

PhD Program Guidelines & Qualifying Procedures

Overview

The Doctoral program in Mechanical Engineering is governed by the policies of the Faculty of Graduate & Postdoctoral Studies (G+PS) studies; for most issues, your primary source of information should be the G+PS website: <https://www.grad.ubc.ca/current-students>.

Students will normally be required to spend a minimum of three winter sessions at the university. Those with a Master's degree (or equivalent) may have this period reduced and those who transfer from a Master's program to a PhD program require at least one year of residence following the transfer.

The PhD program should be completed in 4 years, but to meet this target you will need to work hard and plan well. In your first two terms, you will be busy becoming familiar with UBC and completing coursework. In addition, the work involved in 1 TA-ship is almost the same as one course. Some milestones (such as the literature review and defending your research proposal) are requirements for all PhD students, but most milestones will be unique to your research project. Therefore, you should develop, with the help of your supervisor, specific, tangible and realistic goals. Successful PhD students generally come to realize that it is their own responsibility to manage their time. Your supervisor is a helpful guide, coach, and mentor, but one who should become unnecessary by the time you defend your PhD thesis.

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Supervisory Committee and Research Supervisor

The program of each student is overseen by a supervisory committee consisting of your supervisor and at least 2 other faculty members. The Research Supervisor acts as chairman of the supervisory committee.

Eligibility

The research supervisor or co-supervisor must be a full-time, regular faculty member holding the rank of assistant professor, associate professor, or professor in the department and be a member of the Faculty of Graduate and Postdoctoral Studies. Emeritus or Associate faculty are normally required to appoint a full-time regular or associate faculty member as a co-supervisor. Further information is at <https://www.grad.ubc.ca/current-students/supervision-advising>. Other members of the supervisory committee are nominated by the student's supervisor and approved by the Head of the department in consultation with the departmental graduate advisor, and should include at least one member from outside the Department of Mechanical Engineering.

The supervisory committee membership may include senior instructors, honorary faculty, and adjunct faculty, off campus professionals as well as faculty members from other universities. A request for approval for these members submitted to the Dean of the Faculty of Graduate Studies must include a copy of the individual's curriculum vitae and a letter from the graduate program advisor.

If the proposed supervisor is an Associate Faculty member, the Head, in consultation with the Graduate Advisor, approves the appointment of an Associate Faculty member as Principal Supervisor and an eligible tenure-track faculty member from the appropriate research group is appointed as co-supervisor or advisor at the discretion of Head. It is the duty of the co-supervisor to ensure that both the Associate Faculty and the graduate student are familiar with the current policies, practices and expectations of the Department. The PhD supervisory committee of a student supervised by an Associate Faculty is appointed by the Head and it has a minimum of three faculty members from the Department including the Associate Faculty supervisor and one or more eligible faculty members from other academic units of UBC Vancouver.

Timing

Within the first 3 months of residence, the initial supervisor may be changed by request of the student, provided an alternative supervisor agrees to act. After this time, the supervisor normally becomes permanent. Changes of supervisor are still possible but must be authorized by the Graduate Advisor and the Head of the Department.

Other members of the supervisory committee should be proposed at the time of the literature review examination and confirmed at the research proposal defense. It is in the best interests of the student, and a G+PS requirement, for the student to schedule a meeting with the supervisory committee every year, especially after admission to candidacy. The majority of cases with a very difficult doctoral examination or extended completion time occur when there are not regular meetings with the supervisory committee.

Coursework

The department requires that incoming PhD students have a variety of skills and knowledge before they are admitted to the PhD program, including a broad understanding of Mechanical Engineering material and a demonstrated potential to perform novel research. These characteristics are to be demonstrated by completion of foundational coursework, the literature review, and the research proposal defence, within 16 months of the program start date. All PhD candidates in Mechanical Engineering must pass through this process.

The Ph.D. program requires completion of 33 credits of coursework beyond the Bachelor's level. This includes 12 credits of foundational coursework completed within the student's first two terms in their program, up to 18 transfer credits obtained from an approved Master's degree (extent of transfer is assessed at the Literature Review defense), and the seminar course (if required) or one additional 3 credit course (if not taking the seminar course). The 12 credits of foundational coursework should include 500-level courses from the Department of Mechanical Engineering or from other fields. In all cases, the coursework plan should be approved by the student's research supervisor.

Only the following UBC courses will be accepted for PhD credit:

- 500-level graduate courses, provided that credit has not already been obtained for such courses;
- A maximum of 6 credits of special advanced topics courses (Mech 550 designation)
- A maximum of 3 credits of directed studies courses (Mech 575 designation)

A minimum mark of 68% must be obtained in all courses taken by a student enrolled in a doctoral program. When repeating a failed required course a minimum mark of 74% must be obtained. Supplemental exams are not granted.

Students entering the program with an approved Master's degree may transfer up to 18 credits from that program.

Thesis/Seminar: All PhD students are required to register in their relevant thesis course all year around (for both winter and summer terms). The section ID corresponds with the student's research group (ie. MM0 = Mechatronics & Manufacturing).

The seminar course is mandatory for students who belong to the below research groups in each winter term (no seminar will be held over summer). Please contact the appropriate research chair for more information on your seminar requirements:

- Biomedical
- Design & Applied Mechanics
- Mechatronics & Manufacturing
- Thermofluids (Energy Group only)

Literature Review

The student must prepare a paper on a specific topic assigned by the end of the student's 1st term by the supervisor. The paper must demonstrate critical thinking, and the question that is to be addressed in the paper should allow opportunity for the student to develop, articulate and support their own view on an issue. On the last day of the student's second term, the student must submit the literature review to the supervisory committee. The deadlines for the literature review in relation to the foundational coursework is described in the table below.

Timing

PROGRAM START	12 CREDITS COURSEWORK COMPLETED BY	LITERATURE REVIEW ASSIGNMENT EMAIL RECEIVED BY	LITERATURE REVIEW SUBMITTED BY	LITERATURE REVIEW DEFENDED BY
September	April 30	December 30	April 30	May 30
January	December 30	April 30	August 30	September 30

Assignment Email

The supervisor should email the topic of the paper, with additional specifications for style, clarifications of the issues to be covered and 1-2 recommended papers to the student and Mech Student Services (students@mech.ubc.ca) at the end of the student's first term (specific dates in the table above). This email will be later forwarded to the examiners with the paper submission so that the examiners understand the starting point of the student's efforts.

Format and Evaluation

The paper will be 2800 to 3200 words, including the bibliography and tables. A maximum of 4 figures may be included. Formatting details for the style of references and sections may be specified in the "assignment email". This short format is intended to test the student's ability to include the most important information in the paper; during the oral presentation there is opportunity to demonstrate a greater depth of knowledge as appropriate.

Preparing this literature review will involve many of the same research skills needed to complete a thesis:

- Ability to communicate clearly in writing
- Ability to read papers and books critically
- Ability to formulate an opinion on a research issue and support it logically with evidence from the literature.
- Ability to craft a properly formatted, error-free document

Considering these objectives above, it is NOT sufficient to simply collect and rephrase information from the literature related to a particular topic. Instead, the paper should be directed to a research question provided by the supervisor. This question should be specific and have a reasonable scope, such that it might be reasonably covered in the given format. At the same time, the question should be open-ended

enough that alternative positions might be considered. The examiners must decide whether or not the student has adequately addressed the assignment and demonstrated the abilities listed above to the extent needed to successfully complete the PhD program. The expectations will depend on many factors, including the difficulty and nature of the assignment and the student's background. Generally, the level of effort expected is that of a term project in an ordinary course.

Examining Committee

The student should work with their supervisor to form an examining committee. The committee should (for efficiency) approximate the committee formed later on for the Research Proposal Defense, but for the literature review, quorum will be met with the supervisor and three other examiners, at least 1 from within the Department. The most senior member of the examining committee, excluding the supervisor, should act as Chair.

Submitting, defending, and evaluation of the paper

At the end of the student's 2nd term, the paper should be submitted in pdf format via email to the examiners and Mech Student Services (students@mech.ubc.ca), including the original assignment email as an attachment. The paper is strictly the work of the student and not the supervisor, but in some cases it might be necessary for the supervisor to provide clarifications after the original assignment email. In such cases, the clarifications should be appended to the assignment email.

The student should schedule a 1-hour meeting with the examining committee to take place by the last day of the month following the submission of the paper. In the meeting, the student will make a 20-minute presentation summarizing their paper, after which the committee will question the student on the literature review and supporting foundational material. The committee will then discuss the literature review, presentation and foundational coursework, as well as determine the extent of transfer credit to be granted from the student's Master's degree. The result of the meeting will be one of three outcomes, as determined by majority vote of committee members. The supervisor will have one of the votes in this process.

1. Invitation to proceed to the research proposal defense.
2. As above, but with requirements to complete additional specific courses
3. Student would be asked to withdraw from the PhD program.

**The student should bring a copy of the Part A1: Literature Review Defense Form and Part A2: Credit Transfer (and accompanying course outlines/transcripts) with them to their presentation and return the completed forms to Mech Student Services.

RESEARCH PROPOSAL DEFENSE

The RPD aims to ensure that the student has a worthwhile research topic, has clear goals, suitable preparation and other traits necessary to complete a PhD thesis.

Examination Committee and Chair

The Research Supervisor cannot be a member of the examining committee, but he/she will nominate three examiners. The Research Supervisor can choose whether or not to attend the proposal defense. These three examiners should not all belong to the same research group.

The Chair of the examination must be a full or associate professor in Mechanical Engineering. The Chair must not be the Supervisor or one of the Examiners. It is the student's responsibility to contact and secure an appropriate Chair.

Schedule for the Exam

Within 16 months of starting the program, the student will be asked to prepare, present and defend a proposal for their research. RPD examinations will be held July-December for students with a September start date, and January to May for students with a January start date. The student, in consultation with their supervisor and committee members, must arrange the scheduling of the exam. Allow at least 1 month to arrange the examination date.

Written Proposal Format

The purpose of the proposal is to demonstrate that you have selected important research questions, that you bring new ideas or approaches to the problem, and that your plan to complete your PhD is feasible.

The structure of the proposal can be adjusted to suit the subject area and style of research, but following sections are included at minimum.

1. Title page with proposed thesis title, student name, examining committee, supervisor, Chair, time and location of the exam.
2. Statement of authorship indicating briefly (1 page) how the research supervisor contributed to the substantive and editorial preparation of the proposal. Explain how many drafts were reviewed with the supervisor and what information related to the proposal was provided directly by the supervisor (eg. grant proposals, key papers in the field...)
3. Copy of student's unofficial UBC transcript, showing successful completion of 12 credits of foundational coursework.
4. Copy of the Part B: RPD Examination Details form and G+PS Recommendation for Advancement to Candidacy form, ready for signature by the Chairman and Graduate Advisor.
5. Literature review and motivation that finishes with a discussion of the important gaps in existing knowledge.
6. Work plan that indicates the actual technical approach to be taken and the expected timeline for achievement of the critical milestones. Students who have initial results of a study or pilot study results would be encouraged to include these results in the proposal in addition to proposing new work. It is suggested that this work plan will be shown as a Gantt chart,

highlighting the key dependencies and critical path. In the work plan section, discuss whether there are important elements of risk in the research, and discuss your contingency plans in the event that these elements do not unfold as desired.

7. Statement of key contributions. This section recapitulates the important gaps in the literature that you plan to fill, the reason these are of practical or theoretical importance, and the novel ideas that you will bring to the research.

The proposal may not exceed 6000 words, including references and figure captions. It can include up to 6 figures including the Gantt chart. The proposal must be distributed to the supervisor, examiners and Chair at least 10 days prior to the exam, in hardcopy, Word/Open Office and pdf formats.

Oral Presentation

At the exam the student will make a 30 minute presentation on the proposed work. This is followed by questions intended to determine whether the student has the ability to complete a high-quality thesis as proposed in the written proposal. Questions can be on any aspect of the proposal.

The Chair's job is to ensure that the exam follows these procedures and in particular, he/she should ensure that the following questions are asked at some point during the exam if they are not clearly answered in the presentation:

1. What are the key aspects of novelty in the proposed research?
2. What insights or special ideas have you personally brought to this research?
3. What are the key elements of risk in the plan, and what is your strategy for dealing with this?

The total length of exam is normally 2.5 hours. The Research Supervisor may attend the examination as a visitor and may be asked to provide the committee with verbal comments on the student's progress and research competence and experience. The supervisor would then be required to leave the room and the committee would deliberate regarding the student's evaluation and assignment of a pass or fail on the exam. The committee will also review the courses taken, academic record, and credits transferred during the examination and provide what feedback is necessary.

Students who fail the RPD will, at the discretion of the committee, be given the opportunity to retake the exam within four months of the original exam.

Students are required to submit the Part B: RPD Exam Details form (page 11) and the G+PS Recommendation for Advancement to Candidacy form to MECH Student Services after the defense. As soon as a student has satisfied all requirements, the department will recommend to the Faculty of Graduate Studies that the student be advanced to candidacy. This status is entered on the University's Student Information System.

Appeal Process

The student can appeal the decision of the RPD committee to their supervisor who can in turn make a written appeal to the head of department who will consult with the graduate advisor and the examination committee.

Final Doctoral Exam & Graduation

The Final Doctoral Examination process is an integral part of and is the last step toward the conferral of the PhD degree. Although it is a complex process to navigate, you can reduce stress for yourself and those involved in your examination by being well-informed and well-organized.

The Faculty of Graduate Studies website provides a very comprehensive Doctoral Exam Guide and a number of tools that will help you prepare a timeline and plan of action.

Please carefully review the guide in its entirety here:

<https://www.grad.ubc.ca/current-students/final-doctoral-exam/final-doctoral-examination-guide>

Below are the final key stages that you will need to progress through in order to complete your program:

1. **Nominate the External Examiner** - The Supervisor and Graduate Advisor nominate at least two people for the role of External Examiner (an arm's-length expert in the subject of the dissertation). Graduate and Postdoctoral Studies will select and invite the External Examiner.
2. **The External Examination** – The External Examiner reviews the dissertation and decides whether or not it is ready to proceed to the Final Oral Defence
3. **Form the Examination Committee**, which should consist of:
 - an External Examiner (not required to attend the Final Oral Defence)
 - two approved University Examiners
 - two or three member of the Candidate's Supervisory Committee (including the Research Supervisor)
 - an Examination Chair
4. **The Final Oral Defense** – The Examining Committee will hear the Candidate present their work and then question the Candidate. They will determine whether the culmination of work meets the standards required for a doctoral degree.
5. **Final Dissertation Submission** - Your thesis will be reviewed for formatting by the Faculty of Graduate and Postdoctoral Studies and approved for inclusion in cIRcle. Your program cannot be closed and you will not be eligible to graduate until the content and formatting of the thesis have been officially approved and you have received an official email confirming final approval of your thesis.
6. **Graduation** - There are important steps you need to complete in order to officially graduate:
 - Apply to graduate on the SSC.
 - Make sure that your dissertation has been submitted to the Faculty of Graduate and Postdoctoral Studies.
 - Make sure that all courses you have taken have a grade entered for them.
 - Make sure your UBC financial account is settled.
 - Submit your doctoral citation.

PhD QUALIFYING PROCEDURE

Part A1: Literature Review Defense

Student Name: _____

Student Number: _____

Date of Defense: _____

Examining Committee Members:

1. _____

2. _____

3. _____

To be completed after the presentation:

The committee recommends that the student:

1. Proceed to the research proposal defense []

2. As above, but with requirements to complete additional specific requirements* [] *Additional requirements:

3. Withdraw from the PhD program []

Research Supervisor

Date

Graduate Advisor

Date

PhD QUALIFYING PROCEDURE

PART A2: Credit Transfer

The Ph.D. program requires completion of at least 33 credits course work (not including credit for any master’s thesis) beyond the Bachelor level. At least 12 credits of foundational coursework should be completed at UBC within the first two terms of the student’s program. Transfer credit from other universities may be obtained with the unanimous approval of the student's examining committee following the literature review defense. Such credits cannot exceed 18 in total.

NOTE: This form is not required if you have completed a MASc degree in UBC-MECH.

This form should be accompanied with:

1. A copy of the student’s UBC unofficial transcript showing completion of 12 credits foundational coursework
- 2) A detailed course outline for any transfer credit requested from external courses
- 3) A copy of the transcript for any transfer credit requested from external courses

Student's Name: _____ **Student's Number:** _____

REQUEST FOR TRANSFER CREDIT FROM AN EXTERNAL UNIVERSITY:

COURSE NUMBER & NAME	INSTITUTION	GRADE	CREDIT

Number of transfer credits approved: _____

University from which credit is transferred: _____

Examining Committee Members:

NAME

SIGNATURE

Approval:

Research Supervisor

Graduate Advisor

PhD QUALIFYING PROCEDURE

Part B: RPD Exam Details

Student Name: _____

Student Number: _____

Research Supervisor: _____

Date of Defense: _____

Examining Committee:

Chair: _____

Examiners:

1. _____

2. _____

3. _____

To be completed after the examination:

The committee recommends to the Dean of Graduate Studies that the candidate

a) be advanced to the Ph.D. candidacy []

b) return for another examination []

c) not be admitted to the Ph.D. program []

Chairman of the Examining Committee

Date

Graduate Advisor

Department Head