should obtain permission from the Faculty Contact Person in HCI.

Scientific Computing (Faculty contact: Dr. Ian Mitchell)
- 402: Numerical Linear Algebra
- 403: Numerical Solution of Ordinary Differential Equations
- 406: Computational Optimization
- 517: Sparse Matrix Computation
- 520: Numerical Solution of Differential Equations
- 542: Topics in Numerical Computation (Graduate Breadth) – offered by Robert Bridson
- 546: Numerical Optimization (was numbered CPSC 542B before Sep07 - Nonlinear Optimization offered by Michael Friedlander)

Software Engineering and Programming Languages (Faculty contact: Dr. Gail Murphy)
- 507: Software Engineering
- 509: Programming Language Principles
- 511: Implementation of Programming Languages

Interdisciplinary
- 405: Modelling and Simulation (Faculty contact: Dr. Dinesh Pai)
- 513: Integrated Systems Design
- 532: Topics in AI: Multi-Agent Systems (Faculty contact: Dr. Kevin Leyton-Brown)
- 445: Algorithms in Bioinformatics (Faculty contact for Bioinformatics: Dr. Anne Condon)
- 545: Algorithms for Bioinformatics

Graduate courses from other departments that have relevance to computer science. You need the approval of a faculty member in related area in Computer Science.

NOTE: While courses may be added to allow more ways to fulfill the requirements, no course will be listed in more than one area.

GPA requirement: In order to satisfy the comprehensive course requirement, a Ph.D. student must obtain a minimum grade of 72% in any course contributing to the requirement, and an overall average of at least 80% in these courses. A M.Sc. student must obtain a minimum of 60% in any course taken. However, only 6 credits of pass standing may be counted towards a master's program. For all other courses, a minimum of 68% must be obtained.

Failed Course: If a student failed a proposed course, the student must discuss with the supervisor whether to retake the failed course or take an alternative course. If a course is repeated, both marks will appear on the transcript. When repeating a failed required course, a minimum mark of 74% must be obtained.

Changing a course: Student can change the course selection provided that the change has been approved by the supervisor(s). Once the supervisor(s) has approved the change, please send email to the Graduate Program Coordinator (Joyce Poon) and cc your supervisor(s).

Undergraduate Courses: A maximum of 6 credits at the undergraduate level in courses numbered 300 to 499 may be counted toward the requirements of a master's degree. Undergraduate courses from UBC that cannot be counted
breadth courses are: CPSC 404, 410, 411, 425. Please refer to above for the UBC undergraduate course that can be counted as breadth courses. For courses taken outside UBC, permission from the faculty contact person in each area is required.

Courses taken outside UBC and work experience: Courses taken outside UBC must be equivalent to UBC graduate or advanced undergraduate courses in order to be considered. They must be approved by the Graduate Affairs Committee on the advice of the faculty contact person for the research area. Work experience can be counted as long as a faculty member can vouch that it is equivalent to what would be learned in a graduate course.

When proposing these courses/work experiences, students must provide a detailed course description (calendar description, course outline, course objectives, topics covered, textbooks used, description of projects and prerequisites). Students can ask the faculty contact person in that research area to evaluate the course. If the faculty agrees that the course is equivalent to UBC graduate or advanced undergraduate course, ask him/her to send you a brief email confirmation and attach it to your breadth proposal. The onus will be on the student to argue that the requirement is indeed fulfilled.

For M.Sc. student who is taking the essay option (only)
Master's student who is in the Breadth (essay) option must complete 27 credits of courses work outside the essay, of which:

a. at least 21 credits must be Computer Science courses OR the student must obtain approval for the program from the supervisor or advisor; and

b. a maximum of 6 credits at the undergraduate level in courses numbered 300 to 499 may be counted toward the requirements of an M.Sc. degree.

Definition of a breadth course
Clearly, most breadth courses will not be able to cover at a graduate level an entire field in one semester. For many fields, that task cannot properly be accomplished even with the cursory coverage of a third year undergraduate course. Instead breadth courses should strive to have some of the following properties:

1) Broad coverage of some subfield within the discipline, at a level appropriate for beginning graduates.

2) No graduate level prerequisites, although because they should contain graduate level material, it is fully appropriate for these courses to require undergraduate prerequisites.

3) Student grades are not exclusively based on research projects; homework and/or exams encourage students to absorb lecture material. However, one of the goals of graduate coursework is to teach research skills, and projects provide a well motivated opportunity to practice these skills.

Many but not all existing graduate courses will be appropriate for breadth under these guidelines. It is expected that faculty will consider these guidelines when intending that their course(s) count for breadth.