TABLE OF CONTENTS

Welcome to the UBC Department of Computer Science

ABOUT THE UNIVERSITY
Chapter 1  The University ................................................................................................................ 1
Chapter 2  Housing .......................................................................................................................... 2
Chapter 3  Tuition Fees ................................................................................................................... 3
Chapter 4  Other Expenses ............................................................................................................. 5
Chapter 5  UBC Services and Facilities .......................................................................................... 6
Chapter 6  Department of Computer Science ................................................................................. 7

ABOUT THE DEPARTMENT
Chapter 7  Getting Settled in the Department ................................................................................. 8
Chapter 8  Computer Science Graduate Student Association ........................................................ 9
Chapter 9  Seminars ........................................................................................................................ 9
Chapter 10  Department Facilities ................................................................................................... 10

FINANCIAL SUPPORT
Chapter 11  Graduate Awards & Assistantships ............................................................................. 11
Chapter 12  TA Policies ................................................................................................................... 12

THE GRADUATE PROGRAM
Chapter 13  The MSc Program ........................................................................................................ 14
Chapter 14  PhD Track within the MSc Program ............................................................................. 18
Chapter 15  The PhD Program ......................................................................................................... 19
Chapter 16  Research Proficiency Evaluation (RPE) ...................................................................... 22
Chapter 17  The Comprehensive Course Requirement .................................................................. 24
Chapter 18  Program Timelines ....................................................................................................... 27
Chapter 19  Interdisciplinary Studies ............................................................................................... 29
Chapter 20  Graduate Courses ....................................................................................................... 30

OTHER RESOURCES
Chapter 21  Tips on how to write a thesis ....................................................................................... 37
Chapter 22  Tips on how to finish your Program .............................................................................. 41
Chapter 23  Grievance Procedures ................................................................................................. 44
Chapter 24  UBC Policy & Standard of Conduct .............................................................................. 47

Information in this handbook is updated once a year. Students should refer to the CS Current Graduates website (https://www.cs.ubc.ca/students/grad/) for up-to-date information.

In case of disagreement between the information in this document and the information in the UBC Calendar, the information in the UBC Calendar takes precedence.

Last updated: July 2016
Dear Graduate Students,

Welcome to the Department of Computer Science

Our aim is to provide you the best education to do the best research in the best possible environment. We hope you will enjoy your experience in the department, so that when you leave (with your degree), you will have fulfilled your educational goals and have had a rewarding experience in graduate school both academically and socially. Making the department a better place is everyone's responsibility; therefore, we encourage you to get involved in making this a better place to be.

The graduate handbook is designed to introduce graduate life in Computer Science at UBC. Many people have contributed information that we hope you will find helpful. We would like to hear your comments or, better yet, if you would like to put some effort into making this a better handbook, please contact the Graduate Program Coordinator, Joyce Poon.

If you have any problems, please don't hesitate to contact me or the Head of the department. We may be busy, but we will find time to talk to you if you think it is important. Your well-being is important to us.

Have a great year!

Sincerely,

Alan Wagner
Associate Head, Graduate Program
1 The University

UBC has grown into one of Canada's finest universities ranked among the world’s top 40.

The university employs more than 5,000 faculty who are professors and researchers throughout 18 Faculties and 12 Schools educating more than 59,000 students. The student population growth has been met with expansion through new buildings dedicated to science and engineering, forestry, the health sciences, and the library. A University Town is emerging as well, bringing lively residential, social, and cultural diversity to complete the community.

Occupying about 1,000 acres at the western tip of Vancouver, UBC overlooks the Strait of Georgia. Although adjacent to a wilderness park and extensive public beaches, the University is only a 20-minute drive from the center of downtown Vancouver, which has a population of approximately one million people. The setting for the city is one of the most beautiful in the world, and outdoor sports ranging from skiing to sailing to hiking. The city itself is quite cosmopolitan, with many different ethnic groups represented. The climate is moderate; the average daytime temperature ranges from 5˚C in the winter to 25˚C in the summer.

There’s a downtown campus in the heart of Vancouver’s business district at Robson Square and an educational outreach centre, the Learning Exchange, on the city’s Downtown Eastside. Some of the city’s best attractions including beaches, the Museum of Anthropology, The Chan Center for the Performing Arts, and the UBC Botanical Garden keep visitors trekking out to the campus. In 2005, UBC broadened its scope to include the southern BC interior and established UBC Okanagan.

Located in the heart of the campus is the new Student Union Building (a.k.a. AMS Student Nest). It has five storeys and provides a welcoming space for students to eat, shop, study, and socialize. For more information, please visit http://www.ams.ubc.ca/nest/aboutthenest/

Like all Canadian universities, UBC is funded by the provincial government. The teaching year runs from September to April, with some courses in the summer.

Summing up, UBC is founded on a belief in several vital principles that inform all aspects of learning and research: active engagement in civil society, the pursuit of sustainability in its social as well as its environmental forms, and commitment to global citizenship.

Visit www.ubc.ca to explore the many facets of UBC in greater detail.
2  Housing

If you are moving to Vancouver, you should secure a place to stay in advance. It is difficult to find accommodations both on-campus and close to campus around the start of classes in September.

2.1 On-Campus Residence

UBC Student Housing and Hospitality Services (SHSS) provide housing to more than 9,000 students with twelve on-campus residential complexes. Graduate students can apply to Year Round Residence, Green College, St. John’s College, or Student Family Residence. For detailed information, please visit http://vancouver.housing.ubc.ca/getting-started/graduate-students/

If you are interested in on-campus residence, we recommend that you apply for on-campus housing as soon as possible since it is in high demand. After you have submitted a housing application, you can check your position on the waiting list through the Online Service Centre at https://secure.housing.ubc.ca/

For more information
Essential application facts:  http://vancouver.housing.ubc.ca/applications/essential-facts
How to apply:  http://vancouver.housing.ubc.ca/applications/how-to-apply
How rooms are assigned:  http://vancouver.housing.ubc.ca/applications/how-we-assign-rooms
Residence contracts:  http://vancouver.housing.ubc.ca/applications/residence-contracts/
Fees & payments:  http://vancouver.housing.ubc.ca/applications/fees-payments/

2.2 Off-Campus Accommodation

If you wish to live off-campus expect high rent in Vancouver, especially if you hope to find a place near UBC, in areas such as Point Grey and Kitsilano. Good housing can be obtained at a reasonable price if you are willing to settle in East Vancouver or the West End. If you wish to look for a place for September, then come early. It is very difficult to find a place close to campus at the end of August. Please visit http://vancouver.housing.ubc.ca/other-housing/off-campus-housing for alternative housing options.

Note: You are generally required to provide a half-month’s rent as a security or damage deposit. This is refundable when you leave, subject to any repairs required.
3  Tuition Fees

The following figures are extracted from the 2015-16 UBC Vancouver Calendar. They do not include student fees. The University reserves the right to change fees without notice. For information, please visit the UBC Calendar website at www.calendar.ubc.ca/vancouver/index.cfm?tree=14,266,773,0

3.1  Full Time Master’s Degree

<table>
<thead>
<tr>
<th>Program</th>
<th># of Installments per year</th>
<th>Minimum # of installments</th>
<th>Domestic (per installment)</th>
<th>International (per installment)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Full-time (Schedule A)</td>
<td>3</td>
<td>3</td>
<td>$1,538.45</td>
<td>$2,702.79</td>
</tr>
<tr>
<td>On-leave fee</td>
<td>3</td>
<td>N/A</td>
<td>$111.50</td>
<td>$336.15</td>
</tr>
<tr>
<td>Continuing Fee</td>
<td>3</td>
<td>N/A</td>
<td>$702.87</td>
<td>$2,702.79</td>
</tr>
<tr>
<td>Extension Fee</td>
<td>3</td>
<td>N/A</td>
<td>$987.19</td>
<td>$2,702.79</td>
</tr>
</tbody>
</table>

3.2  Doctoral Degree

<table>
<thead>
<tr>
<th>Program</th>
<th># of Installments per year</th>
<th>Minimum # of installments</th>
<th>Domestic (per installment)</th>
<th>International (per installment)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Full-time (Schedule A)</td>
<td>3</td>
<td>6</td>
<td>$1,538.45</td>
<td>$2,702.79</td>
</tr>
<tr>
<td>On-leave fee</td>
<td>3</td>
<td>N/A</td>
<td>$111.50</td>
<td>$336.15</td>
</tr>
<tr>
<td>Continuing Fee</td>
<td>3</td>
<td>N/A</td>
<td>$702.87</td>
<td>$2,702.79</td>
</tr>
<tr>
<td>Extension Fee</td>
<td>3</td>
<td>N/A</td>
<td>$987.19</td>
<td>$2,702.79</td>
</tr>
</tbody>
</table>

As a result of funding provided by the UBC Graduate Support Initiative, students entering our PhD program without external tuition support will be reimbursed by the department for their tuition during the first four years of their studies. For detailed information about the GSI award, please refer to the Faculty of Graduate and Postdoctoral Studies website.

3.3  Student Fees  

Student fees include fees authorized by student referendum, the UBC Board of Governors, the Alma Mater Society (AMS), and other student societies and organizations. AMS fees are collected by the University at the request of the organization. Fees are calculated according to full time or part-time status, session, and study level. For a list of fees and the ones that students can opt out, please refer to the section on student fees in the UBC Calendar.

3.4  Payment of Fees

Students who are employed as TAs or RAs can arrange to have their tuition fees deducted from their pay cheques. They must complete the Tuition Payroll Deductions/Fee Deferral Application and submit it along with a copy of the Student Appointment form to the Tuition Fee Payment Office before the Tuition Payroll Deductions deadline (not the tuition due date).
For incoming Canadian students starting in September, the Tuition Fee Office normally accepts the form up to the second week of August. Tuition fees are divided by the number of payroll deductions during the term to arrive at the semi-monthly payment amount. Deductions are taken twice a month in:

- **Winter – Term 1:** October, November, and December
- **Winter – Term 2:** January, February, and March
- **Summer Term:** May, June

For international students starting in September, the Tuition Fee Office normally accepts the form up to the end of August. Automatic Tuition Fee Payroll Deductions are not possible for international graduate students who are employed as TAs or RAs. In place of Payroll Deductions, the tuition fee Payment Office has agreed to defer tuition fees to a later date within the term(s) to allow International students to make payments in installments. Fees for Winter Session are deferred as follows:

- **Winter - Term 1 (Sep – Dec):** Deferred to November 30th
- **Winter – Term 2 (Jan – Apr):** Deferred to March 31st
- **Summer – Term 1 (May – Aug):** Deferred to June 30th
  (Note Term 2 Upass fee will remain with a July 6th due date)

Please refer to the Tuition Payroll Deductions/Fee Deferral Application form for detailed information, [http://gradstudies.ok.ubc.ca/__shared/assets/Payroll_Deduction_tuition46020.pdf](http://gradstudies.ok.ubc.ca/__shared/assets/Payroll_Deduction_tuition46020.pdf)

NSERC award payments are administered by Graduate Awards in the Faculty of Graduate and Postdoctoral Studies. Award holders will receive their scholarship payments through UBC bi-monthly. They must complete the required forms and submit them to the Faculty of Graduate and Postdoctoral Studies at least six weeks before requested award “Start Date.” For more information, please visit the Graduate Studies web site at [http://www.grad.ubc.ca/current-students/scholarships-awards-funding](http://www.grad.ubc.ca/current-students/scholarships-awards-funding)
4 Other Expenses

4.1 Medical Services Plan of British Columbia

Medical Services Plan (MSP) is BC’s provincial health insurance plan. Anyone residing in BC for longer than six months is required by law to enroll in the MSP and pay premiums directly to the plan. It covers the cost of basic medical care within Canada when you show your BC Services Card, including most physician and hospital services. Coverage starts after the statutory “waiting period” consisting of the remainder of the month of arrival plus two months. Be sure to apply right away as it may take several months for your application to be processed. MSP application forms and instructions are available on http://www.healthservices.gov.bc.ca/msp. If you have questions regarding problems with your medical insurance or MSP coverage, you can also refer to UBC Student Services for more information (http://students.ubc.ca/livewell/health-insurance/msp) or call them at 604-822-5021 to make an appointment. For international students, a copy of the student authorization must accompany the MSP application and coverage discontinues when the student authorization expires.

4.1.1 For coverage during the waiting period:

Canadians from other provinces should maintain coverage with their former medical plan during the waiting period. New residents and returning residents must purchase private medical insurance. International students will automatically be enrolled in iMED which is a basic insurance plan that covers the waiting period (the remainder of the month of arrival plus two months). If the student arrives early or late, s/he has to apply for a change of the coverage dates. For detailed information, please see http://students.ubc.ca/livewell/health-insurance/imed#change

Note: Medical costs in Canada are very high; therefore, insurance is required.

4.2 AMS/GSS Health & Dental Care Plan www.ams.ubc.ca/services/health-dental-plan

It is important that you have extended health and dental coverage while you are in Canada. All UBC students who pay AMS fees to UBC are automatically enrolled in the AMS/GSS Health & Dental Plan. To verify that you are enrolled, check your fees online and look for the "AMS med/dent fee." This plan does not replace basic MSP (or an equivalent plan). In order to be eligible for all aspects of the AMS/GSS Health & Dental Plan, you must first be covered by MSP or iMED (or have coverage purchased in Canada that is equivalent). For more information, please visit www.ihaveaplan.ca/rte/en/UniversityofBritishColumbiaAMSGSS_Home. Information on benefits and opting out, answers to frequently asked questions, claim forms, and enrolment forms are available on the website. The Health & Dental Plan Office is located in Room 61 in the basement of the Old Student Union Building (Old SUB).

4.3 Cost of Living Expenses

In addition to tuition and student fee costs, Canada Immigration (www.cic.gc.ca/english/study/index.asp) has determined a base-line figure of $10,000 per 12 month period plus cost of tuition as the basic cost of living expenses for a single student (http://www.cic.gc.ca/english/study/study-how-documents.asp?doc3). Please note that this is a base-line estimate; you should expect that personal expenditures on accommodation, food, transportation, books and supplies, and other miscellaneous items will be higher for students living in Vancouver. Important Note: International students will likely have to show proof of funds for $10,000 plus tuition during the application process for a Canadian student visa. A letter from the department indicating funding support to the student might constitute such proof. Please visit the Citizenship and Immigration Canada web site at www.cic.gc.ca/ for more information.

Helpful Tip: Don’t forget that your income is taxable. Your income tax depends on how much you earn. Please visit the following link for detailed information: http://students.ubc.ca/enrolment/finances/financial-advice/taxes-international
5 UBC Services and Facilities

5.1 Graduate Student Society  www.gss.ubc.ca
The Graduate Student Society (GSS) represents and advocates on behalf of all UBC Graduate students. They provide academic, professional, social, and recreational services to graduate students. The GSS is administered by an executive committee elected annually by grad students. The GSS Council consists of the executives and elected representatives from each graduate department. They are located in the Thea Koerner House (Room 225 - 6371 Crescent Road). All graduate Students are welcome and encouraged to attend council meetings.

5.2 International Student Services  http://students.ubc.ca/international
International Student Services assists international students by providing special events and programs such as one-to-one advising, educational and social programs, ESL classes, the Peer Program, and information about immigration and citizenships of Canada. It operates year-round as a social and cultural center for international and intercultural learning. It is a “home away from home” for many international students.

5.3 Athletics Facilities & Recreation
Students can participate in a variety of sports and recreational activities, ranging from non-credit courses, special events and intramural leagues administered by Campus Recreation and Intramural Sports. Athletics and Recreation operates an extensive network of indoor and outdoor facilities, such as the Student Recreation Centre, the Aquatic Centre, the Thunderbird Sports Centre, War Memorial Gymnasium, Thunderbird Stadium, and the UBC Tennis Centre, as well as numerous fields specifically designed for soccer, rugby, baseball, and field hockey.

Students receive preferential rates for most UBC recreation activities as well as special student rates for admission to all UBC Thunderbird football, basketball, hockey, and volleyball home games.
6 Department of Computer Science

6.1 Overview
The UBC Department of Computer Science, established in May 1968, is among the top three Computer Science departments in Canada located on the beautiful grounds of The University of British Columbia, a university ranked as one of the top 40 universities in the world.

6.1.1 Recent Expansion
Over the years, the department has expanded in many dimensions. It is currently a community with 54 faculty members, 15 adjunct professors, associate members and affiliated members, and 33 technical and administrative staff. Jim Little is our Department Acting Head between July and December 2015 and, starting from January 2016, Chen Greif will be our Department Head. Our administrative model includes associate heads for Graduate, Undergraduate, and Faculty affairs. Young, newly-recruited faculty members have joined internationally-recognized researchers in supervising graduate students in a breadth of research areas. Our professors are also members of the Institute for Computing, Information and Cognitive Systems (www.icics.ubc.ca). Several spin-off companies have originated here including: Point Grey Research, Tasktop Technologies, WebCT, Webnames, Worio, Cloudburst Research, Exotic Matter, and Coho Data.

6.2 Grad Students as Key Participants
Currently there are over 70 PhD students and 65 MSc students with roughly 50% of those students being Canadian citizens or permanent residents. Almost all full time graduate students receive full financial support through scholarships, awards, or teaching/research assistantships. The Department is proud, and has benefited from its commitment to encouraging a participatory role for graduate students through active service on departmental committees. Our graduate students enjoy a rather unique program feature that encourages them to explore research areas in their first year prior to choosing a supervisor.

For a list of graduate students who have won awards, please visit our web page at https://www.cs.ubc.ca/news-events/awards
Students must be in the department by September 1st to start in September, and January 2nd for those who are starting in January. We recommend that students drop by the department the week before the start of the term. If you need to find a place to stay, then you should allow at least an additional two to three weeks prior to arrival.

7.1 In the Department

One of the first things you should do is to introduce yourself to the Graduate Program Administrator and the Graduate Program Assistant. Both are in the Computer Science main office, Room 201, 2366 Main Mall. The graduate program assistant will go over the orientation package with you to help you get started with your studies. This package includes vital paperwork such as directions on how and where to apply for a Social Insurance Number (SIN) and a UBC student card. If you are an international student, bring your study permit to your first meeting as we need to keep two photocopies on file. After you have applied for the Social Insurance Number (SIN), you should bring two copies of your SIN Receipt to the Graduate Program Administrator, Joyce Poon. International students should apply for the SIN number as soon as possible. You could not be paid by UBC until we have two copies of your study permit and SIN Receipt.

Every graduate student, upon arrival, is assigned a faculty member as his/her temporary advisor. These assignments are made keeping in mind the research interests of the student and the workload of the faculty member. The advisors assist students in their academic decision-making and oversee the students’ program, including recommending and approving courses. The initial advisor does not necessarily become the thesis supervisor.

Administrative matters concerning graduate students are handled by the Graduate Affairs Committee. The committee is chaired by the Associate Head for Graduate Affairs (ah-grad@cs.ubc.ca, currently Alan Wagner), and composed of faculty members, graduate students elected by the Computer Science Graduate Student Association (CSGSA) and the Graduate Program Administrator, Joyce Poon. Graduate students are invited at any time to call on the Associate Head for Graduate Affairs for advice. Final responsibility for meeting deadlines of the Faculty of Graduate and Postdoctoral Studies or other requirements of the graduate program rests upon the student.

Department’s Orientation Week normally takes place during the first or second week of September. This is an opportunity for you to get acquainted with the department. Events are also organized by the Computer Science Graduate Student Association for all incoming and returning CS graduate students. For more information, please visit the CSGSA website at https://www.cs.ubc.ca/~csgsa/

Activities

- Afternoon tea is held every Tuesday at 4:00pm in the lounge, ICCS X860. This is a great opportunity to relax mid-week with other graduate students.

7.2 Department Policies

Each graduate student has a mailbox to receive mail related to their studies and/or research area. However, please have all your personal mail directed to your home address. The Department will not be responsible for distributing mail, nor for redirecting it once the student leaves.

The fax machine is restricted to staff, faculty, and students with faculty approval. It may NOT be used for private business. It is understood that none of the printers and copiers may be used for private business. Please see your Group Assistant for codes to the photocopiers. Photocopying is charged at 7 cents per page. Output generated on the Laser Printer is charged to your advisor/ supervisor. No personal copying is permitted on Department Copiers or Laser Printers.
8 Computer Science Graduate Student Association

The Computer Science Graduate Student Association (CSGSA; www.cs.ubc.ca/~csgsa/) is the body that represents the graduate students in the Computer Science department at UBC. The purpose of the Association is to promote the welfare of the Computer Science graduate students, and to provide official representation for them. All graduate students currently registered are members of the CSGSA.

CSGSA organizes various events throughout the year, and they are announced by emails to the department mailing list, on the Facebook Page (www.fb.com/ubccsgsa/) and the website. Elections are held in March or April to fill the executive positions, to choose representatives at the UBC Graduate Student Society (GSS) meetings and various department committees. Please visit the Association's website for the list of CSGSA Officer and Representative positions. The executives of the CSGSA can be reached at csgsa@cs.ubc.ca.

9 Seminars

9.1 Distinguished Lecture Series www.cs.ubc.ca/dls

DLS speakers feature renowned researchers from all over the world whose talks present the latest results in their fields. All faculty and graduate students are encouraged to attend. These talks are aimed at a general Computer Science audience. They are a great way to find out about areas beyond your current research project and discover new connections. There are opportunities to meet with the speakers, which is a great way to get to know experts closer to your specialty and get feedback on your own research. Seminars are usually held on Thursdays 3:30pm in room 110 of the Hugh Dempster Pavilion.

None of us work in a vacuum. Find your way to the DLS talks; enjoy some free refreshments; and be better prepared for the exciting things that are going on beyond our department.

9.2 Graduate Seminar Series

The graduate seminar series are interactive sessions (tutorials, workshops, and discussion forums) addressing issues of importance to both new and existing graduate students. Topics are generally related to academic and professional development. Some examples of recent seminars are “how to be a good TA,” “how to select a supervisor,” and “how to write a thesis.” Everyone is welcome. First-year graduate students are highly encouraged to attend Group Meetings.

Different groups often meet at different times to discuss research (and sometimes other issues, e.g., running a lab). These are usually informal, and are typically not closed, although you may have to be “in” to find out about them. Ask other students or the faculty member in your areas of interest whether there are discussion groups. If there are, contact the organizers to get on the mailing list. If there are no such meetings, organize one so that various people can discuss research interests.
10 Department Facilities

10.1 Computer Facilities
The Computer Science computing facility is a large ever changing network and resource which includes network centralization, various computer servers, file servers and computing labs with desktops, Macs, mini PCs, scanners, and printers. Research groups have their own facilities which offer graduate students additional workstations and more specialized equipment specific to their research. For convenient access to the facilities, all seats in the graduate group offices are equipped with network mini PCs or desktops where students can access Unix, Linux, and Windows through servers. Additional computers can be accessed in the graduate student terminal room.

Remote computing is an important part of our facility and as such we support network ports accessing campus network for portable computers throughout the building complex. The UBC wireless network is also widely available in the campus. Graduate students can download software from the web so they can connect securely and easily to the facility from home. Ceiling mounted projectors are available in the meeting rooms and seminar rooms for presentations and meetings.

Support for the facility is provided in a number of ways including a helpdesk run by technical staff, a FAQ, and the departmental website. Students can also seek help via various newsgroups and through their peers.

10.2 Reading Room
The ICICS/Computer Science Reading Room, located on the second floor of ICICS/CS, is a valuable resource for students and faculty. You'll find course reserves, books and ebooks, print and electronic journals, online databases, conference proceedings, videos, CDs, theses and technical reports. Information assistance is available during opening hours or by email (rdngroom@cs.ubc.ca). Reading Room facilities include quiet study space, internet workstations and scanners. Check out the monthly newsletter, Facebook page, or Twitter feed. For complete details, visit the Reading Room website at www.cs.ubc.ca/rr or under CS > our-department > facilities.
11 Graduate Awards & Assistantships

11.1 Graduate Awards for UBC students

11.1.1 NSERC (Natural Sciences and Engineering Research Council) Scholarships
Canadians citizens or permanent residents of Canada with a first-class average (a grade of “A”) in each of the last two completed years of study are eligible to apply. Applications are generally due in late September. For more information, please visit the NSERC website at www.nserc-crsng.gc.ca/Index_eng.asp.

11.1.2 Top-up Awards for NSERC Recipients
Canadian students who apply for and receive NSERC awards receive a substantial top-up award from the department. Students should apply directly to NSERC for one of these NSERC scholarships.

11.1.3 Computer Science Merit Scholarships
The UBC Department of Computer Science is offering CS Merit Awards to outstanding incoming international and domestic students. Students awarded a CS Merit Award are guaranteed award-level funding in their first two years at UBC, consisting of a $10,000 top-up to their stipend over two years.

CS Merit Award recipients who also receive an external scholarship such as an NSERC award will receive CS Merit Award support once their external scholarship ends. Specifically, they will receive the department's NSERC top-up for the duration of their NSERC (1 year for an MSc), and the CS Merit Award for the balance of the two-year period.

All students applying to the MSc and PhD programs will be automatically considered; there is no need to apply separately. These competitive awards are aimed at exceptional student applicants.

11.2 Financial Assistantships from the Department
To continue attracting quality graduate students, and to compete on an equal basis with other graduate schools, the department offers teaching and research assistantships to both Canadian and foreign students without scholarships or awards. Incoming graduate students normally receive a combination of full teaching assistantships and partial research assistantships for the first eight months. Summer support is available for these students in the form of summer research scholarships and summer teaching assistantships.

For PhD students, support is generally guaranteed for the first four years, providing that the student remains in good academic standing and makes acceptable progress. Support beyond four years is not guaranteed. Besides the guaranteed support, PhD students also receive the Graduate Support Initiative (GSI) Award which reimburses the tuition fees for the first four years of study. Students are still responsible for paying the student fees themselves.

For MSc students, support is generally guaranteed for the first 20 months of the program providing that the student remains in good academic standing and makes acceptable progress. Part-time MSc students are not eligible for research or teaching assistantships. Note, however, that a student may not remain in the MSc program for more than 20 months without approval from the Graduate Affairs Committee.

Note: All awards and financial assistantships are subject to funding.
12 TA Policies

The Department of Computer Science strives for excellence in every facet of its responsibilities: in research, in graduate education, and in undergraduate education. Many of our graduate students have a chance to participate as teaching assistants in the department's mission to provide excellent undergraduate education.

This is a summary of important things that TAs need to know early in order to be prepared for this opportunity. Graduate students can look at the UBC TA handbook and the TA collective agreement for much more detailed information about TA rights, expectations, and responsibilities.

12.1.1 Expectations

The instructor of the course for which the TA is assigned to should, at the beginning of the term, give the TA a description of TA responsibilities throughout the term. For a full-time monthly TA, s/he is expected to work no more than **192 hours (16 weeks * 12 hours per week) per appointed term.** This is just an estimate, and deviations throughout the term may happen on occasion. It is within the instructor's right to change your assigned duties as the term progresses.

It is the department’s expectation that no work be conducted on any Statutory Holidays. For a list of Statutory Holidays, please refer to your **CUPE 2278 TA Collective Agreement**

12.1.2 Priority

Teaching assistantship is a job, and for scheduling purposes TA duties take precedence over all other UBC-related duties, except for regularly scheduled activities (lectures, labs, etc.) for the courses that the TA is taking for credit. Cases of conflict between regularly scheduled TA responsibilities and anything else (lab meetings, meetings with the research supervisor, etc.) must be resolved and agreed to by all parties in a way that will not have a negative effect on your TA responsibilities.

12.1.3 Duration

A TA is paid to work an average of 12 hours a week for 16 weeks in each of the two Winter session terms (Term 1 runs September 1st through December 31st, term 2 runs January 2nd through April 30th). Even if there are no formal class activities (lectures, labs, tutorials, etc.) during a week, a TA is expected to be available. In particular, TAs should ensure that their travel plans allow them to be in Vancouver and ready to work for the entirety of the term (except for the standard vacation period, outlined below). It is worth making particular note that the scheduling of final exams in undergraduate courses is done centrally, fairly late in the term, so the timing of the final exam is not under departmental control.

12.1.4 Vacation

Vacation is 8 hours per term, and the 192 hours include these 8 hours. The standard department vacation period for TAs is from December 24th through January 1st. If a TA wishes to take additional vacation, s/he must obtain explicit permission from his/her instructor(s) well in advance, ideally at least one month, and take the responsibility to arrange for a qualified replacement (another TA, for example) to perform the duties while the TA is on vacation.

12.1.5 Lateness and Absences

If a TA is going to be late or absent from a scheduled activity such as a lab, tutorial, meeting or joint marking session, it is the TA's responsibility to contact the instructor or lead TA for the course as soon as possible so that students can be notified or a substitute TA can be arranged. The Collective Agreement allows 12 hours of sick leave per term. Unused sick leave can be carried forward to next term (to a maximum of 24 hours banked). If this absence is due to sickness, the Collective Agreement allows 12 hours of sick leave per term (or the equivalent for part-time TAs). Unused sick leave can be carried forward to next term (to a maximum of 24 hours banked). Please note that these hours include preparatory and grading as well as class time.

12.1.6 Averaging

The expectation of 12 hours of work per week does not mean that the TA will work exactly 12 hours in every week. An instructor has the right to assign work that "reasonably" averages to 12 hours per week. "Reasonable" is only loosely
defined and in cases where the TA and instructor are unable to resolve a disagreement, it should be worked out with the assistance of the TA Coordinator. Some examples may help calibrate the notion of reasonable:

- It is reasonable to ask a TA to work 16 hours one week and 8 hours the next.
- It is reasonable to ask a TA to work 16 hours per week for 3 weeks and then do no work in the 4th week.
- It is not reasonable to ask a TA to work 36 hours in one week and then do no work for each of the next 2 weeks.

Please try to be accommodating as much as possible, especially at the beginning and end of the term when the work largely varies and is much less predictable that during the middle of the term. Note that this section is all about how much time an instructor may ask a TA to work in a given week; there is nothing preventing a TA from choosing to work many more hours in one week than another.

12.1.7 Reporting
TAs should keep track of the hours that they work each week (what the TA does and how long it takes) and discuss them with the instructor regularly throughout the term. This is a good way to ensure that there is agreement between the TA and the instructor on how long various activities should take.

12.1.8 Evaluation
TA performance will be formally evaluated at the end of each term by the students that the TA interacts with. These evaluations will be made available to the TA so that s/he can use them to guide their efforts and to improve their skills. These evaluations form the basis for selecting both outstanding TAs (and nominating them for awards) and TAs who are struggling (see the "Inadequate performance" item below). In addition, the department has procedures for informal evaluation during the term which can provide feedback earlier which can be very helpful in identifying problems and concerns that are preventing the TA from being as effective as possible. These informal evaluations can come at the request of the TA or the Instructor. TAs are encouraged to take advantage of these processes to continually improve their effectiveness.

12.1.9 Training
The department offers training for TAs during the orientation week. This training is mandatory. TAs should ensure that their travel plans allow them to be on campus in time. There will be an additional training session after the first informal evaluations have taken place in early October. The time the TA spends in training counts as hours worked as a TA.

12.1.10 Inadequate Performance
TAs who struggle to meet the department's expectations for quality teaching will be offered as much help as possible to improve (extra training, mentoring, etc.). TAs who fail to improve and continue to not meet the department's minimum expectations of quality will not be offered future TA opportunities.

In the case of Graduate Students, if such a student is unable to secure a research assistantship, s/he will have no funding from the department. The department's guarantee of support is contingent on adequate performance of a student's teaching and research duties.

12.1.11 Course Assignment
The department strives to assign TAs to courses for which they have a strong background preparation. Occasionally a TA may be assigned a course that will be a stretch for him/her. The TA should discuss with the instructor how to make the best of this situation (the TA might be asked to attend lectures, given extra preparation time to read the book in advance of the class, etc.).

12.1.12 Communication Skills
English is the language of instruction at the University of British Columbia. As such, TAs will be required to conduct labs and/or tutorials in the language of instruction, and to communicate both orally and in writing with the students, the professor, and the other TAs. If a TA is not a native speaker, it is the TA’s responsibility to ensure that he/she can communicate concepts clearly and effectively in English. The University provides resources to help TAs with this, and the program coordinator or assistant can also provide you with the details of the University programs.
13 The MSc Program

There are two choices available to MSc students: the thesis options (12 or 6 credit thesis) and the essay option (3 credit essay). The choice between the two options depends on what the student hopes to achieve with the MSc degree, and whether the student wants to pursue a PhD degree. Each choice has its own advantages.

There are two types of MSc theses: the 12 credit and the 6 credit thesis. Either type allows the student to learn how to do research. In choosing to write a thesis, a student will have a better understanding of what goes on in a research establishment. If the student continues on to the PhD program, the thesis option provides valuable experience in performing research and writing it up appropriately. Since PhD work is judged by external examiners, choosing the thesis option provides valuable experience in preparation for the PhD. For students who have not decided on whether to pursue a PhD, the choice of the thesis MSc option will provide a taste of performing and writing up research. The 6 credit thesis is available, but not encouraged, since it typically will require substantially more than half the work of the 12 credit thesis for both the student and the supervisor.

Choosing the essay option gives the student a broader perspective on computer science. It allows the student to sample many areas and see research without becoming overly specialized. If the student is going on to the PhD program, this route can be a fast-track to the MSc degree without doing the extra work of writing a thesis. Since the comprehensive course requirement is also a requirement for the PhD program, completing the essay option for the MSc will give the student a head start in that some of the course work for the PhD program will have already been done. Newly accepted PhD students can get into research straight away, but these students will not have had the experience of performing research and writing up a thesis.

13.1 Academic Regulations

All MSc students must remain continuously registered in one of the thesis (CPSC 549A or 549B) or essay (CPSC 589) options until the degree is completed except for periods of time when the student is away on an official leave of absence. Failure to register for two consecutive terms may result in the student being required to withdraw.

13.1.1 Part-Time Study

A student may be enrolled part-time in the Faculty of Graduate and Postdoctoral Studies and take 6 to 12 credits per year, as well as work on a thesis or essay. Support for part-time study is not available. The program must be completed in five years. Part-time students are not eligible to receive interest-free status government loans, university fellowships, or scholarships and they are not eligible for teaching assistantships, research assistantships, or student housing, and are not guaranteed assigned desk space at the University.

13.1.2 Course Work

A minimum of 60% must be obtained in any course taken by a student enrolled in the MSc program for the student to be granted Pass Standing. However, only six credits of Pass standing may be counted towards a MSc program. For all other courses, a minimum of 68% must be obtained. For students in the essay MSc, please refer to Section 16 for detailed information.

13.1.3 The Examining Committee

The MSc Thesis Examining Committee must include a minimum of two people; the thesis supervisor or designate, and a person who was not involved in advising the student in his or her research.

13.1.4 Transfer Credits

Students may request to transfer up to a maximum of 12 credits toward their MSc degree. These transfer credits cannot have been used as the basis for admission or for credit towards the completion of another program. Only courses in which at least a B standing (UBC 74%) is obtained will be considered for transfer. The time limit for eligibility of courses for transfer to a graduate degree program is normally five years at the time students commence their program. The 12 credit restriction does not apply to students in UBC approved Exchange Agreements established by the UBC Exchange Programs Office.
Graduate courses taken as an unclassified student may be approved for transfer towards the MSc program with the permission of the Department and the Dean of the Faculty of Graduate and Postdoctoral Studies. Consistent with the standard transfer credit regulations, students are limited to transferring a maximum of 12 credits or 40% of the total number of credits needed for degree completion. Only courses in which at least a B standing (UBC 74%) is obtained will be considered for transfer. The time limit for eligibility of courses is normally five years at the time students commence their program. Students who would like to transfer credits must have the written approval from their advisor or supervisor.

13.1.5 Transferring to the PhD Program
During the first year, students who have completed at least 12 credits of course work with an excellent academic record and support from their supervisor may request to transfer directly into the PhD program before completing the MSc degree. The transfer is subject to the student’s successful completion of the Research Proficiency Evaluation (RPE) as outlined in Section 16. Upon receiving the formal recommendation letter from the supervisor and successful completion of RPE, the Graduate Affairs Committee will recommend the transfer to Faculty of Graduate and Postdoctoral Studies. Transfer directly into the doctoral program is not normally permitted beyond 18 months of study at the MSc level and in no case is it permitted after completion of the second year. For more details, please contact the Graduate Program Administrator.

13.2 Program Requirements
Students are expected to complete the MSc program within about 24 months from the initial date of registration. For instance, students who start in September will normally finish by August of the second year. The critical points in the program are associated with finding a supervisor and completing the research.

13.2.1 Finding a Thesis/Essay Supervisor
Every incoming graduate student is assigned a faculty member as his/her temporary advisor. These assignments are made keeping in mind the research interests of the student and the workload of the faculty member. The initial advisor does not necessarily become the thesis supervisor. It is the student’s responsibility to find an appropriate thesis or essay supervisor in his or her area of interest within 6 months.

The supervisor must be a Professor, Associate Professor, or Assistant Professor and a member of the Faculty of Graduate and Postdoctoral Studies. Once the student has found a supervisor, the student and supervisor must complete the supervisory agreement form (www.cs.ubc.ca/students/grad). The supervisor then takes over the responsibility of the advisor. It is essential that students begin their thesis or essay work in the summer following their first year. Support for this work may be available (see our policy on financial support). The thesis or essay must be approved by the supervisor and one other faculty member.

The supervisor may be from outside the student’s home department. In this case, the student must identify a co-supervisor from the home department. All three parties (student and both supervisors) must sign the supervisory agreement form.

If the supervisor leaves the University but the thesis is close to completion the supervisor may, with the permission of the Dean of the Faculty of Graduate and Postdoctoral Studies, continue. In this case, a co-supervisor who is a full member of the Faculty of Graduate and Postdoctoral Studies is appointed.

If the supervisor is on study leave or any other leave exceeding two months, it is highly recommended that an interim co-supervisor who is a full member of the Faculty of Graduate and Postdoctoral Studies be appointed.

13.2.2 Deadline for finding a supervisor
For students starting in September and January:

- By March 15, Year 1: the student should have made substantial progress toward finding a thesis/essay supervisor, i.e., the student should have identified one or more possible supervisors and discussed supervision with them.
- By May 1, Year 1: any student who has not found a thesis/essay supervisor will receive a notification that they have not conformed to the schedule for finding a supervisor and a reminder of the timeline detailed below.
• By July 1, Year 1: if a thesis/essay supervisor has not been found, the student will be judged not to be making satisfactory progress. He/she will not receive any funding beyond August 31 of that year. If a student finds a supervisor, the student will be judged to be making satisfactory progress and funding will be restored.

• By Jan 1, Year 2: if a thesis/essay supervisor not been found, the Graduate Affairs Committee will notify the Faculty of Graduate and Postdoctoral Studies that the student has not met the requirements and should be withdrawn from the program.

Students who start in January have the same deadlines since they will be drawing from the same pool of supervisors as the September entrants. January entrants to the program would have to find a supervisor within 2.5 months, by March 15 of their first year; therefore, students entering in January should start communicating with faculty members in the department before they arrive. Students deferring their start of studies until January will be informed that they must adhere to this schedule.

13.2.3 Timely Completion of the Thesis/Essay

Once the student and the supervisor have been working together, there should be regular meetings during which they can plan the research and organize a timeline for completion, which should include (for example) background reading, a process for refining the research problem, an outline of the research goals, and methods for evaluating the research results. The timeframe on performing the research varies with area and should be agreed upon by the student and supervisor.

It may become increasingly clear that a student pursuing thesis research should instead write an essay. The essay option requires nine courses instead of six, so such decisions should be made early enough to be able to take the necessary courses, preferably at the end of the first summer but no later than December of the second year.

At 20 months, any student who thinks he/she is unable to finish the thesis within the next 4 months should discuss this with the supervisor. A proposed plan should be determined before the end of May (Year 2) by the student and supervisor.

13.3 12 Credit MSc Thesis (Thesis Master's)

The 12 credit MSc thesis is equivalent in credits to four three-credit graduate courses.

13.3.1 Program Requirements under This Option

1. 18 credits of approved courses of which a maximum of six credits may be 300 or 400 level undergraduate courses. All courses must be approved by the student’s advisor or supervisor, and in the case of undergraduate courses, by the Graduate Advisor as well.

2. The 12-credit MSc thesis (CPSC 549B) must satisfy one or more of the following criteria:
   a. It involves some original research results;
   b. It involves novel implementation techniques;
   c. It involves the implementation of a piece of nontrivial software whose availability could have some impact on the computer science user community.

3. The final thesis has to be approved by the supervisor(s) and a second reader. The second reader should be someone who was not involved with the student’s thesis; although the Faculty of Graduate and Postdoctoral Studies highly recommends an external reader, it is not a requirement. If there are any questions, you or your supervisor(s) should contact Associate Head of Graduate Affairs (ah-grad@cs.ubc.ca) as early as possible.

4. The student is required to present the thesis results at a departmental seminar.

The course work in this option comprises six graduate courses, typically taken three per term in the first year of MSc studies. However, students have flexibility in scheduling their course work. For those new to the Canadian educational system the transition can be eased by scheduling two courses in the first term. The additional course can be taken in the second year. Another typical pattern involves taking only two courses in the second term of the first year, allowing the student to explore their intended research area. Additionally, course availability may argue for deferring the final
course until the second year. It is of course possible to defer several courses to the second year of studies, but courses may either be unavailable or scheduled in the same term, which may interfere with research progress.

### 13.4 6 Credit MSc Thesis

The 6 credit MSc thesis is equivalent to two graduate courses. The thesis research and/or implementation are less comprehensive in scope.

#### 13.4.1 Program Requirements under This Option

1. 24 credits of approved courses of which a maximum of six credits may be 300 or 400 level undergraduate courses. All courses must be approved by the student’s advisor or supervisor, and in the case of undergraduate courses, by the Graduate Advisor as well.

2. The 6 credit MSc thesis (CPSC 549A) must satisfy one or more of the criteria cited above for the 12 credit MSc thesis, but is of correspondingly lesser scope.

3. The final thesis has to be approved by the supervisor(s) and a second reader. The second reader should be someone who was not involved with the student’s thesis; although the Faculty of Graduate and Postdoctoral Studies highly recommends an external reader, it is not a requirement. If there are any questions, you or your supervisor(s) should contact Associate Head of Graduate Affairs (ah-grad@cs.ubc.ca) as early as possible.

4. The student is required to present the thesis results at a departmental seminar.

### 13.5 Master’s Essay

The MSc essay is a comprehensive critical survey of the literature in some area of computer science; it may identify feasible and significant open problems, but it is not expected to contribute to their solution.

#### 13.5.1 Program Requirements under This Option

The student must:

1. Complete all of the Faculty of Graduate and Postdoctoral Studies requirements for the MSc degree.

2. Complete the breadth component of the PhD Comprehensive Course Requirement. Please read the chapter on [www.cs.ubc.ca/students/grad/prospective/programs/phd](http://www.cs.ubc.ca/students/grad/prospective/programs/phd) for more details.

3. Complete a 3 credits MSc essay (CPSC 589). The essay has to be approved by the supervisor(s). It does not require an external reader.

4. Complete 27 credits of course 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 their 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 a MSc degree.

4. There is no need to submit the essay to the Faculty of Graduate and Postdoctoral Studies. The essay has to be approved by the supervisor(s). It does not require an external reader (i.e., someone outside of the supervisory committee). Once the essay is approved by the supervisory committee, the supervisor should send a message to the Graduate Program Administrator stating that the essay has been approved and the percentage grade for the essay.

5. The student is required to present the essay results at a departmental seminar.
The PhD Track has been created by the department to attract top graduate students who have or will shortly have an MSc from outside of North America and are interested in pursuing a PhD at UBC. In the past, such students would typically be admitted to the MSc program. In exceptional cases, students with a BSc from anywhere may also be considered for the PhD Track. The PhD Track provides a mechanism by which qualified students can transition into the PhD quickly and smoothly, subject to attaining certain standards of performance.

14.1 Admission to the PhD Track

Admission to the PhD Track is extremely competitive. From the many applications we receive every year, our Grad Recruiting and Admissions Committee will select a very small number of students for entry based on academic excellence, research achievement, perceived potential for the PhD program, and fit with the interests of a potential supervisor. There are risks involved with this kind of fast tracking for both the student and the department and so the Research Proficiency Evaluation (RPE), described in Section 16, has been put into place to mitigate those risks.

14.2 Program Requirements

Coursework: PhD Track students are recommended to take 5-6 courses during the first two terms of their study. The Faculty of Graduate and Postdoctoral Studies requires PhD Track students to complete 12 credits of first class average (80% or above) of which 9 credits must be at the 500-level or above and at least 9 credits must be of first class standing (80% or above). Faculty members assigned as temporary advisors to grad students will assist the students in the selection of appropriate courses and in choosing the right number of courses each term. In selecting courses, students should be aware of the PhD Comprehensive Course Requirement detailed in Section 17.

RPE completion: Students admitted to the PhD Track program are required to demonstrate their research proficiency by completing a research project with under the supervision of a one or more faculty members, and presenting their results in a written report and oral examination before their RPE committee (see Section 16 for details).

14.3 Financial Support

PhD Track students will receive a one-time non-renewable top-up award from the department. For PhD Track students, significant delays in the RPE schedule may result in losing good standing status, which can result in reduced or lost financial support.

14.4 Transfer out of the PhD Track

Upon successful completion of the RPE, a PhD Track student is placed in our PhD program. A student who decides not to do the RPE, or does not pass the RPE, can remain in the MSc program. In this case, research completed as part of the RPE can be used as part of the Master’s thesis / essay, with the approval of the supervisor(s).
15  The PhD Program

15.1  Academic Regulations
All doctoral students must remain continuously registered until the degree is completed except for periods of time when the student is away on an official leave of absence. Failure to register for two consecutive terms may result in the student being required to withdraw. Please refer to Section 18 for details on important checkpoints in all graduate programs.

15.2  Program Requirements
To complete the PhD program, a student must successfully complete a Research Proficiency Evaluation (RPE), be admitted to candidacy, complete the PhD thesis, and defend it according to the Faculty of Graduate and Postdoctoral Studies policies (www.grad.ubc.ca/current-students/graduation). To be admitted to candidacy, the student must complete the Comprehensive Course Requirement and defend the Thesis Proposal Exam. It is highly recommended that both milestones be completed within 24 months from the date of initial registration in the program. A student who is not admitted to candidacy within 36 months from the date of initial registration is expected to withdraw from the program. Extensions may be granted under exceptional circumstances with the permission of the Graduate Affairs Committee and the Dean of the Faculty of Graduate and Postdoctoral Studies. The PhD degree is expected to be completed within 3-5 years. Extensions beyond 6 years require University approval.

15.2.1 Research Supervisor and Supervisory Committee
Every incoming graduate student is assigned a faculty member as his/her advisor. These assignments are made keeping in mind the research interests of the student and the workload of the faculty member. In the case of entering PhD students, the advisor is a member of the “offer sponsorship team,” which consists of one to three faculty. It is the student’s responsibility to formalize a supervisory relationship with a faculty member in his or her area of interest within one term. The advisor and any other sponsors are natural choices for this role, but other faculty may also be considered (if they are interested). (See section 15.3 for details concerning the composition of the supervisory committee.)

15.2.2 Research Proficiency Evaluation (RPE)
Students admitted to the PhD program are required to demonstrate their research proficiency by completing a research project with under the supervision of a one or more faculty members, and presenting their results in a written report and oral examination before their RPE committee (see Section 16 for details).

Exception: Subject to the approval of the supervisor, PhD students who completed a Master’s degree from our department AND are working with the EXACT SAME supervisory team can be exempted from the RPE.

A student who fails the RPE has the option of retaking it if both (i) the RPE committee recommends that the student be given a second chance, and (ii) the student can find an alternate supervisor to guide them through the RPE a second time. The second attempt at the RPE must be completed (including the oral presentation) within 8 months of the first attempt. A student who does not pass the RPE must leave the PhD program.

15.2.3 Comprehensive Course Requirement
All PhD students are required to submit the Comprehensive Course Requirement form (www.cs.ubc.ca/students/grad/resources-forms) to the Graduate Affairs Committee within the first two months of the initial registration. The objective of the comprehensive course requirement is to ensure that the student obtains a breadth of knowledge of computer science, as well as sufficient depth in a specific field. Students should indicate what courses they will be taking or have taken that can satisfy the breadth and depth components of the comprehensive course requirement. If the student has taken courses outside the department that can satisfy the breadth requirement, s/he must contact the faculty in the research area for approval (see Section 17 for details on the comprehensive course requirement). Once the comprehensive course proposal is approved, the student can take the courses in accordance with the proposal.
Note that for courses not contributing to the comprehensive course requirement, a minimum of 68% (B-) must be achieved. Courses contributing to the comprehensive course requirement have a even higher requirement (see section 17).

15.2.4 Thesis Proposal
Having formalized a thesis supervisor and having successfully completed the RPE, the student will continue with the development of a PhD thesis proposal. This proposal must be presented in written form to the supervisory committee by the end of the second year of the PhD program. (See section 15.4 for details on the thesis proposal and the proposal examination.)

15.2.5 Completing the Research Program
Once the thesis proposal examination is passed, the student must carry out a research program in accordance with his or her research proposal under the supervisor’s guidance, with periodic reviews by the student’s committee. A thesis describing his or her research findings must be written by the student, approved by the committee and an external examiner, and defended at a final oral examination set up by the Faculty of Graduate and Postdoctoral Studies. A guide to the preparation of PhD theses is provided by the Faculty of Graduate and Postdoctoral Studies. The student has the final responsibility for meeting the requirements and deadlines of the Faculty of Graduate and Postdoctoral Studies.

15.3 Supervisory Committee
The PhD supervisory committee is responsible for guiding the student in planning research and preparing the thesis. The committee must have at least three members. The membership may include faculty from other departments and other universities. With the approval of the Dean of Graduate Studies, the committee may also include qualified persons who are not faculty members. The majority of the committee must be from UBC. When persons from outside the University are proposed, a memo requesting approval should be sent to the Dean of Graduate Studies, with a justification and curriculum vitae of the person(s) nominated. It is expected that typically the RPE committee of a student will become the student’s supervisory committee.

15.3.1 Chair of the Doctoral committee
The student is responsible for finding a supervisor by going through the RPE process. The supervisor is usually the Chair of the supervisory committee. Once a faculty member has agreed to be the supervisor, the student and the supervisor must sign the agreement form by December 1st in case of September entrants and by April 1st in case of January entrants.

The Chair of the committee must be a full time faculty member of the Computer Science Department. The Chair of the supervisory committee is responsible to the Head of the Department for determining the composition of the supervisory committee, subject to the regulations of the Faculty of Graduate and Postdoctoral Studies. If the Chair leaves the University but the thesis is close to completion the Chair may, with the permission of the Dean of Graduate Studies, continue. In this case, a co-Chair who is a full member of the Faculty of Graduate and Postdoctoral Studies must be appointed.

Although the supervisory committee must be chaired by a full member of the Faculty of Graduate and Postdoctoral Studies, the committee may include individuals who are not full members. In particular honorary faculty, adjunct faculty and off-campus professionals who are academically qualified to advise graduate students may be members of the committee if approved by the Dean of Graduate Studies. When a faculty member approaching retirement accepts an assignment as Chair or as research supervisor, the faculty member and the Head of the Department should ensure that provision is made for an alternate supervisor if or when the need arises.

15.3.2 Supervisory Committee Members
The purpose of this committee is to provide constructive criticism and assessment of the student’s ideas as the program develops. The student is responsible for identifying at least two additional members of the faculty to serve on the committee. They are usually faculty members at least at the rank of Assistant Professor from the department in which the degree is to be taken. Other committee members such as senior instructors, honorary faculty, adjunct faculty, off campus professionals, and faculty members from other universities may be permitted. A letter of request from the supervisor for these members including a copy of the individual’s curriculum vitae must be submitted to the Graduate Advisor. Once the department has approved it, the Graduate Advisor will submit a letter along with the supervisor’s request and the individual’s CV to the Dean of the Faculty of Graduate and Postdoctoral Studies for approval.
The supervisory committee also decides the membership of the comprehensive examination committee. Faculty of Graduate and Postdoctoral Studies recommends that the committee meet at least once and preferably twice a year to monitor the student’s progress.

### 15.4 Thesis Proposal Examination

#### 15.3.3 Thesis proposal

The PhD thesis proposal should satisfy the following:
- It should be no longer than fifty pages;
- It should have a balance between literature review and proposed research;
- It should demonstrate the ability of the student to carry out the proposed research; and
- It should contain expected research milestones.

There is no requirement that a PhD thesis proposal contain research results.

#### 15.3.4 Thesis proposal examination

The thesis proposal examination, administered by the PhD supervisory committee and the Chair, should be scheduled two to four weeks after submission of the thesis proposal. The purpose of the examination is to determine whether:
1. The proposed work is considered PhD thesis material;
2. The student has the ability to conduct the research and complete the thesis as outlined in the proposal; and
3. The supervisory committee has sufficient expertise to guide the student’s research. If the committee decides that it does not have the sufficient expertise to guide the student’s research, the defense can be adjourned without any repercussions for the student. The proposal examination will reconvene once the proper membership is determined.

The Chair of the examination should be:
- a person who is not on the thesis committee or was not involved in advising the student in his or her research;
- selected by the student’s thesis supervisor; and
- a member of the Faculty of Graduate and Postdoctoral Studies or a research member of the department.

The thesis proposal exam meeting should be scheduled for two hours. There are three phases to the meeting. The members of the examination committee may choose to question the candidate in either or both of the first two phases.

**In Phase I**, the candidate presents his/her thesis proposal in an open portion of the meeting. The candidate’s presentation should last at most thirty minutes. The Chair then calls upon each member of the examination committee to question the candidate, and invites questions from the audience.

**In Phase II**, the Chair of the exam requests all audience members to leave the room so that the candidate can be examined in a closed session. The Chair then calls upon each member of the examination committee to question the candidate.

**In Phase III**, the Chair calls for an in-camera discussion for the examination committee to determine the outcome of the examination. There are three possible outcomes:
- Approval to proceed with the thesis,
- Failure, with the possibility to retake the thesis proposal exam exactly one more time within six months; or
- Failure, resulting in withdrawal from the PhD program.

The Chair's report should be sent to the examination committee, the student, the Graduate Program administrator, and the Chair of the Graduate Affairs Committee. Under outcomes (b) and (c), the reasons for failure must be clearly stated in the Chair’s report and this Chair’s report must be made available to the Chair of a subsequent examination.
16 Research Proficiency Evaluation (RPE)

This section describes the Research Proficiency Evaluation (RPE) process. The RPE was introduced as a mechanism to provide an early assessment of a student’s research proficiency and fit within the supervisory context provided by the department, to the benefit of both the student and potential supervisor(s). “Research proficiency” refers to the student’s ability to conduct PhD-level research within the proposed supervisory context, and to demonstrate progress commensurate with four months of full-time research in the chosen area of specialization. “Supervisory fit” refers to the match between the student and the supervisory style and research culture in the lab.

16.1 RPE Design

The RPE is a four-month research exercise, designed to provide a time-constrained but otherwise realistic simulation of PhD-level research activity, including the formulation of a research plan, full engagement of the supervisory relationship, tangible progress towards the fulfillment of the research plan, and presentation, both oral and written, of the research outcomes. Although the RPE project might well be designed as a component of an on-going research project that will eventually be published, it is understood that the RPE project need not be publishable in isolation. In practice, preliminary or negative outcomes, as long as they are well motivated and well executed, are perfectly acceptable.

The RPE is designed to help mitigate the risks (for both students and supervisors) associated with fast-track entry (PhD-track of the MSc program) to the PhD program. In this context it provides an important check before a commitment to the PhD is finalized. The RPE has also been adopted as a mechanism to provide early feedback to students newly admitted to the PhD program, together with their proposed supervisors, about deficiencies that could portend serious impediments to the timely completion of the PhD degree.

16.2 RPE Process

The RPE process typically begins in the first four-month term of study (Term 1) of an incoming PhD or PhD-track student. Subsequent four-month terms are referred to as Term 2, Term 3, etc. In the absence of a formal leave from the program, it is assumed that these terms will be consecutive. So, for a student starting in September, with no leaves, Term 1 means September through December, Term 2 means January through April, and term 3 means May through August.

Identify a supervisor: Students need to have identified the faculty member with whom they will work on a research project for RPE purposes by the end of Term 1 of their study. In general, this faculty member will continue as the thesis supervisor throughout the PhD studies, so we will refer to this faculty member as the supervisor of the student. PhD students are expected to have formalized a supervisory arrangement very early in Term 1 of their study.

Strike an RPE Supervisory Committee: The student’s supervisor forms an RPE committee for the student. This committee must include the student’s supervisory committee (if one has already been struck) and must conform to all rules applicable to a PhD supervisory committee (Section 15.3).

Formulate an RPE project: Early in Term 2, students and their supervisor should start a process that leads to the identification of an RPE research project. This step must be completed by the middle of the last month of Term 2.

a. The student, in consultation with the supervisor, should first give a written proposal for a research project to the RPE supervisory committee based on preliminary research discussions.

b. The RPE project can be part of a larger research project involving other students, as long as the individual contribution of the RPE project can be identified.

c. The proposal can be up to two pages long. It should include both a start and termination date for the project.

d. The committee must approve the proposed project as being suitable for the student to work on within the proposed timeframe.

e. Approved proposals should be filed with the Graduate Program Administrator.

Complete the RPE Project: The student will work on the approved research project for a four-month period, typically term 3 of the program. The student will continue to have periodic meetings with the supervisor during this period,
receiving guidance. The supervisor is expected to engage at the same level as during the rest of the student’s PhD studies.

It is recognized that the RPE project constitutes a four-month snapshot of work. Nevertheless, it is critical to adhere to this timeframe, rather than to extend it in order to produce a more polished/comprehensive outcome. Significant delays in the timeline may result in loss of good standing status, which will have implications on fellowships, tuition waivers, and other funding.

**Prepare an RPE Project Report:** By the middle of the first month following completion of the RPE project, the student is required to submit a written report of the research outcomes.

- The report, written in a style similar to a typical conference paper, will include a clear motivation for the work, its place in the context of related work, significance, and a detailed account of the contributions, along with necessary technical development.
- The suggested length of the written report is up to 12 pages, single-spaced, two-column format.
- The report must be submitted to the RPE committee, and be filed with the Graduate Program Administrator.

**Schedule the RPE examination:** The final evaluation for the RPE should be scheduled to take place two to four weeks following the submission of the RPE report. It is recommended that the student start scheduling the RPE examination well before the submission of the report.

### 16.3 Process for RPE Examination

The student will give an oral presentation in which they will summarize their work and then answer questions from the RPE committee on their research outcomes and related work. The student will be evaluated on their research accomplishments, the written report, their oral presentation, and on their answers to questions. It is recommended that examinations be scheduled for two hours.

The RPE examination, like the PhD thesis proposal defense, should be chaired by a member of the research faculty of the department external to the supervisory committee of the student. The examination has three phases. Members of the examination committee may question the candidate in either or both of the first two phases.

**In Phase I,** the student gives a talk, of approximately twenty minutes duration, which is open to all members of the department. The Chair then calls upon each member of the RPE committee to question the candidate, and invites questions from the audience.

**In Phase II,** the Chair asks everyone other than the student and the RPE committee to leave the room so that the candidate can be examined in a closed session. The Chair then calls upon each member of the RPE committee to question the candidate. At the end of this phase the Chair asks the student to leave the room.

**In Phase III,** the committee deliberates on the student’s performance and reaches a pass/fail decision. The chair then invites the student in and communicates the committee’s decision.

The Chair’s report should be sent to the examination committee, the student, the Graduate Program administrator, and the Chair of the Graduate Affairs Committee. In the event of a failure, the reasons for failure must be clearly stated in the Chair's report.
17 The Comprehensive Course Requirement

All MSc students who have selected the Breadth (essay) option, PhD Track, and PhD 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.

17.1 Procedure

Shortly after a student enters the program s/he, in consultation with the advisor/supervisor, will prepare a comprehensive course proposal indicating courses taken and the proposed program of studies (including the terms during which the courses will be taken) which the student intends to complete in order to fulfill the comprehensive course requirement. This report must be signed by the supervisor and submitted to the Graduate Affairs Committee for approval.

Once the Graduate Affairs Committee approves the comprehensive course proposal, the student will proceed with studying for the degree. When the student has completed the courses in the approved proposal, the student will submit a written report documenting those courses taken and their grades, theses, papers, previous work experience, etc., which, taken together, are intended to fulfill the comprehensive course requirement. If this report is judged to complete the program outlined in the approved proposal, the Graduate Affairs Committee will inform the student that the requirement has been fulfilled.

17.2 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 s/he 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 by both:

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.

17.2.1 Breadth courses

For the purposes of a concrete proposal, the following is a *likely* set of breadth courses.

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

- **Computational Intelligence (Faculty contact: Dr. Giuseppe Carenini)**
  422: Intelligent Systems
  502: Artificial Intelligence I
  503: Computational Linguistics I
  515: Computational Robotics
  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: Dr. Wolfgang Heidrich; Faculty contact: 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 542B before Sept 07 – Nonlinear Optimization offered by Michael Friedlander.

- **Software Engineering and Programming Languages (Faculty contact: Dr. Ron Garcia)**
  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 (Faculty contact: Dr. Alan Hu)
  532: Topics in AI: Multi-Agent Systems (Faculty contact: Dr. Kevin Leyton-Brown)
  547: Information Visualization (Faculty contact: Dr. Tamara Munzner)
  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 PhD student must obtain a minimum grade of 72% (B) in any course contributing to the requirement, and an overall average of at least 80% (A-) in these courses. A MSc 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: Students 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 an email to the Graduate Program Administrator (Joyce Poon) and send a copy to your supervisor(s).

Undergraduate Courses: At most 2 out of the required courses can be fulfilled with undergraduate level course credits; thus all remaining required courses (6 for PhD & PhD Track, 7 for MSc Breadth) must be fulfilled with graduate course credits. Undergraduate courses from UBC that cannot be counted as breadth courses are: CPSC 404, 410, 411, 425. Please refer to the 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 the department or UBC and work experience: Courses taken outside the department or UBC should be equivalent to UBC CS graduate or advanced undergraduate courses in order to be considered. Breadth courses must be approved by the Graduate Affairs Committee on the advice of the faculty contact person for the research area. Depth courses must be approved by the research supervisor. 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 MSc students taking the Essay option (only)
Master’s students who are 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 a MSc degree.

17.3 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; they should contain graduate level material, but 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 practise these skills.

It is hoped that many but not all existing graduate courses will be appropriate for breadth under these guidelines, and that professors will consider these guidelines when intending that their courses count towards the breadth requirement.
18 Program Timelines

The recommended timelines will differ depending on the cohort (PhD vs. PhD-track), admission date, course load, and academic leaves (e.g. for internships). Students should consult other sections of the handbook for timelines specific to their cohort.

Students starting in September

<table>
<thead>
<tr>
<th>Year</th>
<th>Term/Date</th>
<th>MSc</th>
<th>PhD Track within MSc</th>
<th>PhD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Y1</td>
<td>Term 1 (September-December)</td>
<td>Take courses; engage with the research groups of interest</td>
<td>Find supervisor; take courses; begin discussions with supervisor; submit proposal for comprehensive course requirement</td>
<td></td>
</tr>
<tr>
<td>Y1</td>
<td>Term 2 (January-April)</td>
<td>Take courses; engage with the research groups of interest</td>
<td>Pursue RPE topics with supervisor; take courses</td>
<td></td>
</tr>
<tr>
<td>Y1</td>
<td>Term 2 (March 15)</td>
<td>Find a thesis supervisor</td>
<td>Form RPE committee</td>
<td></td>
</tr>
<tr>
<td>Y1</td>
<td>Term 2 (April 2nd week)</td>
<td></td>
<td>Submit RPE project proposal to committee; take courses towards satisfying comprehensive course requirement</td>
<td></td>
</tr>
<tr>
<td>Y1</td>
<td>Term 3 (May—August)</td>
<td>Start thesis research</td>
<td>Work on RPE project</td>
<td></td>
</tr>
<tr>
<td>Y2</td>
<td>Term 4 (September 15)</td>
<td></td>
<td>Submit RPE Research Report</td>
<td></td>
</tr>
<tr>
<td>Y2</td>
<td>Term 4 (Early October)</td>
<td></td>
<td>RPE Presentation</td>
<td></td>
</tr>
<tr>
<td>Y2</td>
<td>Term 4 (Late October)</td>
<td></td>
<td>Transfer to PhD or continue in MSc</td>
<td></td>
</tr>
<tr>
<td>Y2</td>
<td>Term 6 (May-August)</td>
<td>Complete thesis</td>
<td>Admit to Candidacy by completing the thesis proposal defense and comprehensive course requirement</td>
<td></td>
</tr>
<tr>
<td>Year</td>
<td>Term/Date</td>
<td>MSc</td>
<td>PhD Track within MSc</td>
<td>PhD</td>
</tr>
<tr>
<td>------</td>
<td>-------------------</td>
<td>------------------------------------------</td>
<td>----------------------------------------------------------</td>
<td>------------------------------------------</td>
</tr>
<tr>
<td>Y1</td>
<td>Term 1 (January-April)</td>
<td>Take courses; engage with the research groups of interest</td>
<td><strong>Find supervisor:</strong> take courses; begin discussions with supervisor; submit proposal for comprehensive course requirement</td>
<td></td>
</tr>
<tr>
<td>Y1</td>
<td>Term 2 (March 15)</td>
<td><strong>Find a thesis supervisor</strong></td>
<td>Pursue RPE topics with supervisor; take courses</td>
<td></td>
</tr>
<tr>
<td>Y1</td>
<td>Term 2 (May-August)</td>
<td><strong>Start Research</strong></td>
<td>Form RPE committee</td>
<td></td>
</tr>
<tr>
<td>Y1</td>
<td>Term 2 (July 15)</td>
<td></td>
<td><strong>Submit RPE project proposal to committee:</strong> take courses towards satisfying comprehensive course requirement</td>
<td></td>
</tr>
<tr>
<td>Y1</td>
<td>Term 2 (August 2nd week)</td>
<td></td>
<td>Work on RPE project</td>
<td></td>
</tr>
<tr>
<td>Y1</td>
<td>Term 3 (September-December)</td>
<td><strong>Take courses and continue with research</strong></td>
<td>Submit RPE Research Report</td>
<td></td>
</tr>
<tr>
<td>Y2</td>
<td>Term 4 (January 15)</td>
<td></td>
<td>Submit RPE Research Report</td>
<td></td>
</tr>
<tr>
<td>Y2</td>
<td>Term 4 (Early February)</td>
<td></td>
<td>RPE Presentation</td>
<td></td>
</tr>
<tr>
<td>Y2</td>
<td>Term 4 (Late February)</td>
<td></td>
<td>Transfer to PhD or continue in MSc</td>
<td></td>
</tr>
<tr>
<td>Y2</td>
<td>Term 6 (September-December)</td>
<td>Complete thesis</td>
<td>Admit to Candidacy by completing the thesis proposal defense and comprehensive course requirement</td>
<td></td>
</tr>
</tbody>
</table>
19 Interdisciplinary Studies

The Department of Computer Science encourages ties with other disciplines in order to both foster new areas of learning in computer science, as well as to apply modern computer science techniques to research in other fields.

Graduate students are primary instigators of cross-disciplinary fertilization. Each discipline communicates using its own language. A true multidisciplinary collaboration demands that the researchers learn the background and be able to speak the language of each discipline. Faculty members often establish research programs but are too busy to take the time to learn this background. However, graduate students have the ideal opportunity to do so early in their graduate program.

There are a number of ways of interacting with other disciplines:

1. Take courses offered by other departments. Students are encouraged to do this as part of their required course work.

2. Attend talks from other departments. This is an excellent way of finding out what kind of research is happening in other departments. Unfortunately, most of these talks are not publicized outside of closed circles and there is no easy way of finding out about them. Most departments maintain lists of researchers and their interests. Go to other departments and talk to researchers whose work you are interested in, and ask if they have regular seminars that you might attend. Most groups are happy to welcome interdisciplinary interest.

3. Choose a supervisor who is engaged in interdisciplinary work and has ties to other departments. There are a number of such researchers within the Computer Science Department.

4. Collaborate informally with researchers in other departments. This often involves considerable incentive on behalf of the student to seek out and establish ties with other departments, but the rewards can be well worth the effort.

5. Enroll in one of the several interdisciplinary degree programs that exist outside of the traditional disciplinary departments. These programs usually require that the student be based in a home department that will provide the student’s administrative needs (office space, funding) and that the student has a supervisor from that department. By arrangement with that department, the student will satisfy the degree requirements of the interdisciplinary program instead of those of the home department. The interdisciplinary programs that we currently are aware of are:

   - Institute of Applied Math. Contact the Mathematics Department.

   - Graduate Program in Neuroscience. Contact the Psychiatry Department.

   - Interdisciplinary Studies Program. Contact the Faculty of Graduate and Postdoctoral Studies.

Dempster Pavilion
20 Graduate Courses

Students should visit the Student Service Center on the web, for descriptions of the undergraduate and graduate courses. The graduate courses to be given in any year will be posted on the web. 
https://ssc.adm.ubc.ca/sscportal/servlets/SRVSSCFramework

Students are encouraged to take courses outside the department (Mathematics, Commerce, Electrical Engineering, etc.), but they should consult their advisors first.

Students can also take courses at other universities through the Western Dean’s Agreement www.grad.ubc.ca/current-students/student-status-classification/visiting-under-western-deans-agreement and the Graduate Exchange Agreement www.grad.ubc.ca/current-students/student-status-classification/visiting-under-graduate-exchange-agreement. These agreements allow graduate students in good standing at UBC to take courses at each other’s university without having to pay extra tuition fees to the host institution, providing that they have met the terms of agreement.

20.1.1 Registration

Students can register through the Student Service Center on the web. To log onto SSC, you’ll need your student number and Personal Identification Number (PIN), which is initially set to your birth date (YYMMDD). The student number and PIN together provide the password to access your student information. Students should change their PIN to protect the privacy and security of their registration and grades information. You can change it as often as you like.

Note: Computer Science graduate students are required to register for the thesis section or breadth essay for as long as they are in the program.

20.2 Balance your course load

All graduate courses will have at most one assigned item of course work (exam, project, or assignment) after the end of regularly scheduled classes (e.g., during the examination period). In the past, we have had graduate students unable to complete projects for their graduate courses before the end of term. They are forced to then complete course projects in the following term, or over the summer. This has been a source of considerable frustration to many students and is an impediment to the timely completion of graduate degree requirements. The following recommendations are aimed at balancing course workload to ensure students are able to complete all course work (especially in courses with final projects) within the term.

1. The granting of extensions of project deadlines to individual students that extend into the following term should be considered only in exceptional circumstances, and blanket extensions for an entire course into the next term should not generally be considered appropriate. An extension should always include a firm deadline.

2. Instructors and students may find it beneficial to view projects as having three milestones:
   I. Serious Proposal. After an initial discussion with the instructor, followed by some initial research by the student, the student delivers a concrete proposal that forms the basis of the project. The proposal should define the directional goal of the project to ensure that the instructor and student agree on its scope. (The actual project may differ slightly after further discussions with the instructor.)
   ii. Intermediate Progress Report. Some scheduled interaction, based on a written report by the student, is recommended between instructor and student to ensure reasonable progress is being made.
   iii. Final Delivery.
   Grading these milestones separately will provide student incentive and definitive feedback.

3. A course syllabus should be made available within the first week of classes. It should include topics to be covered, marking scheme, approximate due dates for assignments, projects, tests, and other relevant information.
Care should be taken to ensure that the workload for the course remains as well balanced as possible throughout the term. Courses run by multiple instructors are more difficult to organize, due to decentralized responsibility. Instructors of these courses must make additional efforts to ensure their independent lectures are coordinated appropriately to form a coherent presentation. In addition, instructors should ensure that the marking of course work, changes in course content, changes in due dates, etc., are well coordinated.

### 20.3 Project Guidelines for instructors and graduate students

The due date for all course material, including projects and exams, in graduate courses should not be after the last day of exams in the term in which the course is held.

The project guidelines are presented below.

1. A course project does not require new research. A course project also does not require publishable results. Implementations of existing algorithms or systems are suitable for a course project and a student can be successful with such a project.

   **Rationale:** There have been rising expectations about course projects from both students and instructors. Students want to do the best they can; instructors want to provide opportunities for students to experience and succeed at research. Both instructors and students need to be realistic about what can be accomplished in the available time.

2. Course projects should start as soon as possible. We recommend that instructors make available suggestions for projects in the first four weeks of term; we recommend that students be asked to submit a project proposal no later than six weeks into the term.

   **Rationale:** To enable students to start on projects earlier and to structure their time on the projects.

3. Milestones are helpful in structuring course project work. A minimum of two milestones are suggested: the project proposal within the first six weeks of term, and a milestone a few weeks later so that students can report progress. Some examples of the second milestone are a class discussion of each project and its status, a meeting with the instructor, or a progress report.

   **Rationale:** Students leave too many of the projects until the end of term when they are still busy with marking, etc.

4. Group work on course projects should be encouraged.

5. Instructors are encouraged to consider alternatives to a project. For instance, students might choose between an exam or a project, or a project and a literature review, etc. More choice for the students would provide them flexibility in structuring their time, and would reduce the number of projects a student has to undertake per term.

   **Rationale:** Instead of mandating project and non-project course formats, students and instructors should have the flexibility to choose how material is best conveyed, and in which areas a student wishes to delve in deeper.

### 20.4 Course Description [www.cs.ubc.ca/students/grad/courses](http://www.cs.ubc.ca/students/grad/courses)

The descriptions presented here are the general course description. Actual course content may vary somewhat from this. Not all of the following graduate courses are offered every year. For current offerings, please visit the courses web page at [www.cs.ubc.ca/students/grad/](http://www.cs.ubc.ca/students/grad/).

**500 Fundamentals of Algorithm Design and Analysis**

The objective of this course is to expose students to basic techniques in algorithm design and analysis, fundamental problem domains, applications, and foundations for more advanced (and specialized) courses in algorithm design and analysis. Although specific problems (and lectures) cut across several of these dimensions, the material can be classified in terms of algorithm design techniques, analysis techniques, advanced data structures, lower bounds on intrinsic complexity, and fundamental problem domains (and their associated domain-specific techniques).
501 Theory of Automata, Formal Languages and Computability
The scope and limitations of effective computation. General and restricted models of computation, formal languages and grammars. Relations between automata and formal languages. Resource bounded computation. Applications in parsing, pattern matching, and the design of efficient algorithms. **Prerequisite: CPSC 421.**

502 Artificial Intelligence I
An introduction to AI emphasizing various approaches to the representation of domain specific knowledge and methods of reasoning using these representations. Typical applications to be discussed include natural language understanding systems, problem solving, deductive question answering, production-based expert systems and machine vision. **Prerequisite: Sufficient programming background (e.g., CPSC 310) and consent of instructor.**

503 Computational Linguistics I
Computational Linguistics (CL) is the study of human language from a computational perspective. This course will examine algorithms used in the automatic analysis or production of language. Along with formal models of language, we will also study the engineering of natural language processing software. Many of the concepts, methods and algorithms studied are related to topics like formal linguistics, information retrieval, data mining from text, and bioinformatics

504 Data Management
Principles and techniques for the design and implementation of data management systems. History of data management. Design of relational systems. Data management applications. Alternate data models.

505 Image Understanding I: Image Analysis
Image formation constraints and the processing of digital images in order to extract information about the world being imaged. Computational models for analysis. **Prerequisite: Sufficient programming background (e.g. CPSC 310) and consent of instructor.**

506 Complexity of Computation
Abstract complexity theory, time and space hierarchies, properties of complexity measures. Provably intractable problems, reducibility’s and complete problems. P = NP question. Concrete complexity and algorithms design. Resource trade-offs. **Prerequisite: CPSC 320**

507 Software Engineering
Principles and techniques for the design, implementation and evolution of large software systems. An introduction to methods for evaluating the effectiveness of new techniques.

508 Operating Systems
Principles and techniques for the design and implementation of operating systems, especially distributed operating systems and operating systems for parallel computer systems. The concept of object model applied to operating system design. **Prerequisite: CPSC 416.**

509 Programming Language Principles
Comparative study of language constructs; effects on implementation.

510 Multigrid and Multilevel Methods
Numerical methods based on multi-level resolution for solving large, sparse systems with an appropriate local structure. Practical and theoretical aspects investigated. **Prerequisite: CPSC 302.**

511 Implementation of Programming Languages
Advanced techniques for the implementation of programming languages. Translator writing systems. Special classes of grammars of interest to compiler writers. Code optimization. **Prerequisite: CPSC 411.**

513 Integrated Systems Design
Integrating software with hardware. Software engineering aspects of real-time and distributed systems. Safety-critical systems. Reliability measures. System validation. Formal specification and verification. Cost estimation and scheduling. Students will undertake a programming project. **Prerequisites: CPSC 310, 311 and 318.**

514 Computer Graphics: Rendering
Light and Vision - human color vision; color representation and measurement. Sampling and Filtering - continuous vs. discrete; sampling; reconstruction; the Sampling Theorem; sampling methods and filtering methods; applications to
displays and image transformation. Wavelet based methods. Architecture of Graphics Systems - raster and vector displays; frame buffer architecture, high performance graphics accelerators. Volume rendering - sources and properties of 3-D data (CT, MRI, PET, confocal microscope data); voxel classification algorithms; ray-casting, splatting and compositing techniques; Fourier Projection Slice Theorem; interactive viewing techniques. Visualization of multi-dimensional data.

515 Computational Robotics
Computational robotics is the science of understanding and manipulating the physical world by computer. This course introduces the algorithms and scientific fundamentals underlying field, with emphasis on simulation, programming and planning. The course includes a significant term project which will provide hands-on experience with robotics research, including experiments with LCI's robots and simulation software.

516 Computational Geometry
The design and analysis of algorithms for geometric problems including convexity, intersection, search, proximity and optimization. Lower bound arguments, NP-completeness results, parallel algorithms, probabilistic algorithms, approximation algorithms, dynamization techniques, effects of pre-processing and other issues applicable to geometric problems. Applications of geometric algorithms. Prerequisite: CPSC 320.

517 Sparse Matrix Computation
Algorithms for computational solution of basic numerical linear algebra problems applied to large sparse matrices. Solution of large sparse linear systems by direct and iterative methods; application to linear least squares problems; computation of eigenvalues and singular values of large sparse matrices.

519 Logic Programming and Functional Programming
An introduction to the theory, applications and implementation of logic programming languages and functional programming languages. Data flow architecture to support logic and functional programming languages. Prerequisite: All of CPSC 311, CPSC 312

520 Numerical Solution of Differential Equations
Finite difference and finite element methods for time-dependent partial differential equations. Explicit and implicit schemes, stability and accuracy considerations, choice of boundary conditions, efficiency of computation, special schemes for particular linear and nonlinear equations. Prerequisite: CPSC 403.

521 Parallel Algorithms & Architecture
Parallel computation is the study of the use of more than one computational unit to speed up the execution of a given task. The course introduces students to several different aspects of parallel computing. The first part of the course is theoretical in nature and focuses on the different models and metrics used in the design and analysis of parallel algorithms, including the effects of machine configuration and communication on performance. The second part of the course is practical in nature and focuses on programming models, tools and techniques that are available. The course includes a project to provide hands-on experience developing programs and the use of a parallel machine.

522 Artificial Intelligence II
Heuristic search and game playing. Problem solving and planning. Problem reduction, and/ or trees, goal-directed behavior. Expert, diagnosis, and advising systems. Knowledge-based systems. Prerequisite: Sufficient programming background e.g. CPSC 310 and CPSC 503, or consent of instructor. CPSC 502 would be helpful, but is not essential.

523 Computational Linguistics II
Natural language processing by computer. Modeling of dialogue and discourse. Applications in question-answering interfaces for large databases. Prerequisite: CPSC 503.

524 Computer Graphics: Modeling
Mathematical Tools - polynomial vector spaces and polynomial basis functions; elements of differential geometry; systems of linear equations. Curves and Surfaces - properties of curves and surfaces; formulations for curves and surfaces; implicit surfaces; parametric formulations; modeling and display. Local illumination - basic shading models, reflection, refraction, anisotropy, volume-based models. Global Illumination - ray-tracing; radiosity; hybrid techniques. Virtual Reality - Head-tracked and stereo displays; haptic and other modalities.
525  **Image Understanding II: Scene Analysis**  

526  **Computer Animation**  
This course is about motion: how humans, animals, and robots can plan motions and can control them; how artists can go about creating new motions; and how we perceive motions. Topics include kinematics, motion capture, dynamics, control, motion perception, and motion planning. This course does not cover how to use common animation packages, nor is it a requirement to learn how to use these packages.

527  **Computer Communication Protocols**  
Fundamentals of computer communications and OSI lower level protocols. Higher level protocols: transport, session, presentation and application layers. Introduction to formal techniques for protocol specification, verification and testing.  *Prerequisite: CPSC 417.*

528  **Formal Techniques for Communication Protocols**  
Current development in higher level protocol standards. Formal description techniques (FDTs). Methods and tools for protocol implementation, testing, and verification/validation.  *Prerequisite: CPSC 527.*

529  **Definition of Programming Languages**  
Approaches to defining the syntax and semantics of programming languages.

530  **Topics in Information Processing**  
- Probabilistic Machine Learning  
- Social Impact of Computing  
- Sensorimotor Computation

531  **Topics in Theory of Computation**  
Possible topics: algebraic structure of automata, program schemata, recursive function theory, computability and logic, language theory.

532  **Topics in Artificial Intelligence**  
- Advanced Machine Learning  
- Adaptive User Interfaces  
- Intelligent Interfaces  
- Dynamic Programming  
- Multiagent Systems  
- Semantic Science

533  **Topics in Computer Graphics**  
- Animation Physics  
- Computational Photography and Display  
- Digital Geometry  
- Information Visualization  
- Visualization

534  **Topics in Data Management**  
- Information Integration  
- Meta-Data Management  
- Web Data Int & Management  
- Social Networks

535  **Topics in Simulation and Optimization**  
- Statistical Comp.
536  **Topics in Algorithms and Complexity**  
- Empirical Algorithmics  
- Markov Chains  
- Randomized Algorithms

537  **Topics in Coding and Information Theory**  
Possible topics: Properties of Shannon’s information measure, source encoding discrete memoryless channels, the fundamental theorem of information theory, linear and cyclic error correcting codes; selected topics from the analysis of channels with memory and from algebraic coding theory.

538  **Topics in Computer Systems**  
- Advanced Operating Systems  
- Cloud Computing  
- Computer Architecture  
- Execution Mining  
- Online Privacy

539  **Topics in Programming Languages**  
- AOP & Middleware  
- Program Meanings  
- Web Services Architecture

540  **Machine Learning**  
Is an introductory graduate class on machine learning, covering topics such as supervised learning (classification, regression), unsupervised learning, (clustering, dimensionality reduction) and graphical models (Bayes nets and Markov random fields). There is an emphasis on Bayesian techniques. Examples of applications in the areas of vision, speech language and biology are used throughout to illustrate the main concepts

541  **Computational Methods for Ordinary Differential Equations and Dynamical Systems**

542  **Topics in Numerical Computation**  
- Nonlinear optimization  
- Level Set Method  
- Graduate Breadth  
- Convex Optimization  
- Introduction to Numerical Methods

543  **Physical User Interface Design and Evaluation**

544  **Human-Computer Interaction**  
An advanced course in Human-Computer Interaction that provides a deeper treatment of topics typically found in an undergraduate HCI course. For example, design methodologies, evaluation methodologies (both quantitative and qualitative), human information processing, and aspects of human movement, cognition and perception. This course also introduces students to several research frontiers in HCI. For example, groupware and computer-supported cooperative work; customizable and adaptive systems, universal usability, small screen, large screen and tabletop displays; hypertext and multimedia, virtual and augmented reality. Pre-requisite: an undergrad HCI course or permission of the instructor.

545  **Algorithms for Bioinformatics**

546  **Numerical Optimization**  
The main algorithms for the numerical solution of unconstrained and constrained optimization problems. Emphasis on the computational aspects of solving large-scale problems that arise in practice. Unconstrained optimization, linear and quadratic programs, least-squares (including regularization), general nonlinearily constrained optimization. Optimality conditions. Newton & quasi-Newton, sequential quadratic programming, penalty function and interior-point methods.

547  **[3] Information Visualization**

548  [3] Directed Studies
549  (6/12) Master’s Thesis
550  Machine Learning II

554  Topics in Human-Computer Interaction
Possible topics: Multimodal user interface design, research and testing methodologies, perception user modeling, computation and adaptation
  • Adaptive User Interfaces
  • Universal Usability, CSCW, and Personalization

564  Data Mining
589  (3) MSc Major Essay
590  Research Methods in Computer Science
649  Doctoral Dissertation
21 Tips on how to write a thesis

Section 21.1 to 21.4 are derived from Bob Woodham’s guidelines for his students.

21.1 Choose a Problem

The purpose of research is to contribute to knowledge. Selecting a problem is the major part of any thesis project. Avoid the Computer Science tendency to think only in terms of tools and techniques (and mindless programming tasks).

There are four steps to a research project. Step 1 is for motivation and is done first. The Steps 2 and 3 address the thesis. Step 4 typically occurs only after the thesis is completed. The four steps are:

1. Identify the research problem. Understand the state-of-the-art within a topic area well enough to determine fundamental obstacles to further success. You have identified a research problem when you can make clear where necessary new knowledge is needed.

2. Choose the research domain. Choose a domain that is rich enough to demonstrate the intended result yet simple enough to avoid wasteful diversions. Pragmatic considerations best determine the choice of domain. This best choice often is not the domain of the original problem. The link is simply that the necessary new knowledge required is the same. Choose the domain that supports the most rapid prototyping and testing of your ideas.

3. Discover the new knowledge. This is where you add your talent and creativity!

4. Apply the new knowledge to the original research problem. This will complete the research and will provide a foundation for future research by helping to identify the next set of obstacles.

Here are more suggestions to avoid common pitfalls:

1. Decide on the research problem before committing yourself to a particular domain. Bad way: I like to play chess and I need a thesis topic. Maybe if I implement a chess program I will discover something interesting. Good way (after P.H. Winston): Learning is difficult. Maybe there is power in noticing similarities and differences between symbolic descriptions. I can explore this easily in the context of the world of the blocks.

2. Does the research problem demand exploration. A lot of work in AI and computational vision is on non-problems. A demonstration that a tool or technique is sufficient for a given task is not a demonstration of necessity. Convince yourself that your research problem is necessary. What is to be learned? Who is likely to care about the result? Is the problem of fundamental importance? Without necessity, you can easily be scooped by a better tool or technique.

3. Examine your commitment to the research problem. Commitment to a problem means that you will accept a solution, regardless of the scientific discipline that gives rise to it. If you only accept solutions of a certain type, then your commitment is to a technology, not to scientific research.

4. Develop a detailed scenario to demonstrate your work. A scenario provides an organizing principle for your research. As much as possible, carefully work through the scenario by hand simulation. Identify critical components. Work hard to develop the new ideas required dealing with these components.

21.2 Thesis Proposal

In Computer Science, a written thesis proposal is required for the PhD program. There is no written thesis proposal requirement for the MSc. In either case, a written proposal is a useful component of thesis research and many faculties now require it of their students. Here are guidelines to the thesis proposal:
1. **State your thesis.** According to Webster's dictionary, a thesis is "A position or proposition which a person advances and offers to maintain by argument." Advance your proposition. Define a research plan that will demonstrate that your proposition is true (or false).

2. **Be clear on your research objective.** In particular, indicate whether you propose to do research in AI or research using AI. No thesis should try to do both. Those that try to do both invariably do neither. Ask yourself, "What research in AI am I proposing?" The answer might be, "I'm not proposing research in AI. Rather I'm proposing to use AI to solve a problem that is of intrinsic interest." Then ask yourself, "What problem of intrinsic interest am I proposing to solve?" The answer might be, "The problem itself is merely a toy problem. I'm only using it to explore some important new ideas in AI." You are allowed either alternative, but not both.

3. **Describe your methodology.** What new knowledge are you trying to discover? What is the domain you intend to explore? What is the scenario that demonstrates your finished work? Consider any alternatives. Justify your choice in terms of your research objective.

4. **Survey related work.** This is essential homework to help you determine the frontiers of knowledge in your field and to help your supervisor and committee to suggest areas you may have missed.

5. **Write the thesis proposal as a contract.** One question that arises between student and supervisor is, "Am I done yet?" Write the thesis proposal so that there is no confusion. It also is important to identify milestones when progress can be demonstrated and new directions taken, as required. A well-written proposal provides a guarantee that the degree will be awarded for completion of the work, as proposed. Changes that arise may warrant a revision of the proposal, but never its abandonment.

6. **Have a fallback position.** A research proposal is usually too ambitious. Too much in the initial stages of a research project is not necessarily bad since one cannot always predict what path will turn out to be fruitful. However, avoid a "big bang" project that requires everything to come together in order for you to have anything. If you succeeded you would be world famous. Unfortunately, if you failed you might well have nothing. Strive for a research project in which steady progress is assured even if the original objective is not fully satisfied.

---

**21.3 Thesis Research**

Research productivity cannot be guaranteed. However, it can be maximized if you keep your thesis proposal in mind and if you use its scenario as the organizing principle for your work. Anything that cannot be directly related to your proposal and scenario is an unnecessary diversion. There are many diversions.

1. **Programming does not substitute for thinking.** Most programs written during the early stages of thesis research are best thought of as throwaway items of no lasting value. No program should be written unless there is a specific idea to test or specific experiment to perform. The product of this activity is the outcome of the test or experiment, not the program itself.

2. **Repeated cycles of tool building are wasteful.** If excessive tool building seems required before you can proceed, you have not chosen an appropriate domain for your research problem. Re-evaluate your choices.

3. **Programs must self-document their performance.** Knowing why a program works or fails contributes more to knowledge than simply knowing that a program worked or failed over a small set of examples. For example, stating that a given AI expert system has 5,000 rules is essentially meaningless. What is required for each rule is an example for which that rule is necessary for the correct performance of the system. It is a relatively easy matter to adopt a programming style to do the required bookkeeping. Unfortunately, this is rarely done. It is a serious mistake to emphasize speed of performance at the expense of research perspicuity.

6. **See your supervisor when you have difficulty.** Don't assume that the only time to see your supervisor is when you have produced exciting new results. It is more valuable to see your supervisor when you are stuck.

---

**21.4 Thesis Writing**

There is no universal thesis format. My experience suggests the following:
1. Do not assume your thesis will be read from cover to cover. A handful of individuals are obliged to read your thesis. Nobody else is. All readers will read the title. Most readers will read the abstract. Many readers will read the first and last chapters. Few readers will read anything else.

2. Show your hand quickly. The title should be your best one line description of your work. The abstract should be your best one page description of your work. The first chapter should be your best one chapter description of what you accomplished. The last chapter should be your best one chapter summary of what has been learned by your work and who should care about it. LEAVE NOTHING OUT OF THESE SECTIONS! The reader should only have to read the rest of the thesis to find out how you accomplished what you say you have accomplished in the title, abstract, introduction and conclusions. I have a bad reaction to theses that after the first hundred pages have not yet stated what the research contribution is going to be. Whatever is required by way of a “Review of the Literature”, do not let this get in the way of clear exposition.

3. Demonstrate the power of your work through an annotated scenario. Concentrate, in the introduction, on showing what your work permits. If there is a danger that the work may appear trivial, carefully note where the essential difficulties lie and where your system has made the appropriate response from possible alternatives. If the work is obviously non-trivial, a scenario will excite the reader to read more about how the system actually works. (Winograd's SHRDLU thesis is the best example of this that I know. It is a good thesis to read and re-read.)

4. Use figures.

5. A thesis reports research results. Avoid narratives on your personal philosophy of life, science or religion. Few fields are in need of proselytes. Personally, I don't want to read about why you chose to do graduate work rather than go to medical school, however important that may be to you.

6. Be scholarly when you discuss the work of others. No reader is going to believe that you got it right whereas everybody else got it wrong just because you say so. If there are technical errors in the work of others, point them out. If there are assumptions or approaches that differ, point them out too. Nevertheless, criticize a work only for failure to accomplish what it is set out to accomplish. It is not fair to criticize a work for failing to accomplish what you would like it to have accomplished. Your work cannot be strengthened by negative comments about others.

7. Avoid overstatement. There are very few conclusions that are universally valid. Many conclusions are valid under the assumptions of a given piece of work and, most often, which is all you require. Beware of making statements out of context that appear to be universal truths. This will merely convince the informed reader that you do not fully understand the problem.

8. Be conscientious about references. References are included for three reasons: (1) to attribute the origin of ideas; (2) to acknowledge influences on the work described; and (3) to provide pointers to previous results, as needed to avoid repetition. Scholarship demands particular attention to the origin of ideas. The origin of an idea is not simply the place where you read it. Do your best to determine the reference in which the idea originally appeared. Suppose (Smith, 1986) says that (Jones, 1984) established that X. Do not state X and cite (Smith, 1986). Do not state X and cite (Jones, 1984) unless you've actually read (Jones, 1984) to confirm the accuracy and relevance of the citation. Check every reference you cite for accuracy in both form and content. Finally, the same material often appears in multiple places. Even if you have worked for months with a third generation copy of an obscure 1983 technical report, cite the corresponding 1985 journal article if it is the more generally accessible version.

7. Do not try for a polished first draft. I am told that most good writers have horrifying first drafts. Anticipating revision often helps to break writer's cramp.

21.5 Thesis Schema

The following schema is the Guaranteed Mackworth Thesis Formula, good for all that ails you including thesis anomy and backache.
Chapter 1. **Introduction**  
General area of research; summary of work proposed; guide to reader including short one sentence summary of contents of each chapter.

Chapter 2. **Framework of Field**  
This chapter must be both more and less than a literature review. It should not be an exhaustive survey. It should impose structure on the field and cite illustrative examples of each approach. Use author/year citations (e.g. (Minsky, 1962)) rather than numbers to aid extensibility and to save reader trouble of flipping to references. Develop evaluation criteria for work in the field. Chapter should end with outline of current hot research issues, within your framework.

Chapter 3. **My Theory/Solution/Program/ Problem...**  
Picking up from end of Chapter 2, explicate a research issue and outline your solution/extension/destruction (of someone else’s theory/solution/…)/…

Chapter 4. **Description of Implementation/ Formalism/...**  
Not every thesis needs an implementation (and vice versa). Premature implementation is common. So is premature formalization. The criterion is that things must be clearer when you are done than they were when you started.

Chapter 5. **Results and Evaluation**  
Choose your evaluation criteria and state them. The adequacy, efficiency, productiveness, effectiveness of your gizmo must be judged clearly and honestly by choosing fair measures and giving results. These results must then be evaluated on an absolute yardstick or by comparing them to other competing or previous approaches. These must have been discussed in Chapter 2 - indeed, they may only be there for that reason. Your criteria and measures will also have been introduced in Chapter 2 or, if not, then many pointers back to the Chapter 2 framework are necessary. Be honest in your evaluation. Admitting weakness is a mark of strength.

Chapter 6. **Conclusions**  
Summarize the achievements and their impact on research questions raised in Chapter 2. Indicate open issues/directions for further work with estimate of relevance, importance and amount of work needed. Say that you did what you said you were going to do (if you did).

Appendices: Include technical material that would disrupt flow of thesis but must be available for curious or disbelieving reader.
22  Tips on how to finish your Program

The following are some ramblings of MSc student Yggy King, based on personal experience in the master’s program and observations of others.

Many of these guidelines are suggested in hindsight -- i.e., I did not follow them, but wish I had. These comments may have more relevance to the master’s program, but I think they relate to PhD’s as well. Please add however many grains of salt you feel appropriate; caveat emptor!

The way I see it, there are 6 main stages to completing a degree:
1. Taking courses
2. Getting a supervisor
3. Picking a thesis area
4. Finding a topic and writing a proposal
5. Doing the research
6. Writing the thesis
7. Submitting the thesis

22.1 Taking Courses

When you first arrive, life will proceed much as it did in your undergraduate program, with courses being your main academic focus. Courses should be chosen with an eye to seeing different members of the faculty in action, getting breadth in computer science (especially if you're in the PhD program), and, of course, satisfying your personal goals and interests.

Consult with your advisor to make sure you are taking an appropriate number and selection of courses for the requirements of your particular program. You should also chat with the professors of any course you think you might be interested in – they're busy, but will usually take 10 or 15 minutes to tell you more about the course than appears on the course outline. This is also a good way to get to meet faculty when you arrive.

It's a good idea to take at least a couple of project courses. These courses can give you some exposure to doing research; experience with the labs and tools of different research groups; and, in the best case, good lead on thesis topics.

If possible, try to get the course work out of the way in the first 8 months you are here.

22.2 Getting a Supervisor

Talking to potential supervisors can be a potentially nerve-wracking experience – do not let it get to you. The supervisor/student relationship is a rather curious but very important one; therefore, it is important to choose someone who you will be comfortable working with. Talk to as many faculty members as possible. Let them know you are shopping around for supervisors. Find out what research they do, what projects they have on the go, what sorts of things they are interested in, and what they think of the things you are interested in. When the decision is made, make sure that both parties are aware of the commitment and that a decision really “has” been made. Ideally, one should have a supervisor by the time course work is finished.
Choosing a Thesis Area

Before trying to hone in on a specific topic for your thesis, you will want to pick a general area within which you want to work. This should be something more specific than "Graphics," but more general than "Rendering of Auburn Hair in Prematurely Bald Men of Scandinavian Descent." After taking courses, attending seminars and discussion groups, and reading papers, you should have a good idea of the area you want to work in. If not, maybe you should review your course notes in courses you enjoyed, talk to other people about what they're doing, attend more seminars and read more papers, and talk with faculty about their current research interests.

Finding a Topic and Writing a Proposal

This can be the single most difficult part of doing a graduate degree, and is the point at which the largest numbers of people go astray. Picking a thesis topic marks the point at which your academic career shifts gears from satisfying requirements set by others to setting your own goals and determining your own course. You can, of course, ask your supervisor for suggestions, but it's nice to feel that your topic is really "yours."

Once you have chosen a thesis area, you should be reading everything you can get your hands on in that area. Check out the most recent journals in that area in the reading room and other libraries on campus. Ask your supervisor, other faculty, and other graduate students what are the "seminal" papers in your chosen area. Read them extra carefully. The "future work" section of papers is a good source of thesis topics, but the best topics may be things no one has thought of before. Read papers with a critical eye, always thinking of ways the results could be improved or extended. Join paper discussion groups – the department has lots of them and will likely have one in your chosen area ... if not, start one!

When picking a topic, try to keep refining it – smaller is usually better. You will have grandiose ideas about how far to take a topic, but the reality is that even what looks like a small project at first will bloat to fill every bit of time you have. A solid and complete solution to a well-defined problem will usually yield a better thesis than a partial attempt to solve some huge, over-arching problem and its many sub-problems. Pick one of the sub-problems instead – your conclusions chapter can always tell how it ties in with the larger problem.

Like the topic, a thesis proposal should be well defined and clear. Writing a proposal is a good discipline for refining a topic. The proposal should clearly state the problem to be solved and the techniques you think will provide a solution. It should provide at least a partial literature review of the area. It should also indicate some sort of schedule that will get the project finished. The schedule will no doubt change, but it is useful to have some guidelines to start with. A good thesis proposal should be able to fit in 4 or 5 pages. Get comments on your proposal from as many people as possible, not just your supervisor. In its final form, a proposal should represent a contract between you and your supervisor – "if I do what I'm proposing, I will deserve a degree."

If possible, the (master's) proposal should be done by the end of your first summer in the program.

Doing the Research

Having your proposal accepted will be a great weight off your shoulders – you can finally get down to actually "doing" something! Actually solving the problem is in some ways easier than defining it in the first place. The key is to be organized – don't let days and weeks drift by as you read news, reformat a LaTeX document, or hang out drinking cappuccinos in the SUB. Not to say you shouldn't have fun, but try to maintain a focus on the work at hand and keep moving it forward.

A good way to do this is to keep a schedule – make up a task list that gets you from your current state to completion, with tasks covering maybe a week or two. A six-month schedule should fit on one page in point form. As each task comes to hand, you can draw up a sub-schedule outlining all the different small jobs that need to be done to get the task finished. (Use boxes that can be checked off – it's very satisfying to see the check-marks marching down the page.) Show your proposed schedule to your supervisor--make it clear that the schedule is provisional and subject to change, but try and make it realistic and try to keep to it.

The research work of a master's thesis will probably take 6 to 8 months; so finishing in March or April is a reasonable goal.
22.6 Writing the Thesis

This stage may seem anticlimactic – you have sweated through all the work, now you just need to write it up and get it signed. However, you are getting tired of the whole thing and would like to get it out of the way so you can get on with your life. The best advice I can give you to make the process less of drudgery is to write “early” and “often.” As the research is progressing, you can be constantly writing things up. These write-ups can become chapters or sections of your thesis.

Writer's block can be a problem. Don't let it stop you from writing. Just write whatever you can think of even if it seems like total garbage. Early writing also helps provide more focus and direction to the research. When it finally comes time to put it all together, you will have half or more of it done already. The rest will come together much more quickly.

As you are writing, get people to comment on what you have done. Have fellow graduate students read chapters; see if your second reader is willing to read early drafts, get feedback from your supervisor. The earlier you can correct problems, the easier it will be to do so and the better the thesis will be in the long run.

You should probably allow at least a couple months for final write-up, generation of figures, library approval, etc.

There is, of course, much more to the graduate program than I have mentioned. These are just important highlights, which provide a general framework. I hope they are not totally useless.

22.7 Submitting the Thesis

The Dean's Office in the Faculty of Graduate and Postdoctoral Studies will assume the responsibility for accepting and processing all final copies of Master’s and Doctoral theses. Previously, this function was performed by the Rare Books and Special Collections division of the Main Library.

Once these are checked and processed by Graduate Studies, microfiche copies will be made, which will be catalogued and shelved by the Library as usual.

Students are asked to submit, in person, one unbound copy of their thesis to Grad Studies before the deadline. Guidelines for thesis formatting and submission will be posted shortly on the Faculty of Graduate and Postdoctoral Studies web site at: www.grad.ubc.ca.

One copy of the thesis (in PDF) must be submitted to Joyce Poon. Students must obtain all the signatures on the Release Form and submit it before their graduation. Application forms and additional information are available on the Graduate Affairs web at www.cs.ubc.ca/students/grad.

Length of time allowed for submission of Doctoral theses to the Faculty of Graduate and Postdoctoral Studies following successful thesis defense

When a Doctoral student's thesis is placed in either Category #1 or #2, the thesis must be submitted to the Faculty of Graduate and Postdoctoral Studies no later than 1 month after the date of the defense. Research Supervisors are expected to make arrangements to ensure that the thesis is submitted on time.

When a Doctoral student's thesis is placed in either Category #3 or #4, the thesis must be submitted to the Faculty of Graduate and Postdoctoral Studies no later than 6 months after the date of the initial defense.

Note: Tuition fees are pro-rated to the end of the month that the thesis is submitted to the Main Library.
This document describes resources available to graduate students, whom they may approach to discuss concerns and seek advice, and the process by which serious issues are propagated to more formal levels of resolution. Also described is a policy for striking a grievance resolution committee for the resolution of significant issues.

This document aims to improve communication between affected students and members of the department who can offer help and advice. In the past, slow communication has proven detrimental to the resolution process. A graduate student’s career within the department only spans a few years and thus requires efficient resolution.

Section 23.1 describes resources from which a student may seek help. Section 23.2 proposes communication channels for serious issues to be propagated. Section 23.3 describes the purpose and mechanism for striking a grievance resolution committee.

### 23.1 Resources Available to Graduate Students

The following resources are available to graduate students. These are divided into categories that loosely reflect the level of seriousness of a concern in sections 23.1.1 and 23.1.2. Section 23.1.3 lists resources outside the department.

#### 23.1.1 Minor or Informal Concerns

**Fellow graduate student** A fellow graduate student, especially a senior student who has been in the department for several years, can be an excellent source of advice. Informal discussion with other students allows for comparison of differences between research groups and research supervisors.

**Supervisor/advisor** As part of his or her duties, a supervisor or advisor is expected to provide academic and research advice to his or her students. In most cases, a student’s supervisor or advisor will be his or her main source of assistance.

**Mentor** The mentor and mentee group provide a forum outside of a student’s immediate research group to discuss issues. Each incoming graduate student is appointed a mentor upon arrival. Mentors are expected to setup informal group discussion meetings with their mentees once per term.

**Member of graduate affairs committee** any member of the graduate affairs committee can be approached by a student. Members of the committee are well versed in the technicalities of graduate student concerns such as breadth requirement definitions or proposal defense definitions, which may require clarification.

**Computer Science Graduate Students Association** Representatives of the CSGSA executive are usually senior students who are willing to help and give advice.

#### 23.1.2 Serious Concerns

**Associate Head of the Graduate Program** The Associate Head of the Graduate Program should be the first person consulted with serious concerns. These may involve a broad range of issues from academic misconduct to conflicts with a supervisor.

**Chair of Graduate Affairs Committee** As an alternative to the associate head, students may approach the chair of the Graduate Affairs Committee.

**Head of Department** For extremely serious issues, a student may wish to approach the head directly. These may include sexual harassment, discrimination, or illegal activity.

#### 23.1.3 Assistance Outside Department

Graduate students may wish to consult with the following university offices:

- Faculty of Graduate and Postdoctoral Studies
- Graduate Student Society
- UBC Equity Office
- AMS Ombudsoffice
After having been approached by a student with a concern, a member of the department may deem the problem more serious and decide to involve additional help. He or she may then decide to discuss the problem with another member or group within the department. The following are recommendations, not rules, for the propagation of more serious concerns. Of course, problems may require the involvement of a specific committee, such as the space, or of a specific individual that are not listed here.

### 23.2.1 Graduate Affairs Committee
After being approached for help, a member of the graduate affairs committee may bring an issue to the Associate Head of the Graduate Program. The associate head may bring an issue to the chair of the graduate affairs committee to be discussed with the entire committee.

### 23.2.2 Graduate Student Community
A graduate student who is approached for help may wish to seek additional help from the graduate student community within the department. Computer Science Graduate Student Association executive members are always available. For a larger forum, monthly CSGSA meetings provide a supportive pool of advice.

### 23.2.3 Supervisor, Advisor, or Mentor
Of course, a supervisor, advisor, or mentor may be approached with an issue deemed too serious. Depending on the issue, he or she may approach any member of the graduate affairs committee, the Associate Head of the Graduate Program, or the head of the department.
23.3 **Grievance Resolution Committee**

A very small fraction of concerns require more serious attention than may be provided by an individual or by the graduate affairs committee alone. For these few and unfortunate cases, a separate grievance resolution committee would be struck to work towards a solution. This committee would allow several people to work towards a goal by providing ideas from various points of view.

23.3.1 **Purpose of a Grievance Resolution Committee**

The grievance resolution committee has as its purpose to help suggest possible solutions to intra-departmental conflicts involving graduate students. The committee should provide representation from different points of view within a conflict, without necessarily including those individuals who are directly involved. The committee should work towards providing an impartial and expedient solution to resolve the conflict.

23.3.2 **Who may Request to Strike a Grievance Resolution Committee**

Presumably, the person striking the committee would be acting on behalf of the concerned parties and would not be directly involved with the problem. Any graduate student, faculty member, or staff member in the department may request to the Associate Head of the Graduate Program that a committee be struck. Assuming he or she is free of any conflict of interest, if the associate head deems a grievance resolution committee to be an appropriate means of problem resolution, then he or she may strike the committee. If the associate head finds him or herself in a conflict of interest, then the head of the department may strike the committee.

23.3.3 **Selection of Grievance Resolution Committee Members**

A grievance solution committee will be composed of four members of the department of computer science. The committee should not include the parties directly involved in the conflict. The person striking the committee (usually the Associate Head of the Graduate Program) will appoint two members, at least one of whom must be a faculty member from the department, and the CSGSA will independently appoint the other two members, at least one of whom must be a graduate student from the department. Upon meeting for the first time, the newly-formed grievance resolution committee will elect one of its members as chair.

The need for such a committee will be infrequent and unpredictable. Thus, definitions for membership are left somewhat flexible, since different situations may require very different committees.

23.3.4 **Interaction between the Grievance Resolution Committee and the Department**

Once a grievance resolution committee is struck, the following should be included in its immediate agenda:

- The committee should contact all parties involved and begin compiling a detailed account of facts describing the conflict.
- The committee should clearly define the conflict, so that the goal of the resolution being sought is made clear.
- The committee should list deadlines or milestones, to ensure progress in the resolution of the conflict.
- The committee should report first locally to the parties involved and to the person who struck the committee. Depending upon the nature of the conflict, the committee may make a recommendation to the graduate affairs committee, to the head of the department, or to the department.
24 UBC Policy & Standard of Conduct

24.1 UBC Policy #85: Scholarly Integrity [www.universitycounsel.ubc.ca/policies/]
You should be aware that UBC has a number of policies governing academic life, which are available at www.policy.ubc.ca. In particular, Policy 88 claims ownership on behalf of UBC of many forms of intellectual property created at UBC, including computer materials such as software. Should you choose to patent or commercialize research conducted here at UBC, the university will provide resources and expertise to help you do so, and any resulting income will be shared equally between UBC and all the inventors.

24.2 Standard of Conduct

As an ACM member I will ...

1.2 Avoid harm to others,
1.3 Be honest and trustworthy,
1.6 Give proper credit for intellectual property,
1.7 Respect the privacy of others.
1.8 Honor confidentiality.
2.1 Strive to achieve the highest quality, effectiveness and dignity in both the process and products of professional work.
2.6 Honor contracts, agreements, and assigned responsibilities.
2.8 Access computing and communication resources only when authorized to do so.


Every student in the Department of Computer Science, or students taking courses in the Department, must be aware of the responsibilities inherent in the associated activities. The above quotations are part of the current Code of Ethics and Professional Conduct for members of the ACM, the Association for Computing Machinery. Many faculty members belong to this association and most subscribe to it tenets. As part of their education process, students should acquire an appreciation of the privileges and responsibilities expected of computing professionals.

The University of British Columbia also has a responsibility to ensure that the behavior of all students is of the highest quality. In this regard, all students should read and understand the section on Student Discipline in the Calendar. Under the University Act, the President of the University “has the right to take whatever disciplinary action is deemed warranted by a student’s misconduct”. Various offences are listed, including the following:

• Plagiarism, a form of academic misconduct in which a student submits or presents the work of another person as his or her own.
• Submitting the same essay or assignment more than once.
• Falsifying or submitting false documents.
• Assaulting individuals, including conduct that leads to the physical or emotional injury of faculty, staff, students, or others at the University, or which threatens the physical or emotional well-being of faculty, staff, students, or others at the University.

Penalties may include singly or in combination:
• a failing grade or a mark of zero in the course, examination, or assignment in which the misconduct occurred;
• suspension from the University for a specified period of time, or indefinitely;
• or reprimand, with a letter placed in the student’s file.

Students of course have the right of appeal up to and including the decision of the President. It is therefore incumbent upon all students taking courses to make sure that they fully understand the professor’s instructions and expectations with respect to assignments, projects, tests, and examinations. Similarly, students must be aware of their advisors’ and supervisors’ instructions and expectations with respect to research activities.