

# Dalhousie School of Biomedical Engineering

## Academic Policies and Administrative Procedures for Graduate Programs

### Introduction

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Since its official opening in July of 1999, the School of Biomedical Engineering (SBME) has grown and established itself as part of the Dalhousie community within the Faculties of both Medicine and Engineering. The policies and administrative procedures within the School of Biomedical Engineering (SBME) contained in this document have developed from past experiences in the SBME, from comments and input from our faculty, staff and students, and the graduate program policies of the Faculty of Engineering and the Faculty of Graduate Studies.

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#### Revision history:

- First approved - May 2002
  - First revision - July 2004
  - Second revision - March 2005
  - Third revision - October 2006
  - Fourth revision - October 2007 (current)
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### Admission Enquiries and Tear-off Cards from SBME Advertising Posters

- General enquiries through e-mail, mail or telephone will be answered by the SBME Administrator or the Graduate Coordinator as soon as they arrive.
  - Tear-off cards will be collected by the SBME Administrator. Enquiring students will receive a letter about the program and an application form. Normally, several boxes on the card's "areas of interest" are checked. A list of faculty research interests falling under each broad category has been created and the SBME Administrator will provide these researchers (by e-mail) with the e-mail address of inquiring students and ask the researcher to answer. It is recommended that faculty members generate a general answer describing their research interests to facilitate and speed replies to these enquiries.
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### Admission Processing

- Applications are sent to the SBME Administrator. Domestic applications are due by June 1st, November 15th, and February 28th and foreign applications are due by April 1st, August 31st, and December 31st for September, January, and May admission, respectively.
- The influx of files on a weekly basis is checked and in cases where there are incomplete files of potentially "very good" students, they are contacted directly with encouragement to complete the application.
- When applications are complete and meet all requirements, students will be contacted to request the names of at least three (3) faculty members in order of preference as potential supervisors, if they have not done so already in their application. Applicants will be directed to the BME web-site to view the information on faculty research interests. It is important that links to lab/research web-pages are provided and that all research information is up-to-date.
- Information about students who qualify for SBME programs will be entered into the admissions computer database for distribution to all interested faculty by secure web access. All faculty will be notified by e-mail when new information about potential students is available.
- The database will include a list of faculty members identified by the applicant as potential supervisors.

- Faculty members have two (2) weeks to review the applicant data and respond to the Graduate Coordinator (by phone or e-mail) indicating if they are interested in the student.
- Faculty members identified as potential supervisors will have priority in negotiating acceptance of students.
- If no positive response has been obtained from a preferred faculty member within two (2) weeks, the Graduate Coordinator will notify all faculty that the application is still available.
- If no positive response has been obtained from any faculty members after a further one (1) week, the file will be closed and the applicant notified.
- If a faculty member accepts a student, the Graduate Coordinator will contact the supervisor to arrange for the student's stipend.
- FGS require proof of secured funding for the student before processing the application. The SBME aims for a minimum annual stipend that is competitive with current graduate scholarship funding levels of federal agencies (i.e. NSERC, CIHR, etc.).
- The sources of funding for the stipend may be made up from several sources including student scholarships, FGS scholarships, faculty research grants and teaching assistantships.
- If a teaching assistantship in a faculty member's home department is part of the student's stipend, the student must be made aware of such a stipulation for their funding. Further, this stipulation must be clearly indicated as one of the terms of admission outlined in the letter of offer of admission to the program.
- The SBME Administrator or the Graduate Coordinator will correspond with the applicant regarding the status of the application, with a copy to the supervisor.

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## Introduction to M.A.Sc. Program

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The Master's Program in Biomedical Engineering is comprised of both graduate-level course work and a supervised research project leading to the defence of a Master's thesis. The program is designed to be completed in approximately two years of full-time study, with a normal complement of six (6) half-credit (single semester) courses taken mainly in the first year of study. Students are also expected to participate in the school seminar program by regular attendance at seminars and by presenting seminars about their research projects.

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## Admission to the M.A.Sc. in Biomedical Engineering

- Candidates must satisfy the general requirements for admission to the Faculty of Graduate Studies.
- Students can be accepted into the M.A.Sc. program from any of:
  - (i) a B.Eng. or B.A.Sc. from an accredited undergraduate engineering program.
  - (ii) a 4-year B.Sc. in the physical sciences (e.g. Mathematics, Physics, Chemistry, etc) with research experience.
  - (iii) a 4-year B.Sc. in the biological sciences (e.g. Physiology, Biophysics, Biochemistry, Microbiology, Immunology, etc.) with research experience.
  - (iv) M.D., D.V.M., D.D.S., or equivalent.
- In some cases additional undergraduate course work may be required prior to entry into the program. This will depend on the nature of the research thesis to be undertaken. Any such requirements will be developed in consultation with the school.
- A minimum of 2nd year undergraduate calculus (equivalent to Dalhousie University's MAT 2001.03 and MAT 2002.03) plus linear algebra and/or statistics, and one year of physics and chemistry will normally be required.
- A minimum mid-B average during the student's undergraduate course work (with a minimum average of A- over the last two years) will be required, plus demonstrated ability to communicate and write in English (consistent with the entry requirements of the Faculty of Graduate Studies, i.e. TOEFL > 600).
- GRE Aptitude and Advanced scores in one of the sciences are recommended for all applicants whose undergraduate work has been completed outside Canada.

**Research experience** would include: a research thesis, senior research project, or equivalent work experience determined in consultation with the School of Biomedical Engineering.

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## Progress through the M.A.Sc. in Biomedical Engineering

- All Master's programs are defined as "one-year" for the purpose of assessing fees. Students required to take additional courses as a requisite of admission to the program (e.g. differential calculus) also qualify for the "one-year" as long as the total number of credits does not exceed 4.5 full or 9 half-credits.
  - The minimum time for completing a Master's program is twelve (12) months and the maximum length of time is five (5) years.
  - **Courses:** Students are required to take six (6) half-credit graduate courses for an M.A.Sc. in BME, four (4) of which must be selected from the SBME suite of graduate courses. However, students may take a maximum of two (2) senior undergraduate courses (3000 level for Science courses and 4000 level for Engineering courses) as part of their required six (6) half-credit graduate courses.
  - **Thesis:** A research thesis comprising original work by the student will be carried out under the direct supervision of a faculty member of the School of Biomedical Engineering. Subject to the regulations of the Faculty of Graduate Studies, this document will be a scholarly work, and will represent an original contribution to knowledge relevant to Biomedical Engineering.
  - **Seminars:** Graduate students are also required to participate in the departmental monthly seminars by (i) attending all seminars and (ii) conducting a seminar on their thesis work. The presentations are 30-40 minutes in length followed by 10-15 minutes of questions from the audience. Students should contact the seminar coordinator to schedule their seminar, which normally occurs in the second year of the program.
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## M.A.Sc. Supervisors and Supervisory Committees

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### Thesis Supervisors

**All students will have a Thesis Supervisor, or Co-Supervisor who:**

- is appointed in the School of Biomedical Engineering.
  - has an earned Ph.D. or equivalent research experience as judged by the faculty members of the SBME.
  - is a member of the Faculty of Graduate Studies at Dalhousie University.
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### Supervisory Committees - Composition

**Excerpt from the Engineering Graduate Studies Handbook:**

*"... It is the responsibility of the Graduate Coordinator to ensure that ... the student's (Supervisory Committee) SC is selected. SC members are selected by the Thesis supervisor (TS) and should complement expertise available to assist the student in completing the research program. ... The membership of this committee must be approved by the Graduate Studies Research Office (GSRO). The TS is responsible for the direction of the appropriate research or industrial project. The SC Approval forms are available at the GSRO (Appendix Form ENGIGSR-GS-2/02-2001). The appropriate form is to be filled out by the student and signed the SC members and returned to the GSRO for approval. Approval by the GSRO does not preclude changes to composition of the SC at a later date."*

**The Supervisory Committee shall normally consist of:**

- the Thesis Supervisor.
- another faculty member from the SBME.

- (iii) another faculty member.
  - (iv) at least two members must have their primary appointments in a different departments.
  - (v) any other faculty members deemed necessary by the Thesis Supervisor and/or the Graduate Coordinator of the SBME.
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## Supervisory Committees - Duties

### The duties of the Supervisory Committee include:

- (i) to co-ordinate the overall program in accordance with all regulations concerning the degree sought, including those presented in the University Calendar and the Engineering Graduate Studies Handbook.
- (ii) to meet immediately after appointment to evaluate the qualifications of the student, and to discuss and approve a program of study.
- (iii) to meet as needed for the purpose of evaluating and discussing the proposed thesis research project.
- (iv) to approve the student's Thesis Proposal.
- (v) to assist the student as a group or on an individual basis with problems or concerns arising from the research.
- (vi) to participate in the Thesis Examination when appropriate.

**See also:** Evaluation, Committee Meeting Form

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## Supervisory Committees - Meetings

### The Supervisory Committee will meet:

- (i) within eight (8) months after initial registration to approve the research plan.
  - (ii) within twelve (12) months after initial registration to approve the thesis proposal.
  - (iii) at least annually thereafter.
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## Evaluation of Progress through M.A.Sc. Program

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### Excerpt from the Engineering Graduate Studies Handbook:

*“Students and Thesis Supervisors (TS) are encouraged to have regular meetings which may or may not include other members of the Supervisory Committee (SC). This enables the student to get advice on problems which may be encountered and enables the TS/SC to evaluate the progress of the research. Students who do not make satisfactory progress due to unreasonable periods of absence from the campus may be asked to register as part-time students, apply for leaves of absence, or required to withdraw, depending on the individual case. TSs and SCs are urged to make regular evaluations of progress on coursework and research. A number of criteria may be used by the SC to evaluate performance. On the basis of regular committee meetings, the SC may consider the student's progress to be unsatisfactory. If such is the case, the student shall be notified in writing. Discrepancies between the student and TS/SC concerning research performance should be brought to the attention of the Department Head and the Associate Dean of Engineering (ADE). Each year, on the anniversary of the term of initial registration in the program, all graduate students must submit a progress report on the prescribed form (Appendix Form ENG/GSR-GS-4/02-2001). The reasons for having this requirement are as follows:*

- (i) To ensure the standards of graduate programs are uniform throughout the Faculty,*
- (ii) To protect the student by having a complete record of his/her graduate study; and*
- (iii) To help the student, TS, and Graduate Coordinator meet program goal dates.*

*It should be noted that the progress report requirement is a uniform requirement throughout Dalhousie. The consequences in not completing this form on an annual basis become apparent in any appeal, program extension, or leave of absence.”*

Prior to each committee meeting, students are to prepare a summary of progress made on their research since the last committee meeting and submit the summary to all thesis Supervisory Committee members at least 1 week in advance of the meeting date. It is recommended that the summary include the presentation of data and results, a discussion of the results, problems that may have arisen, an indication of progress made in relation to the timeline in the thesis proposal, questions for the committee members, and responses to any "Actions Required Before Next Meeting" as outlined in the previous meeting's "Graduate Student Advisory Committee Meeting Assessment Form".

At the committee meeting, students are required to make an oral presentation of their results and progress since the last meeting and answer questions from the committee. The presentation should not exceed twenty (20) minutes and the use of overheads or a PowerPoint presentation is recommended. The intent of committee meetings is not only to ensure the timely progress of a student's research program, but also to allow an open and informed discussion of the research being conducted in order to aid and guide the student. The committee meetings should provide feedback to the student that will enrich their thesis project and graduate training.

For every supervisory committee meeting, the SBME requires that a designated chair ensure that an SBME Graduate Student Advisory Committee Assessment Form is filled-out, dated, and signed by all committee members. The assessment form is a record of the student's performance and progress. Both the committee and student have the ability to provide written comments on the assessment form with a copy of the report provided to the student and placed in their file. After each committee meeting, the designated chair will go through the form with the student and explain the committee's evaluation and comments. The student is then given an opportunity to respond in writing to the committee and is required to date and sign the form.

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## M.A.Sc. Thesis Proposal

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### **Excerpt from the Engineering Graduate Studies Handbook:**

*"...Students in a M.A.Sc. program..., shall present research proposals in written form to their research (Supervisory Committee) SC's by the end of the first year (12 months after initial registration). The plan or proposal should include a review of the pertinent literature, background information on the proposed project, research objectives, materials/equipment required, methods and a projected schedule. The SC must formally approve the research plan and advise the student on necessary modifications. Approval of the proposal does not preclude its being modified as the project progresses. However modification should only be considered if the SC is in agreement... All graduate students must forward a copy of the project plan or the research proposal to the Graduate Studies and Research Office to be kept in the student's file."*

Each M.A.Sc. candidate must prepare a Thesis Proposal at about the one-year mark in the M.A.Sc. program. The written proposal should include (at minimum) a title page, table of contents, introduction/literature review, thesis objectives/hypothesis, proposed methods and materials, timeline for the project, progress/results to date, and a list of references. The body of written text should not exceed twenty (20) pages, double spaced, 12 point font, excluding the table of contents, tables, figures, list of references, and appendices.

Students are required to make an oral presentation of their proposal and answer questions from the committee to assess their understanding of the proposed research area.

A chair for the committee will be designated by the Graduate Coordinator. It is the Chair's responsibility to ensure that an SBME Graduate Student Supervisory Committee Assessment Form is completed and signed by all committee members. The assessment form is a record of the committee's acceptance of the proposal.

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## M.A.Sc. Thesis

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### **Excerpts from the Engineering Graduate Studies Handbook:**

*"Guidelines for the preparation of graduate theses may be obtained from the Graduate Studies and Research Office*

*(GSRO). Although students are given a reasonable amount of freedom in selecting thesis format, the "Preparation of Graduate Theses" must be consulted on acceptable and unacceptable writing practices. The "Appointment for Oral Examination" form is submitted to the GSRO when the Thesis Supervisor is satisfied with the quality of the thesis or project and the Supervisory Committee has agreed to a date for the defence or presentation. This form must be signed by all committee members and be accompanied by a final, letter quality unbound copy of the thesis. The format and style of the thesis or project will be examined and the GSRO will reserve a room and distribute defence announcements provided the thesis/project meets the accepted criteria."*

*"Thesis preparation usually begins with the thesis proposal which contains a summary of the research previously reported in the technical literature. However, presentation of results and discussion occur only after considerable research has been carried out. Students are encouraged where possible to publish their results in the refereed literature prior to defence of the thesis. Students must seek the approval of the Thesis Supervisor and Supervisory Committee to be certain that the volume and quality of work is sufficient to warrant thesis preparation. Notwithstanding this, in some cases it is the student's right to have a defence."*

## Thesis Defence

- Refer to the [Engineering Graduate Student Handbook](#) section 14.5
- Further to the Faculty of Engineering requirements, the SBME requires that at least one member of the thesis examining committee has **not** been directly involved in the thesis supervision.

### Schedule of M.A.Sc. Program

Time	Requirement
Within thirty (30) days of initial registration	Approval of Program
By the end of the first term of initial registration	Approval of Supervisory Committee
Within eight (8) months of initial registration	First meeting of Supervisory Committee
Eleven (11) months after initial registration and on the same date in each subsequent year	Progress Report to Faculty of Graduate Studies
Within twelve (12) months of initial registration	Approval of Research Proposal
Two (2) months before thesis defence	Approval of thesis title
Twelve (12) business days before thesis defence	Scheduling of Defence, thesis copies to Supervisory Committee, plus one copy to the Graduate Student Research Office at Engineering with "Appointment for an Oral Examination" form
Within four (4) years of initial registration	Completion of all program requirements

## Transfer from M.A.Sc. to Ph.D. program

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**Transfer to the Ph.D. program from the M.A.Sc. program will be considered only for exceptional students. When permitted, transfer will normally occur after one (1) year in the M.A.Sc. program.**

### Transfer will be contingent on:

- (i) successful completion of 5 half-classes (recognized by the School as being acceptable) with cumulative A- or better average.
  - (ii) preparation of a 10–15 page Ph.D. Transfer Proposal, outlining a research program that has a high probability of completion and of making a significant new contribution to knowledge.
  - (iii) oral defence of the Transfer Proposal at a Transfer Examination.
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- The Transfer Examination Committee will consist of the candidate's Supervisory Committee plus one other member who is appointed to both the SBME and the Faculty of Graduate Studies at Dalhousie.
  - The examination will consider: (i) the Ph.D. Transfer Proposal with its defence and (ii) the demonstrated research capabilities of the student.
  - Candidates transferring from the M.A.Sc. program will complete at least five (5) of the six (6) half-classes required of that program prior to transfer to the Ph.D. program. Up to two of these courses may be senior undergraduate classes judged acceptable by the SBME's graduate coordinator.
  - After transfer, candidates will complete the remainder of the total of six (6) half-classes from their M.A.Sc. program, plus a minimum of two (2) additional half-classes for their Ph.D. program, all on the advice of their supervisor and supervisory committees. This total must include a minimum of 4 half-classes from the suite of 5000-level SBME offerings and no more than two half-classes of the "Directed Studies" or "Directed Readings" variety. This course list must be approved by the SBME's graduate coordinator.
  - Students transferring from the M.A.Sc. program will submit their Ph.D. Thesis Proposal after one (1) year in the Ph.D. program, i.e. after two (2) years in the overall program.
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## Introduction to Ph.D. Program

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The Ph.D. Program in Biomedical Engineering is comprised of both graduate-level course work and a supervised research project leading to the defence of a Ph.D. thesis. The program is designed to be completed in three to four (3-4) years of full-time study, after an appropriate Master's degree, with a normal complement of four (4) half-credit (single semester) courses taken mainly in the first year of study. Students are also expected to participate in the school seminar program by regular attendance at seminars and by presenting seminars about their research projects.

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## Admission to the Ph.D. in Biomedical Engineering

- Candidates must satisfy the general requirements for admission to the Faculty of Graduate Studies.
- Students can be accepted into the Ph.D. program from an accredited Master's program, or in exceptional cases by direct transfer from the M.A.Sc. program after completion of five half-classes and success in a Ph.D. Transfer Examination.
- In some cases additional undergraduate course work may be required prior to entry into the program. This will depend on the nature of the research thesis to be undertaken. Any such requirements will be developed in consultation with the school.
- A minimum of 2nd year undergraduate calculus (equivalent to Dalhousie University's MAT 2001.03 and MAT 2002.03) plus linear algebra and/or statistics, and one year of physics and chemistry will normally be required.
- A minimum mid-B average during the student's undergraduate course work (with a minimum average of A- over the last two years) will be required, plus demonstrated ability to communicate and write in English (consistent with

the entry requirements of the Faculty of Graduate Studies, i.e. TOEFL > 600).

- GRE Aptitude and Advanced scores in one of the sciences are recommended for all applicants whose undergraduate or previous graduate work has been completed outside Canada.
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## Progress through the Ph.D. in Biomedical Engineering

- The Ph.D. in Biomedical Engineering will normally be completed in 3-4 years of full-time study after completion of a Master's degree. The residency period during which the candidates will pay full fees will be two (2) years, followed by 1-2 years further study during which they will pay thesis-only fees.
  - The minimum duration of a Ph.D. program is two (2) years and the maximum duration is six (6) years.
  - **Courses:** Students admitted directly to the Ph.D. program will normally complete four (4) graduate-level half-classes on the advice of their Supervisor and Supervisory Committee. This course list must be approved by the SBME graduate coordinator. Of these, no more than one half-class may be of the "Directed Studies" or "Directed Readings" variety.
  - Additional undergraduate coursework may be required prior to entry into the Ph.D. program. This will depend on the nature of the research thesis to be undertaken and the requirements will be developed in consultation with the School. However, a minimum of 2nd-year undergraduate mathematics (including differential equations, linear algebra, and statistics) and one year of physics and chemistry will be required.
  - **Thesis:** A research thesis comprising original work by the student will be carried out under the direct supervision of a faculty member of the School of Biomedical Engineering. Subject to the regulations of the Faculty of Graduate Studies, this document will be a scholarly work, and will represent an original contribution to knowledge relevant to Biomedical Engineering.
  - **Seminars:** Ph.D. candidates must participate in the research seminar program of the School of Biomedical Engineering. The requirements include regular attendance at the seminars and presentation of two (2) seminars: the first in the 2nd year of the program (normally between the submission of the Ph.D. Thesis Proposal and the Candidacy Examination), and the second to present the outcome of the research work to the School, shortly before the thesis defence. Beginning in their second year of their program, candidates will also be expected to present their work at the annual Biomedical Engineering Research Day.
  - **Publication:** Ph.D. candidates must present their research work at one or more national or international conferences during their program and submit at least one research paper based on their thesis work to a refereed journal prior to program completion. It is expected that further presentations and publications will occur during the course of the program.
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## Ph.D. Supervisors and Supervisory Committees

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### Thesis Supervisors

**All students will have a Thesis Supervisor, or Co-Supervisor who:**

- is appointed in the School of Biomedical Engineering, and
  - has an earned Ph.D. or equivalent research experience as judged by the faculty members of the SBME, and
  - is a member of the Faculty of Graduate Studies at Dalhousie University, and
  - has previously served on the supervisory committee of a doctoral student.
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### Supervisory Committees - Composition

**The Supervisory Committee shall normally consist of:**



- the Thesis Supervisor, and
  - another faculty member from the SBME, and
  - another faculty member, and
  - any other faculty members deemed necessary by the Thesis Supervisor and/or the Graduate Coordinator of the SBME.
  - At least two members must have their primary appointments in different departments.
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## Supervisory Committees - Duties

### The duties of the Supervisory Committee include:

- to co-ordinate the overall program in accordance with all regulations concerning the degree sought, including those presented in the University Calendar and the Faculty of Graduate Studies, and
- to meet immediately after appointment to evaluate the qualifications of the student, and to discuss and approve a program of study, and
- to meet as needed for the purpose of evaluating and discussing the proposed thesis research project, and
- to approve the student's Thesis Proposal, and
- to assist the student as a group or on an individual basis with problems or concerns arising from the research, and
- to participate in the Candidacy Examination, and
- to submit three proposed names for an External Examiner, and
- to participate in the Thesis Examination when appropriate.

**See also:** Evaluation, Committee Meeting Form

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## Supervisory Committees - Meetings

### The Supervisory Committee will meet:

- within eight (8) months after initial registration to approve the research plan, and
  - within twelve (12) months after initial registration to approve the thesis proposal, and
  - at least annually thereafter.
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## Evaluation of Progress through Ph.D. Program

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Evaluation of progress through the Ph.D. program occurs by regular meeting of students with their supervisory committees, by the approval of a Thesis Proposal, and by the Candidacy Examination.

Prior to each committee meeting, students are to prepare a summary of progress made on their research since the last committee meeting and submit the summary to all thesis Supervisory Committee members at least 1 week in advance of the meeting date. It is recommended that the summary include the presentation of data and results, a discussion of the results, problems that may have arisen, an indication of progress made in relation to the timeline in the thesis proposal, questions for the committee members, and responses to any "Actions Required Before Next Meeting" as outlined in the previous meeting's "Graduate Student Advisory Committee Meeting Assessment Form".

At the committee meeting, students are required to make an oral presentation of their results and progress since the last meeting and answer questions from the committee. The presentation should not exceed twenty (20) minutes and the use of overheads or a PowerPoint presentation is recommended. The intent of committee meetings is not only to ensure the timely progress of a student's research program, but also to allow an open and informed discussion of the research being conducted in order to aid and guide the student. The committee meetings should provide feedback to the student that will enrich their thesis project and graduate training.

For every supervisory committee meeting, the SBME requires that a designated chair ensure that an SBME Graduate Student Advisory Committee Assessment Form is filled-out, dated, and signed by all committee members. The assessment form is a record of the student's performance and progress. Both the committee and student have the ability to provide written comments on the assessment form with a copy of the report provided to the student and placed in their file. After each committee meeting, the designated chair will go through the form with the student and explain the committee's evaluation and comments. The student is then given an opportunity to respond in writing to the committee and is required to date and sign the form.

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## Ph.D. Candidacy Examination

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Ph.D. candidates must successfully complete a Candidacy Examination (also known as "Comprehensive Examination") that demonstrates their background preparation to successfully complete and defend their research thesis. This will normally occur at about the 2-year point in their program.

### **The Candidacy Examination Committee will consist of:**

- the candidate's Supervisory Committee, plus
- at least one other faculty member who is a member of the Faculty of Graduate Studies. and appointed in SBME
- a Committee Chair appointed by the Graduate Coordinator.

The candidate will be presented with five (5) questions relevant to the research thesis program. He/she will then choose three (3) of these questions and will answer them in three (3) corresponding original, scholarly documents of 20-25 pages in length. Each document will have the format of a scientific journal review paper and the candidate will have four (4) weeks to complete them before submitting them to the SBME Graduate Coordinator and thereby to the Candidacy Examination committee for review.

The candidate must successfully defend the documents and his/her background knowledge of the research thesis area (as might be reviewed in the Introduction to the thesis) in a 2-3 hour oral examination similar in structure to the Ph.D. Oral Examination. Successful examination will be based on consideration of both the written documents and the oral defense.

It is the responsibility of the Graduate Coordinator to report the results of the Candidacy Examination to the Faculty of Graduate Studies.

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## Ph.D. Thesis Proposal

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In preparation for the research thesis work, each Ph.D. candidate must first prepare and defend a Ph.D. Thesis Proposal.

Presented at about the 1-year mark in the Ph.D. program, this 20-40 page proposal will:

- briefly review the relevant scientific/engineering literature, and
- present the research objectives and specific hypotheses to be tested, and
- describe the methodology to be employed, the expected outcomes and potential pitfalls, and
- demonstrate the likelihood of an original contribution to knowledge relevant to Biomedical Engineering.

The Ph.D. Thesis Proposal and the candidate's preparation will be examined by the candidate's Supervisory Committee in a committee meeting. The Thesis Proposal, with any suggested revisions, must be approved by the Supervisory Committee as being likely to meet the requirements for the Ph.D. program. A chair for the committee will also be designated who's responsibility it is to ensure that an SBME Graduate Student Supervisory Committee Assessment Form is filled-out and then signed by all committee members. The assessment form is a record of the committee's acceptance of the proposal.

## Ph.D. Thesis

Each Ph.D. candidate in the SBME must present his/her research work at one or more national or international conferences during their program and must have submitted at least one research paper based on the thesis work prior to program completion and thesis defence. It is expected that further presentations and publications will have occurred during the course of the program.

The Ph.D. Examination Committee will consist of:

- the Supervisor, and
- two members from the student's Supervisory Committee appointed in the Faculty of Graduate Studies, and
- one member from another academic unit at Dalhousie University, appointed in the Faculty of Graduate Studies, and
- a qualified external examiner, expert in the area of the thesis research, and from an institution outside Dalhousie University. The external examiner will normally hold an earned Ph.D. or equivalent and have experience of doctoral student supervision.

### Schedule of Ph.D. Program

Time	Requirement
At initial registration	Approval of Program
Within four (4) months of initial registration	Approval of Supervisory Committee
Within four (4) months of initial registration	First meeting of Supervisory Committee
Eleven (11) months after initial registration and on the same date in each subsequent year	Progress Report to Faculty of Graduate Studies
Within twelve (12) months of initial registration	Approval of Research Proposal
Within twenty-four (24) months of initial registration	Candidacy Examination
Six (6) months before thesis defence	Approval of thesis title
Three (3) months before thesis defence	Submit list of at least three (3) potential external examiners
Four (4) weeks before thesis defence	Submit copies of thesis and other information to FGS for scheduling
Twelve (12) business days before thesis defence	Scheduling of Defence, thesis copies to Supervisory Committee, plus one copy to the Graduate Student Research Office at Engineering with "Appointment for an Oral Examination" form

Within six (6) years of initial registration	Completion of all program requirements
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## Introduction to Prosthodontics/M.A.Sc. Program

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The Prosthodontics/M.A.Sc. in Biomedical Engineering Program is designed to prepare graduates for a career in academic research related to all aspects of the design and application of prosthodontics. The program is interdisciplinary, integrating prosthodontic clinical training with a course and thesis based Master's program in biomedical engineering.

The program is designed to be completed in approximately three years of full-time study. Prosthodontic training will include clinics, laboratory training, and clinical seminars. Students will take a minimum of five (5) full-credit (two semester) courses in Prosthodontics plus nine (9) half-credit (single semester) courses, with four (4) of the courses chosen from the SBME suite. Clinical and coursework will be taken mainly in the first two years of study, and thesis research completed in the final year. Students are also expected to participate in the SBME seminar program by regular attendance at seminars and by presenting seminars about their research projects.

As a graduate program leading to a dental specialty, the program is accredited by the Commission on Dental Accreditation of Canada.

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### Admission to the Prosthodontics/M.A.Sc. in Biomedical Engineering

- Candidates must satisfy the general requirements for admission to the Faculty of Graduate Studies.
  - Candidates must have received the D.D.S. or equivalent degree from an accredited institution.
  - Candidates must also meet the admission requirements of the M.A.Sc. program in Biomedical Engineering.
  - In some cases additional undergraduate course work may be required prior to entry into the program. This will depend on the nature of the research thesis to be undertaken. Any such requirements will be developed in consultation with the school.
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### Progress through the Prosthodontics/M.A.Sc. in Biomedical Engineering

- The minimum time for completing a Master's program at Dalhousie is twelve (12) months and the maximum length of time is five (5) years.
  - **Courses:** Students are required to take five (5) full-credit (two-semester) courses in Prosthodontics plus six (6) half-credit (single-semester) courses of which four (4) must be selected from the SBME suite of graduate courses. One course must be in statistics. Students may take a maximum of two (2) senior undergraduate courses (3000 level for Science courses and 4000 level for Engineering courses) as part of their required six (6) half-credit graduate courses.
  - **Thesis:** A research thesis comprising original work by the student will be carried out under the direct supervision of a faculty member of the School of Biomedical Engineering. Subject to the regulations of the Faculty of Graduate Studies, this document will be a scholarly work, and will represent an original contribution to knowledge relevant to Biomedical Engineering.
  - **Seminars:** Graduate students are also required to participate in the SBME monthly seminars by: (i) attending all seminars and (ii) conducting a seminar on their thesis work. The presentations are 30-40 minutes in length followed by 10-15 minutes of questions from the audience. Students should contact the seminar coordinator to schedule their seminar, which normally occurs in the second year of the program.
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## Prosthodontics/M.A.Sc. Supervisors and Supervisory Committees

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### Thesis Supervisors

**All students will have a Thesis Supervisor, or Co-Supervisor who:**

- (i) is appointed in the School of Biomedical Engineering.
  - (ii) has an earned Ph.D. or equivalent research experience as judged by the faculty members of the SBME.
  - (iii) is a member of the Faculty of Graduate Studies at Dalhousie University.
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### Supervisory Committees - Composition

**Excerpt from the Engineering Graduate Studies Handbook:**

*“... It is the responsibility of the Graduate Coordinator to ensure that ... the student's (Supervisory Committee) SC is selected. SC members are selected by the Thesis supervisor (TS) and should complement expertise available to assist the student in completing the research program. ...The membership of this committee must be approved by the Graduate Studies Research Office (GSRO). The TS is responsible for the direction of the appropriate research or industrial project. The SC Approval forms are available at the GSRO (Appendix Form ENGIGSR-GS-2/02-2001). The appropriate form is to be filled out by the student and signed the SC members and returned to the GSRO for approval. Approval by the GSRO does not preclude changes to composition of the SC at a later date.”*

**The Supervisory Committee shall normally consist of:**

- (i) the Thesis Supervisor.
  - (ii) another faculty member from the SBME.
  - (iii) another faculty member.
  - (iv) at least two members must have their primary appointments in a different departments.
  - (v) any other faculty members deemed necessary by the Thesis Supervisor and/or the Graduate Coordinator of the SBME.
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### Supervisory Committees - Duties

**The duties of the Supervisory Committee include:**

- (i) to co-ordinate the overall program in accordance with all regulations concerning the degree sought, including those presented in the University Calendar and the Engineering Graduate Studies Handbook.
  - (ii) to meet immediately after appointment to evaluate the qualifications of the student, and to discuss and approve a program of study.
  - (iii) to meet as needed for the purpose of evaluating and discussing the proposed thesis research project.
  - (iv) to approve the student's Thesis Proposal.
  - (v) to assist the student as a group or on an individual basis with problems or concerns arising from the research.
  - (vi) to participate in the Thesis Examination when appropriate.
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### Supervisory Committees - Meetings

**The Supervisory Committee will meet:**

- (i) within twenty (20) months after initial registration to approve the research plan.
- (ii) within twenty-four (24) months after initial registration to approve the thesis proposal.

(iii) at least annually thereafter.

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## Evaluation of Progress through Prosthodontics/M.A.Sc. Program

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### **Excerpt from the Engineering Graduate Studies Handbook:**

*“Students and Thesis Supervisors (TS) are encouraged to have regular meetings which may or may not include other members of the Supervisory Committee (SC). This enables the student to get advice on problems which may be encountered and enables the TS/SC to evaluate the progress of the research. Students who do not make satisfactory progress due to unreasonable periods of absence from the campus may be asked to register as part-time students, apply for leaves of absence, or required to withdraw, depending on the individual case. TSs and SCs are urged to make regular evaluations of progress on coursework and research. A number of criteria may be used by the SC to evaluate performance. On the basis of regular committee meetings, the SC may consider the student's progress to be unsatisfactory. If such is the case, the student shall be notified in writing. Discrepancies between the student and TS/SC concerning research performance should be brought to the attention of the Department Head and the Associate Dean of Engineering (ADE). Each year, on the anniversary of the term of initial registration in the program, all graduate students must submit a progress report on the prescribed form (Appendix Form ENG/GSR-GS-4/02-2001). The reasons for having this requirement are as follows:*

- (i) To ensure the standards of graduate programs are uniform throughout the Faculty,*
- (ii) To protect the student by having a complete record of his/her graduate study; and*
- (iii) To help the student, TS, and Graduate Coordinator meet program goal dates.*

*It should be noted that the progress report requirement is a uniform requirement throughout Dalhousie. The consequences in not completing this form on an annual basis become apparent in any appeal, program extension, or leave of absence.”*

Prior to each committee meeting, students are to prepare a summary of progress made on their research since the last committee meeting and submit the summary to all thesis Supervisory Committee members at least 1 week in advance of the meeting date. It is recommended that the summary include the presentation of data and results, a discussion of the results, problems that may have arisen, an indication of progress made in relation to the timeline in the thesis proposal, questions for the committee members, and responses to any “Actions Required Before Next Meeting” as outlined in the previous meeting’s “Graduate Student Advisory Committee Meeting Assessment Form”.

At the committee meeting, students are required to make an oral presentation of their results and progress since the last meeting and answer questions from the committee. The presentation should not exceed twenty (20) minutes and the use of overheads or a PowerPoint presentation is recommended. The intent of committee meetings is not only to ensure the timely progress of a student’s research program, but also to allow an open and informed discussion of the research being conducted in order to aid and guide the student. The committee meetings should provide feedback to the student that will enrich their thesis project and graduate training.

For every supervisory committee meeting, the SBME requires that a designated chair ensure that an SBME Graduate Student Advisory Committee Assessment Form is filled-out, dated, and signed by all committee members. The assessment form is a record of the students performance and progress. Both the committee and student have the ability to provide written comments on the assessment form with a copy of the report provided to the student and placed in their file. After each committee meeting, the designated chair will go through the form with the student and explain the committee’s evaluation and comments. The student is then given an opportunity to respond in writing to the committee and is required to date and sign the form.

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## Prosthodontics/M.A.Sc. Thesis Proposal

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### **Excerpt from the Engineering Graduate Studies Handbook:**

*“...Students in a M.A.Sc. program..., shall present research proposals in written form to their research Supervisory Committee.... The plan or proposal should include a review of the pertinent literature, background information on the*

*proposed project, research objectives, materials/equipment required, methods and a projected schedule. The SC must formally approve the research plan and advise the student on necessary modifications. Approval of the proposal does not preclude its being modified as the project progresses. However modification should only be considered if the SC is in agreement... All graduate students must forward a copy of the project plan or the research proposal to the Graduate Studies and Research Office to be kept in the student's file."*

Each Prosthodontics/M.A.Sc. candidate must prepare a Thesis Proposal at about the two-year mark in the program. The written proposal should include (at minimum) a title page, table of contents, introduction/literature review, thesis objectives/hypothesis, proposed methods and materials, timeline for the project, progress/results to date, and a list of references. The body of written text should not exceed twenty (20) pages, double spaced, 12 point font, excluding the table of contents, tables, figures, list of references, and appendices.

Students are required to make an oral presentation of their proposal and answer questions from the committee to assess their understanding of the proposed research area.

A chair for the committee will be designated by the Graduate Coordinator. It is the Chair's responsibility to ensure that an SBME Graduate Student Supervisory Committee Assessment Form is completed and signed by all committee members. The assessment form is a record of the committee's acceptance of the proposal.

## M.A.Sc. Thesis (Prosthodontics/M.A.Sc. Program)

### Excerpts from the Engineering Graduate Studies Handbook:

*"Guidelines for the preparation of graduate theses may be obtained from the Graduate Studies and Research Office (GSRO). Although students are given a reasonable amount of freedom in selecting thesis format, the "Preparation of Graduate Theses" must be consulted on acceptable and unacceptable writing practices. The "Appointment for Oral Examination" form is submitted to the GSRO when the Thesis Supervisor is satisfied with the quality of the thesis or project and the Supervisory Committee has agreed to a date for the defence or presentation. This form must be signed by all committee members and be accompanied by a final, letter quality unbound copy of the thesis. The format and style of the thesis or project will be examined and the GSRO will reserve a room and distribute defence announcements provided the thesis/project meets the accepted criteria."*

*"Thesis preparation usually begins with the thesis proposal which contains a summary of the research previously reported in the technical literature. However, presentation of results and discussion occur only after considerable research has been carried out. Students are encouraged where possible to publish their results in the refereed literature prior to defence of the thesis. Students must seek the approval of the Thesis Supervisor and Supervisory Committee to be certain that the volume and quality of work is sufficient to warrant thesis preparation. Notwithstanding this, in some cases it is the student's right to have a defence."*

## Thesis Defence

- Refer to the Engineering Graduate Student Handbook section 14.5, pp 17-19.
- Further to the Faculty of Engineering requirements, the SBME requires that at least one member of the thesis examining committee has **not** been directly involved in the thesis supervision.

## Schedule of Prosthodontics/M.A.Sc. Program

Time	Requirement
Within thirty (30) days of initial registration	Approval of Program

Eleven (11) months after initial registration and on the same date in each subsequent year	Progress Report to Faculty of Graduate Studies
Within sixteen (16) months of initial registration	Approval of Supervisory Committee
Within twenty (20) months of initial registration	First meeting of Supervisory Committee
Within twenty-four (24) months of initial registration	Approval of Research Proposal
Two (2) months before thesis defence	Approval of thesis title
Twelve (12) business days before thesis defence	Scheduling of Defence, thesis copies to Supervisory Committee, plus one copy to the Graduate Student Research Office at Engineering with "Appointment for an Oral Examination" form
Within five (5) years of initial registration	Completion of all program requirements

## General Policies for All Programs

### Summary of Required Committee Memberships

("Members of SBME" include both primary appointees and cross-appointees)

#### All Supervisory Committees:

- (i) the Thesis Supervisor.
- (iii) at least two other faculty members who are members of the Faculty of Graduate Studies.
- (ii) at least two committee members must be members of SBME.
- (ii) at least two committee members must have primary appointments in different departments (this can include the thesis supervisor).
- (iv) any other faculty members deemed necessary by the Thesis Supervisor and/or the Graduate Coordinator of the SBME.

#### All Thesis Proposals:

- (i) Supervisory Committee.
- (ii) Chair appointed by the Graduate Coordinator.

#### M.A.Sc. Thesis Defence:

- (i) Supervisory Committee.
- (ii) at least two members of the Examining Committee must be from SBME.
- (iii) at least one member of the Examining Committee must **not** have been directly involved in the thesis supervision.
- (iv) Chair appointed by the Graduate Coordinator.
- (v) All thesis examining committees (M.A.Sc. and Ph.D.) must be approved by both the Graduate Coordinator and the Director of the School of Biomedical Engineering.

#### M.A.Sc. to Ph.D. Transfer Committee:



- (i) Supervisory Committee.
- (ii) at least one additional members of the SBME.
- (iii) Chair appointed by the Graduate Coordinator.

**Ph.D. Candidacy Examination:**

- (i) Supervisory Committee.
- (ii) at least one additional faculty member from SBME.
- (iii) Chair appointed by the Graduate Coordinator.

**Ph.D. Thesis Examination (FGS Regulations):**

- (i) Chair of the Defence: The Examination is chaired by the Dean, the Associate Dean of Graduate Studies, or a member of the Panel of PhD Defence Chairs.
- (ii) the Thesis Supervisor or Co-supervisors.
- (iii) at least two additional members (who shall normally have been members of the Supervisory Committee).
- (iv) the external examiner who shall be from outside the University.
- (v) a departmental representative (the chairperson of the department or a designate) is included as a non-voting member of the committee.
- (vi) All thesis examining committees (M.A.Sc. and Ph.D.) must be approved by both the Graduate Coordinator and the Director of the School of Biomedical Engineering.

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## SBME Course Regulations

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Course offered by the School of Biomedical Engineering are listed in the appropriate university calendars and on the school website.

**The following special regulations apply to SBME courses:**

**Limited Enrolment:** Any course with limited enrolment offered by the School of Biomedical Engineering will require permission of the instructor to register. Normally, priority will be given to students registered within the School of Biomedical Engineering but as enrolment is limited early registration is recommended. All other applicants will be placed on a waiting list. Students on a waiting list can be permitted to register on the first day of classes for the term that the course is offered.

**Low enrolment:** Courses with enrolment of less than three (3) graduate students are offered only at the discretion of the instructor.

**Directed reading courses:** Directed reading courses may be offered by faculty members in the School of Biomedical Engineering. All such courses must have a brief written syllabus that is approved by the Curriculum Committee and the Director of the School before the course is delivered.

**Changes in course offerings:** The School of Biomedical Engineering Curriculum Committee and the Graduate Coordinator must be notified of any changes in course offerings for any reason.

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## Supervisors and Supervisory Committees

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### Thesis Supervisors

**All students will have a Thesis Supervisor, or Co-Supervisor who:**

- (i) is appointed in the School of Biomedical Engineering

- (ii) has an earned Ph.D. or equivalent research experience as judged by the faculty members of the SBME
  - (iii) is a member of the Faculty of Graduate Studies at Dalhousie University
- (Additionally for Ph.D. students)**
- (iv) has previously served on the supervisory committee of a doctoral student
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## Supervisory Committees - Composition

### Excerpt from the Engineering Graduate Studies Handbook:

*“... It is the responsibility of the Graduate Coordinator to ensure that ... the student's (Supervisory Committee) SC is selected. SC members are selected by the Thesis supervisor (TS) and should complement expertise available to assist the student in completing the research program. ...The membership of this committee must be approved by the Graduate Studies Research Office (GSRO). The TS is responsible for the direction of the appropriate research or industrial project. The SC Approval forms are available at the GSRO (Appendix Form ENGIGSR-GS-2/02-2001). The appropriate form is to be filled out by the student and signed the SC members and returned to the GSRO for approval. Approval by the GSRO does not preclude changes to composition of the SC at a later date.”*

### The Supervisory Committee shall normally consist of:

- (i) the Thesis Supervisor
  - (ii) another faculty member from the SBME
  - (iii) another faculty member from outside the SBME
  - (iv) any other faculty members deemed necessary by the Thesis Supervisor and/or the Graduate Coordinator of the SBME
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## Supervisory Committees - Duties

### The duties of the SC include:

- (i) to co-ordinate the overall program in accordance with all regulations concerning the degree sought, including those presented in the University Calendar and the Engineering Graduate Studies Handbook
- (ii) to meet immediately after appointment to evaluate the qualifications of the student, and to discuss and approve a program of study
- (iii) to meet as needed for the purpose of evaluating and discussing the proposed thesis research project
- (iv) to assist the student as a group or on an individual basis with problems or concerns arising from the research
- (v) to participate in the Ph.D. Transfer Examination when appropriate (M.A.Sc. program)
- (vi) to participate in the Candidacy Examination (Ph.D. program)
- (vii) to submit three proposed names for an External Examiner (Ph.D. program)

**See also:** Evaluation, Committee Meeting Form

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## Supervisory Committees - Meetings

### The Supervisory Committee will meet:

- (i) within eight (8) months after initial registration to approve the research plan
- (ii) within twelve (12) months after initial registration to approve the thesis proposal
- (iii) at least annually thereafter

**See also:** Evaluation, Committee Meeting Form

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## Teaching Assistantships

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Graduate students in the SBME may hold Teaching Assistantships (TAs). However, only a limited number of such positions are available within the SBME. Students may also seek TA positions outside the School.

### **Excerpt from the Engineering Graduate Studies Handbook:**

*“A student who has a scholarship may hold a job simultaneously only if the job involves no more than 16 hours work per week, including a maximum of 10 hours as a teaching assistant. Notification of the duration of the job should be sent to Graduate Studies. If the student wishes to work more than 16 hours per week during the summer months, the scholarship can be suspended until the student resumes full-time work on the program”*

Further, students wishing to obtain a TA position should inform their supervisor of their intent. Students are encouraged to take TA positions as this helps to build their teaching experience, which is most important for graduate students at the Ph.D. level. If a TA position within the home department of a faculty member is a requirement of a student’s stipend, this must be clearly indicated to the student, including the number of hours required per week, before they accept admission to the SBME program.

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## Academic Integrity and Plagiarism

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The School of Biomedical Engineering strictly adheres to the University policies on academic integrity in scholarly work including course assignments, reports and theses. Information on these policies can be found on the following websites:

[Plagiarism defined and University policies website](#)

[Academic Integrity Home](#)

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