MS

BIOMEDICAL ENGINEERING

GRADUATE STUDENT HANDBOOK

July 2024

Michigan Technological University

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Michigan Technological University
Biomedical Engineering

Departmental Assessment Plan

At the end of the Biomedical Engineering Master's Research/Thesis and Coursework program, students will be able to:

Learning Goals	Measures
Demonstrate proficiency of the subject matter.	Graduate course grades Thesis/Report & Defense Master's Evaluation and IDP
Demonstrate research skills, execute a research project. (thesis and report only) • Apply existing research methodologies and techniques. • Critically analyze and evaluate one's own findings and those of others.	Thesis Research Proposal Thesis/Report & Defense Master's Evaluation and IDP Publications Conference Publications
Make a contribution to the discipline. (thesis only)	Thesis/Research Proposal Publications Conference presentations Master's Evaluation and IDP
Demonstrate professional skills. • Effective oral and written communication skills. • Follow ethical guidelines for work in the field.	Thesis/Report & Defense Teaching evaluations (if applicable) Publications Conference presentations Master's Evaluation and IDP
Practice responsible conduct of research (field appropriate)	Thesis/Report & Defense Teaching evaluations (if applicable) Publications Conference presentations Master's Evaluation and IDP RCR Training

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Biomedical Engineering Master's Admission Process

Applications will be accepted on a rolling basis. There is no deadline for applying to the master's program.

BME offers an accelerated MS program for MTU undergraduate students. **Undergraduate students must apply for admission to the accelerated program though the standard Graduate School application process. Students can apply to the program starting two semesters prior to graduation. The application must be accepted by the Graduate School and department prior to graduation. The GRE is waived for Michigan Tech students and the required letters of recommendation are waived for Michigan Tech Biomedical Engineering students.**

Master's students typically do not receive support from the Biomedical Engineering Department (BME) during their studies.

Admission Requirements:

- GPA of 3.0 on a scale of 4.0
    - To convert your GPA to the 4.0 scales, please use this link: GPA Calculator

- GRE: Recommended scores of:
  160 Quantitative
  153 Verbal
  3.0 Analytical
  (*Michigan Tech students are exempt)*

- TOEFL: Recommended Score of 100 iBT (*International Students)*

- IELTS: Recommended Overall Band Score of 7.0 (*International Students)*

The BME graduate committee will review applications approximately biweekly and reject any applications that do not meet the basic requirements.

- All students who have a BS in an engineering discipline are eligible to apply. However, students lacking undergraduate courses in life sciences or biomedical engineering may be required to complete additional courses to correct this deficiency, these courses may not be counted toward the graduate coursework degree requirements. The advisor and BME graduate program director will approve a plan for satisfying the deficiency.

- Exceptional students with non-engineering BS degrees are also eligible to apply. However, these students may be required to complete additional courses in engineering and/or mathematics to correct the deficiency, these courses may not be counted toward the graduate degree requirements if they are 3000 level or below. The advisor and BME graduate program director will approve a plan for satisfying the deficiency.

- The standard Graduate School admissions process applies.

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Choosing an Advisor

We recommend that students review the website and contact us with who they would like to set up as their temporary advisor. If they are having trouble selecting an advisor by a specific date (one month prior to arrival on campus) a temporary advisor will be assigned. Coursework students who have not chosen an advisor will have the departmental graduate program director (Jingfeng Jiang) assigned as their advisor.

Students must choose an advisor prior to the end of the first semester and submit the Advisor and Committee Recommendation Form to the department and Graduate School. The (primary) students' advisor must have at least 50% of a full-time-equivalent appointment with the Biomedical Engineering Department.

Choosing a Committee

Complete Advisor & Committee Recommendation Form and submit to the Graduate School prior to the end of the 2nd semester. A copy of the document is also required for department files.

A master's student committee must consist of at least three faculty members listed as graduate faculty by the graduate school.

Keys, Desk, Computers, and Research Space Assignments

See office staff at front desk in H-STEM Complex 339 for keys. Master's students are generally not assigned an office. Thesis and Report MS should see their advisor for appropriate lab training and workspace.

Mail Service, Photocopier, Supplies, and Printers

Students will receive announcements and information via the departmental graduate student Google group.

Copy machine, printers, and campus mail boxes are located in the main H-STEM Complex 339 office.

International Students

Please refer to the International Programs and Services website for helpful information.

University Student Policies:

The following links from the Graduate School website explain University Student Policies

Academic Standards

- **Appeals of Suspension or Dismissal**
- **Attendance Policy**
- **Exam Policies**
- **Good Academic Standing and Dismissal**
- **Scholastic Standards**

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Continued next page.

Course and Credit Policies

- **Adding and Dropping a Course**
- **Bills, Due Dates, Refunds, and Payment Plans**
- **Credit Hours and Expectations**
- **Enrollment Policies and Full-Time Status**
- **Full-Time Course Listing**
- Medical (**Voluntary** and **Involuntary**) and **University Withdrawal**
- **Entering Candidacy (Research Mode)** **(also see department guidelines)**
- **Reusing Credits**
- **Transfer, MIGS, and Senior Rule Credits**

Degree Completion Requirements

- **Degree Requirements** **(also see department guidelines for all MS or Coursework , Thesis, Report)**
- **Dissertations, Theses,** and **Reports** **(also see department guidelines)**
- **Holds FAQ**
- **Graduation, Certification, and Commencement**
- **Tracking and Status Forms**

Financial Policies

- **Assistantships**
- **CGS Resolution Regarding Graduate Scholars, Fellows, Trainees, and Assistants**
- **Federal Financial Aid**
- **Fellowships**
- **Financial Aid Policies**
- **Minimum Stipend Rates**

Professional Conduct

- **Academic Integrity**
- **Conduct Policies**
- **Sexual and/or Relationships Misconduct Policy**

Student Support and Health Insurance

- **Disability Services** and **Policies**
- Grievances: **Dean of Students** | **Graduate School**
- **Health Insurance Policy and Information**
- Medical Withdrawal: **Voluntary** | **Involuntary**
- **Parental Accommodation**

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Accelerated MS Program Overview

- BME offers an accelerated MS program for MTU undergraduate students. **Undergraduate students must apply for admission to the accelerated program though the standard Graduate School application process.**

- Students can apply to the accelerated master's program starting two semesters prior to graduation. **The application must be accepted by the Graduate School and department prior to graduation.**

- During their junior year students should review the BME website and select an advisor. That selection should be emailed to biomed@mtu.edu. If an advisor cannot be selected one can be assigned. A meeting must be arranged with the advisor to complete a Plan of Study Form that will indicate which undergraduate-level courses will be applied to both their BS and MS degrees. This should be done before registering for courses for the fall semester of their senior year.
- Only students who intend to complete both a bachelor's and a master's degree at Michigan Tech are eligible to enroll in the accelerated program.
- Students already enrolled in a graduate program may not retroactively enroll in the BME accelerated master's program.
- Students are allowed to count up to 9 credits of 4000 level or higher courses taken as an undergraduate towards both their BS and MS degrees.
- Qualified students under the Senior Rule may also take 5000 level courses to be applied to their MS degree.
    - These courses cannot be applied to their BS degree requirements.
    - Senior Rule credits cannot be considered for undergraduate financial aid.
    - A student so enrolled and carrying 6 credits or more in 5000 or 6000 level courses may carry no more than 16 credits of coursework per semester.
    - The total number of Senior Rule credits may not exceed one-third (or **10 credits**) of the required non-research course credits.
    - Total number of Senior Rule credits and 4000 level credits taken as an undergraduate towards both their BS and MS degrees many not exceed 15 credits (combined total)
- The number of credits required for the accelerated MS degree is 30 credits.

  The following courses are required core courses, all students must take and pass with a minimum of a "B" grade. Students will be required to re-take the course with grades less than "B".

    - MA5701 Statistical Methods 1 offered Fall and Spring
    - BE5200 Cellular & Molecular Biology II offered Spring OR KIP5500 Systems Physiology offered Fall

- No undergraduate research credits may be applied to the MS degree.
- Research credits taken by students in other plans may not be counted as coursework credits.
- Students must complete the master's requirements for all students, as well as the requirements for courses as specifically outlined in each option (coursework, report, thesis).

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Biomedical Engineering Requirements for ALL Master's Students

Newly accepted student responsibilities upon arrival on campus and prior to 1st day of class:

Obtain Husky Card

International students report to International Programs and Services (IPS)

Attend Graduate School Orientation

- Complete Basic Responsible Conduct of Research Training:
    - Provided during Graduate School Orientation

  Or Basic RCR Training

- Complete on MyMichiganTech the Patent, Research, & Proprietary Rights Agreement Form
- Submit official proof of previous degrees earned to the Graduate School
- Attend BME Department Grad Student Orientation Meeting.
- Students can be enrolled in the MS program under three options: Thesis Option, Report Option, and Coursework Option. Students need to indicate their option by completing the MS Plan of Study Form before the end of the first semester in the program. Students are allowed to change their plans while enrolled in the program at any time. This plan must be approved by their BME advisor.
- Students who wish to change their program option (same advisor) must submit a Degree Schedule Form to the Graduate School.
- Students who need to fulfill deficiencies (non-engineering background) cannot count 3000 level courses toward their required coursework.
- Graduate students who wish to take 4000 level courses must get special approval from their advisor.
- Students are permitted to take courses outside the BME department as determined by the student and his/her advisor.
- Up to 6 credits of SCV/BC/C grades are allowed as long as (1) they aren't one of the required core courses and (2) approved by the advisor and graduate director.
- A cumulative GPA for courses counted toward the degree of 3.0 is required for graduation.
- Students who are accepted to the program will be placed under probation if their cumulative GPA for courses counted toward their degree falls below a 3.0. Students with 2 consecutive probation semesters will not be allowed to continue in the program.
- All graduate students are required to attend all BME graduate seminars. See separate section - Graduate Seminar Series for further information and requirements.
- All graduate students are required to attend 1 WRITE-D writing workshop per month. Students will receive information from the department facilitator.
- All Graduate School residency and credit requirements must be met.
- All students are required to complete an annual Evaluation and IDP Form and meet with their advisor after completion of the assessment.
    - Office staff will send students the Evaluation and IDP forms.

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Required Core Courses:

Each student must take and pass with a minimum of a "B" grade. Students will be required to re-take the course with grades less than "B".

- MA5701 Statistical Methods I offered Fall and Spring
- BE5200 Cellular & Molecular Biology II offered Spring OR KIP5500 Systems Physiology offered Fall

The Graduate School allows up to six credits of SCV/BC/C to count toward a degree, the department will accept up to six credits as long as the course is not one of the required core courses and is approved by the advisor and graduate director.

Coursework Option

This plan requires the minimum of 30 credits be earned through coursework. Research credits taken by students in other plans may not be counted as coursework credits.

- Students must complete the master's requirements for all students as listed on the Graduate School website, as well as the below requirements for courses:
- A minimum of 30 approved credits (including required core courses)
- Coursework must satisfy the following:
  - 18 credit minimum 5000-6000 classes
  - 9 credit maximum 4000 classes
  - 3 credit minimum 4000 or higher level courses outside the department
  - 12 credit minimum from BME department
- Up to 6 credits taken as Independent Study may be for research-related activities

- **The following courses are required core courses, all students must take and pass with a minimum of a "B" grade. Students will be required to re-take the course with grades less than "B".**

  - MA5701 Statistical Methods I offered Fall and Spring
  - BE5200 Cellular & Molecular Biology II offered Spring OR KIP 5500 Systems Physiology offered Fall
- Graduate students who wish to take 4000 level courses must get special approval from their advisor.

All other deadlines and requirements for completion of the master's coursework are located on the Graduate School website.

Coursework students are required to complete the Evaluation and IDP form and meet with their advisor annually to ensure they are taking and enrolling in the correct courses to fulfill degree requirements.

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Biomedical Engineering Academic Timeline – Coursework Option

Each MS student enrolled in the Department of Biomedical Engineering (BME) MS program is required to adhere to the following deadlines.

REMEMBER THAT FORMS ARE AVAILABLE ON THE GRADUATE SCHOOL WEBSITE, MyMichiganTech AND THE BIOMEDICAL ENGINEERING'S GRADUATE WEBSITE.

STUDENTS ARE REQUIRED TO MONITOR THEIR ACCOUNTS AND SUBMIT FORMS BY THE REQUIRED DEADLINES.

Beginning of 1st semester:

- Complete EverFi training

Prior to the end of the 1st semester:

- Complete Advisor Recommendation Form and submit to the Graduate School. A copy of the document is also required for department files. This process is to choose your advisor.
- Proposed coursework and MS option: Biomedical Engineering MS Plan of Study Form. The proposed coursework will include the classes taken during the first semester. This must be signed by the advisor. This form is for department files only.

2nd or 3rd semester:

- Complete Advanced Responsible Conduct of Research Training:
    - Students are recommended to take these courses fall or spring semester

At the end of every year:

- Share Master's Coursework Student Evaluation and IDP Form with advisor (sent to student by office staff).
- **Arrange meeting with advisor to review the Evaluation and IDP.**
- The purpose of the Evaluation and IDP is to keep the advisor abreast of progress and garner their feedback. The advisor may determine if more frequent meetings are required. Students can access their Evaluation and IDP form anytime.

Semester before Planned Degree Completion:

- Submit Degree Schedule to the Graduate School.

SEMESTER OF PLANNED DEGREE COMPLETION:

Students need to monitor their MyMichiganTech account for required Graduate School forms and deadlines.

- Submit Degree Completion Form to the Graduate School.
- Submit Verification of Final Degree Requirements Form to Graduate School.
- Advisor complete Biomedical Engineering Evaluation of MS Graduate Student Outcomes – Coursework using the Biomedical Engineering MS Evaluation Rubric.

Please refer to the Graduate School guidelines for remaining procedures or MyMichiganTech

Staff at the front desk will send you a departmental Exit Interview to complete before you leave the university.

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Grad School/BME Master's Coursework Timeline

Before you arrive on campus:

- Arrange for housing
- Consult with your assigned BME advisor for course selection
- International students must submit arrival information on MyMichiganTech to notify International Programs and Services(IPS)

Upon arrival on campus:

- Obtain Husky Card
- International students report to IPS

Prior to 1st week of class:

- Attend Graduate School Orientation
- Complete Basic Responsible Conduct of Research Training
- Complete Patent, Research, & Proprietary Rights Agreement Form on MyMichiganTech
- Submit official proof of previous degrees earned to the Graduate School
- Attend BME Grad Student Orientation

Beginning of 1st semester:

1. Complete EverFi training

Prior to the end of the 1st semester:

- Submit Advisor Recommendation Form to the Graduate School
- Complete BME Plan of Study Form

Every semester:

- Register for courses
- Pay your tuition bill
- Confirm your enrollment
- Attend required graduate seminars and WRITE-D workshops

Every year:

1. Provide proof of health insurance or pay University policy
2. Obtain parking permit
3. Submit Master's Coursework Evaluation and IDP form to advisor (Office staff will send assessment)

2nd or 3rd semester:

- Complete Advanced Responsible Conduct of Research Training

Semester before planned degree completion

- Submit Degree Schedule to the Graduate School

Semester of planned degree completion

10 weeks prior to commencement:

1. Submit Degree Completion Form to the Graduate School
2. Submit Verification of Final Degree Requirements Form to the Graduate School.
3. Advisor complete Biomedical Engineering Evaluation of MS Graduate Student Outcomes - Coursework

Before leaving Campus:

- Submit Graduate Student Workspace Cleanout Form on MyMichiganTech
- Complete Exit Survey
- Complete departmental Exit Interview

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Biomedical Engineering Master's Report Option

Under this master's option a student will select an independent project of research interest. The student will prepare a report describing the results of the project. The scope of the research topic for the report should be defined in such a way that a full-time student could complete the requirements for a master's degree in twelve months or three semesters following the completion of course work by regularly scheduling graduate research credits. Reports must be prepared following the formatting guidelines from the Graduate School.

Upon completion of the course requirements and project, the student must present the results of their report during their defense. The defense must include the faculty advisor and the committee. The defense will be open to the public. Upon dismissal of the general audience the committee will continue to question the student. The committee will evaluate the student's ability to present and defend the report using the Biomedical Engineering MS Evaluation Rubric and record the results on the Biomedical Engineering Evaluation of MS Graduate Student Outcomes - Report. Students must report the results of their oral examination and submit a final report to the Graduate School prior to completing their degree

Visit the deadlines section on the Graduate School website for detailed information about required forms and due dates.

Biomedical Engineering Report Option Course Requirements

Under this plan, the student is required to produce a report describing the results of an independent study project. At least 24 of the 30 credits must be earned in coursework other than the project.

- Students must complete the Master's requirements for all students as stated on the Graduate School website, as well as the below requirements for courses for the report option:
- A minimum of 30 approved credits (including required core courses).
- 24 credit minimum of course work
    - 12 credit minimum 5000-6000 level courses
    - 9 credit maximum 4000 level courses
    - 3 credit minimum 4000 or higher level courses outside the department
    - 12 credit minimum from BME department
- 2 to 6 research credits

The following courses are required core courses, all students must take and pass with a minimum of a "B" grade. Students will be required to re-take the course with grades less than "B".

- MA5701 Statistical Methods I offered Fall and Spring
- BE5200 Cellular & Molecular Biology II offered Spring OR KIP5500 Systems Physiology offered Fall.

- Graduate students who wish to take 4000 level courses must get special approval from their advisor.

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Biomedical Engineering Master's Thesis Option

Under this master's option a student will select a project of research interest. The program requires a research thesis prepared under the supervision of the advisor. The thesis describes a research investigation and its results. The scope of the research topic for the thesis should be defined in such a way that a full-time student could complete the requirements for a master's degree in twelve months or three semesters following the completion of coursework by regularly scheduling graduate research credits. The thesis must be prepared following the current Graduate School procedures.

Upon completion of the course requirements and research thesis, a master's thesis student will present a defense of their work. The defense must include the faculty advisor and the committee. The defense will be open to the public. Upon dismissal of the general audience the committee will continue to question the student. The committee will evaluate the student's ability to present and defend the thesis using the Biomedical Engineering MS Evaluation Rubric and record the results on the Biomedical Engineering Evaluation of MS Graduate Student Outcomes - Thesis. Students must report the results of their oral examination and submit a final thesis to the Graduate School prior to completing their degree.

Visit the deadlines section on the Graduate School website for detailed information about required forms and due dates.

Biomedical Engineering Thesis Option Course Requirements

Under this plan, the student is required to produce a research thesis with the supervision of an advisor. The minimum course requirements are as follows:

- Students must complete the master's requirements for all students as stated on the Graduate School website, as well as the below requirements for courses:
- A minimum of 30 approved credits (including required core courses)
- 20 credit minimum of relevant coursework
    - 12 credit minimum 5000-6000 level courses
    - 9 credit maximum 4000 level courses
    - 3 credit minimum 4000 or higher level courses outside the department
    - 12 credit minimum from BME department
- 6 to 10 research credits

The following courses are required core courses, all students must take and pass with a minimum of a "B" grade. Students will be required to re-take the course with grades less than "B".

- MA5701 Statistical Methods I offered Fall and Spring
- BE5200 Cellular & Molecular Biology II offered Spring OR KIP5500 Systems Physiology offered Fall.

- Graduate students who wish to take 4000 level courses must get special approval from their advisor.

All other deadlines and requirements for completion of the master's thesis are located on the Graduate School website.

Biomedical Engineering Academic Timeline – Thesis and Report Option

Each MS student enrolled in the Department of Biomedical Engineering (BME) MS program is required to adhere to the following deadlines.

REMEMBER THAT FORMS ARE AVAILABLE ON THE GRADUATE SCHOOL WEBSITE, MyMichiganTech AND THE BIOMEDICAL ENGINEERING'S GRADUATE WEBSITE.

Beginning of 1st semester:

- Complete EverFi training
- Complete Advisor & Committee Recommendation Form and submit to the Graduate School. A copy of the document is also required for department files. This process is to confirm who the advisor will be. . The (primary) students' advisor must have at least 50% of a full-time-equivalent appointment with the Biomedical Engineering Department.

2nd semester:

- Complete Advisor & Committee Recommendation Form and submit to the Graduate School. A copy of the document is also required for department files. This process is to choose your advisory committee.
    - A master's student committee must consist of at least three faculty members listed as graduate faculty by the graduate school. The (primary) students' advisor must have at least 50% of a full-time-equivalent appointment with the Biomedical Engineering Department.
- Proposed coursework and MS option: Biomedical Engineering MS Plan of Study Form. The proposed coursework will include the classes taken during the first semester. This must be signed by the advisor. This form is for department files only.

2nd – 3rd semester:

- Complete Advanced Responsible Conduct of Research Training:
    - Students are recommended to take these courses fall or spring semester.

Every semester:

- **Must attend a minimum of 6 BME graduate seminars each semester. Attendance of other department seminars is required if there are not enough BME seminars offered.**
- **Must attend 1 WRITE-D workshop per month. Information will be sent to students by the department facilitator.**

At the end of Spring semester:

- Submit Graduate Student Evaluation and IDP Form to advisor. (This form will be sent to student by office staff).
- **Arrange meeting with advisor to review the Evaluation and IDP.**
- The purpose of the Evaluation and IDP is to keep the advisor abreast of progress and garner their feedback. The advisor may determine if more frequent meetings are required. This also provides graduate students with a review of their performance and expectations for the coming semester. Negative reviews will reflect in the graduate student's grade.

Continued next page.

Semester before Planned Degree Completion:

- Submit Degree Schedule to the Graduate School.

SEMESTER OF PLANNED DEGREE COMPLETION:

Students need to monitor their MyMichiganTech account for required Graduate School forms and deadlines.

- Submit Degree Completion Form to the Graduate School.

Thesis/Report Defense:

The thesis/report defense is open to the public. The student will give a presentation to the audience. The general audience will first question the student on the proposal. Upon dismissal of the general audience, the thesis/report committee members will continue to question the student. The committee will evaluate the student's ability to present and defend the thesis/report using the Biomedical Engineering MS Evaluation Rubric and record the results on the Biomedical Engineering Evaluation of MS Graduate Student Outcomes – Thesis or – Report. If the student does not pass the defense, he/she can retake the defense a second time. Failure in the second defense will result in the dismissal of the student from the thesis/report MS program. The student will have the option to complete the MS degree with the coursework option.

If you have questions regarding the defense process, please see staff at the front desk for instructions.

2 weeks prior to Defense:

- Provide the date, time, building/room number and title of defense to the departmental coordinator. H-STEM Complex 339 staff can reserve a room for the defense.
- Schedule the defense in the Current Students tab on MyMichiganTech and submit the Defense Draft to the Graduate School and advisory committee. Committee members may request to have the defense draft turned in sooner.

On the day of your Defense:

- Bring a copy of the Report on Final Oral Examination Form and Evaluation Rubrics with you to your defense.

Please refer to the Graduate School guidelines for remaining procedures or MyMichiganTech

Staff at the front desk will send you a departmental Exit Interview to complete before you leave the university.

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Entering Candidacy (Thesis/Report)

Master's Thesis or Report Students are eligible for candidacy at the start of the first semester following completion of all 30 required credits for their degree. They may register for research credits at a reduced tuition rate.
The primary purpose of candidacy is to provide assistance to faculty who are supporting graduate researchers on external funds.
For more information regarding entering into candidacy, please see the Graduate School website.

Thesis/Report Defense

Students must prepare their document using the guide found on the Graduate School website.
Students can pick up a Thesis/Report Defense packet from the front desk with instructions for the defense process.
The defense may be scheduled on the Current Students tab on MyMichiganTech, see the Graduate School website for more information. This form requires a date, time and building/room number for the defense. **Students must provide this information along with the title of the defense to the departmental coordinator before or at the same time the defense is scheduled.** Staff in H-STEM Complex 339 can reserve a room for the defense.

All defenses must be scheduled two weeks in advance of the desired date. Students must submit the complete defense draft of their thesis to the Graduate School and also to their advisor and committee two weeks before their defense. **The deadline to submit a committee approved post-defense dissertation, thesis or report is 4:00 p.m. on the Monday of week 14.**

There is a grace period from Tuesday of week 14 to Wednesday 4:00 p.m. of the week before classes begin for the next semester. Students who submit their dissertation, thesis, or report will qualify to enroll in UN5951 in the upcoming semester. These students will pay the resubmission fee (25% of one-credit of tuition) when their documents are accepted.

The thesis/report defense is open to the public. The student will give a presentation to the audience. The general audience will first question the student on the proposal. Upon dismissal of the general audience, the thesis/report committee members will continue to question the student. The committee will evaluate the student's ability to present and defend the thesis/report using the Biomedical Engineering MS Evaluation Rubric and record the results on the Biomedical Engineering Evaluation of MS Graduate Student Outcomes – Thesis or – Report. If the student does not pass the defense, he/she can retake the defense a second time. Failure in the second defense will result in the dismissal of the student from the thesis/report MS program. The student will have the option to complete the MS degree with the coursework option.

Upon completion of the defense, students should make any technical corrections requested by their advisor and committee and also any formatting corrections from the Graduate School. Print the Approval of Dissertation, Thesis or Report Form from the Graduate School website and obtain signatures from advisor and all committee members. The completed form must be submitted to the Graduate School. Within one week and prior to the deadline, submit the final dissertation to the Graduate School (see the website for submission instructions). The deadline to submit a final dissertation is Monday of week 14 of the semester.

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Grad School/BME Master's Thesis-Report Timeline

Before you arrive on campus:

- Arrange for housing
- Consult with your assigned BME advisor for course selection
- Submit arrival information on MyMichiganTech to notify IPS (international students)

Upon arrival on campus:

- Obtain Husky Card
- Report to IPS (international students)

Prior to 1st week of class:

- Attend Graduate School Orientation
- Complete Basic Responsible Conduct of Research Training
- Complete Patent, Research, & Proprietary Rights Agreement Form on MyMichiganTech
- Submit official proof of previous degrees earned to the Graduate School
- Attend BME Grad Student Orientation

Beginning of 1st semester:

- Submit Advisor Recommendation Form to the Graduate School
- Complete EverFi training

Every year:

- Provide proof of health insurance or pay University policy
- Obtain parking permit

Every semester:

- Register for courses
- Pay your tuition bill
- Confirm your enrollment
- Attend required graduate seminars and WRITE-D workshops

At the end of spring semester:

- Submit Evaluation and IDP Form to your advisor

2nd semester:

- Submit Advisory Committee Form to the Graduate School
- Complete BME Plan of Study Form

2nd or 3rd semester:

- Complete Advanced Responsible Conduct of Research Training

Semester before planned degree completion

- Submit Degree Schedule to the Graduate School

Semester of planned degree completion

10 weeks prior to commencement:

- Submit Degree Completion Form to the Graduate School

2 weeks prior defense:

- Provide date, time, building/room number and title of defense to departmental coordinator
- Schedule defense in the Current Students tab on MyMichiganTech and submit the Defense Draft to the Graduate School and your advisory committee

Defense date:

- Defend and bring a copy of Report on Final Oral Examination Form and Evaluation Rubrics

Post – defense (refer to deadlines on Graduate School web-site)

- Submit Approval of Dissertation, Report, or Thesis Form to the Graduate School

Within 1 week of submitting Approval Form and by semester deadline MONDAY OF WEEK 14:

- Submit Thesis/Report to Digital Commons and ProQuest

Before leaving Campus:

- Submit Graduate Student Workspace Cleanout Form on MyMichiganTech
- Complete Exit Survey
- Complete departmental Exit Interview

Evaluation and IDP Instructions

- Completed after each semester in the first year and then annually for PhD students.
- Completed annually by Master's students.
- Both the student and advisor need to complete sections on the assessment.
- Assessments will contain written feedback and must be discussed during a meeting between the advisor and student and then signed and dated.
- The assessment is a shared document between the advisor and student and is kept in the departmental shared drive.
- In the event that serious deficiencies are identified, they must be clearly identified in the advisor expectations with a plan to remedy the deficiencies.

The Evaluation and IDP forms will be sent to students as a shared document by office staff.

EVLAUATION FORMS MUST BE COMPLETED ELECTRONICALLY AND CANNOT BE FILLED OUT BY HAND.

Student:
You will receive a shared document from office staff.
Complete all questions pertaining to **student information**.
Prepare an updated Curriculum Vitae.
Share your CV and Evaluation form with your advisor to complete.
You should arrange to meet with your advisor to discuss, sign, and date the Evaluation and IDP.

Advisor:
You will receive a shared document from your grad student.
Complete all questions pertaining to **advisor information** in the live document. Do not make a copy.
The completed Evaluation and IDP should be discussed, signed and dated at the meeting with your student.
Notify office staff that the Evaluation and IDP is complete. Students can access their Evaluation and IDP form anytime.

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Graduate Seminar Series

Attendance of all Biomedical Engineering Graduate Seminars is **required**.
PhD students are required to present a seminar to BME faculty and BME graduate students.
Faculty attending the PhD student's seminar will use the Biomedical Engineering PhD Evaluation Rubric and record the results on the Biomedical Engineering Evaluation of PhD Graduate Student Outcomes – Seminar.
The department coordinator will email notifications about the date, time, and location for seminars that will occur (a seminar will not be held every week so please watch your email closely).

Seminars and defenses held during the summer are not to be counted toward the spring or fall seminar requirements.

Requirements:

- All graduate students MUST attend all Biomedical Engineering seminars.
    - There will be a sign in sheet at the seminar to ensure attendance.
- Graduate students must attend 6 seminars per semester (emails are sent from the department coordinator announcing other departmental seminars as well). If the BME department does not hold 6 seminars per semester, students must attend seminars from other departments.
    - BME PhD proposal defense, dissertation defense and MS Thesis/Report defense are considered to be part of the seminar series.
- Graduate students must write up a brief summary of each seminar attended. They must have their advisor approve and sign the summary and then turn it in to staff at the front desk.
- Failure to attend the appropriate number of seminars will result negatively on student's evaluations that occur each semester and will negatively impact their research grade.

Events that are not acceptable for seminar assessments:

- Seminars that are **not** a scientific or technical research topic
- Webinars
- Graduate School workshops or training sessions
- PhD proposal defense, dissertation defense and MS Thesis/Report defense **outside of the BME department**
- Conferences
- Tech Talk Series

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Michigan Technological University
Biomedical Engineering

Graduate Seminar Assessment Form

Student Name: _____ **Date:** _____

Title of Seminar attended: _____

Name of Seminar Presenter: _____

Summary of Seminar:

Advisor Signature: _____ **Date:** _____

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BE5900 Biomedical Engineering Master's Topics

Title of topic/project: _____

# of credits: _____*BE5900 will receive a letter grade.*

Student Name: _____ M# _____

Faculty Approval:

_____ _____ Date: _____

Printed Signature

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Michigan Technological University
Biomedical Engineering

BME MS Plan of Study Form

Student Name: _____ M #: _____ Date: _____

MS Option Selection: _____ Thesis _____ Report

_____ Coursework _____ Accelerated

Complete Part A prior to the end of the first semester of MS Program.

Complete Part B during undergrad junior year.

PART A
Thesis/Report/Coursework courses to be counted toward MS degree.

Title	Course Number	Number of Credits

PART B – For Accelerated Master's (COURSES TO BE APPLIED TO BOTH BS & MS)

Approval signatures:

Advisor: _____

Biomedical Engineering Fall Semester Graduate Courses

REQUIRED CORE COURSE: MA 5701 - Statistical Methods Introduction to design, conduct, and analysis of statistical studies, with an introduction to statistical computing and preparation of statistical reports. Topics include design, descriptive, and graphical methods, probability models, parameter estimation and hypothesis testing.
Credits: 3.0 **Lec-Rec-Lab:** (0-3-0)
Semesters Offered: Fall and Spring

BE 5000 - Biomedical Masters Research Includes the study of an acceptable biomedical engineering problem and the preparation of a report or thesis.
Credits: variable to 12.0; May be repeated; Graded Pass/Fail Only
Semesters Offered: Fall, Spring, Summer

BE 5330 - Biomimetic Materials This course introduces students to biologically inspired approaches to design functional biomaterials. Topics include the discovery and incorporation of biological designs into novel materials and their application in the biomedical field.
Credits: 3.0 **Lec-Rec-Lab:** (3-0-0)
Semesters Offered: Fall - Offered alternate years beginning with the 2014-2015 academic year.

BE 5335 - Smart Polymers This course introduces students to smart polymers that change their physical properties in response to various environmental stimuli. Topics include the molecular origin of the stimuli responsiveness of these materials and their application in the biomedical field.
Credits: 3.0 **Lec-Rec-Lab:** (3-0-0)
Semesters Offered: Fall - Offered alternate years beginning with the 2015-2016 academic year.

BE5340 – Biocompatibility This course will cover the general principles and biomedical engineering applications of biocompatibility. You will be able to critically read the international standards in the area of biocompatibility.
Credits: 3.0
Semesters Offered: Fall Offered alternate years beginning with the 2022-2023 academic year.

BE 5350 - Cell Biomechanics and Mechanical Transduction This course, will teach basic biology and mechanics behind cell mechanics, methodologies, and models regarding mechanobiology.
Credits: 3.0 **Lec-Rec-Lab:** (3-0-0)
Semesters Offered: Fall – Offered alternate years beginning with the 2021-2022 academic year.

Continued next page.

BE 5510 – Cardiovascular Engineering
Fundamental cardiovascular pathology and the biomedical engineering approaches being developed and used toward problems resulting in significant cardiovascular deficiency such as myocardial infarction, chronic kidney disease, atherosclerosis, and heart valve disease.
Credits: 3.0 **Lec-Rec-Lab:** (3-0-0)
Semesters Offered: Fall

BE5670 – Micro & Nano Technologies This course introduces students to micro- & nano- technologies and the processes involved in their manufacturing. Particular emphasis will be on the use in biomedical applications. Goal is to provide beneficial research and development to the industry.
Credits: 3.0
Semesters Offered: Fall

BE 5700 - Biosensors This course introduces the student to the fundamentals of biosensor development and applications. It provides an understanding of biological components, immobilization methods, transducers, and fabrication techniques.
Credits: 3.0 **Lec-Rec-Lab:** (3-0-0)
Semesters Offered: Fall - Offered alternate years beginning with the 2021-2022 academic year

BE 5755 - Medical Devices An introduction to medical devices used for diagnosis, monitoring, and treatment in clinical medicine. Topics covered include product planning, reliability, clinical trial design, regulatory as well as technical aspects of common medical devices.
Credits: 3.0 **Lec-Rec-Lab:** (3-0-0)
Semesters Offered: Fall

BE 5760 – Numerical Techniques in BME An introductory course on numerical techniques consists of three main components: solution of linear and non-linear sets of equations; computer modeling of physiological systems and medical devices; and numerical optimization of systems.
Credits: 3.0 **Lec-Rec-Lab:** (3-0-0)
Semesters Offered: Fall

BE 5770 - Biomedical Microcontrollers The focus of this course is to provide biomedical engineering students the necessary skills to develop microcontroller-based devices. Provides basic knowledge on computer programming languages, microcontrollers, digital circuits, and microcontroller development kits. Students will design and fabricate a microcontroller-based device using a microcontroller development kit for a specific biomedical application.
Credits: 3.0 **Lec-Rec-Lab:** (1-0-2)
Semesters Offered: Fall - Offered alternate years beginning with the 2022-2023 academic year.

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BE 5870 - Computer Vision for Microscopic Images. This course involves how to quantify data out of images typically from optical microscopes
Credits: 3.0 **Lec-Rec-Lab:** (0-1-2)
Semesters Offered: Fall - Offered alternate years beginning with the academic year 2020-2021

BE 5900 – Biomedical Engineering Master's Topics Biomedical engineering courses will be offered as professional electives dependent upon the interest of the faculty.
Credits: variable to 6.0; May be repeated
Semesters Offered: Fall, Spring, Summer

BE 5930 – Biotransport This course aims to leverage fundamental principles of fluid mechanics, and heat and mass transfer with particular emphasis on physiological and biomedical systems.
Credits: 3.0
Semesters Offered: Fall – Offered alternate years beginning with the academic year 2024-2025

6000 – Biomedical Engineering Doctoral Research Includes the study of an acceptable biomedical engineering problem and the preparation of a report or thesis.
Credits: variable to 12.0; May be repeated; Graded Pass/Fail Only
Semesters Offered: Fall, Spring, Summer

BE 6900 - Biomedical Engineering Doctoral Topics Biomedical engineering courses will be offered as professional electives dependent upon the interest of the faculty.
Credits: variable to 6.0; May be repeated
Semesters Offered: Fall, Spring, Summer

REQUIRED CORE COURSE: KIP 5500 - Systems Physiology A comprehensive systemic study of the physiological functions of the adult human, including an introduction to the underlying etiologies and clinical indicators of molecular, cellular, and tissue bases for common organ system diseases in humans.
Credits: 3.0
Semesters Offered: Fall
(This course can be taken in place of BE5200 Cellular and Molecular Biology II, which is offered every spring.)
REQUIRED CORE COURSES MUST HAVE A GRADE OF "B" OR BETTER. STUDENTS WILL BE REQUIRED TO RE-TAKE THE COURSE WITH GRADES LESS THAN "B"

These courses are offered fall semester by the department. If your faculty advisor has recommended you take courses that are 4000 level, you must see the staff in H-STEM Complex 339 for a waiver to take these courses.

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Biomedical Engineering Spring Semester Graduate Courses

BE 5000 - Biomedical Masters Research Includes the study of an acceptable biomedical engineering problem and the preparation of a report or thesis.
Credits: variable to 12.0; May be repeated; Graded Pass/Fail Only
Semesters Offered: Fall, Spring, Summer

BE 5115 - Finite Element Modeling The course teaches both fundamentals of finite element theory and hands-on experience for bio-engineers.
Credits: 3.0 **Lec-Rec-Lab:** (3-0-0)
Semesters Offered: Spring

REQUIRED CORE COURSE: BE 5200 - Cellular and Molecular Biology II Covers, at an advanced level, the general principles and engineering applications of science and biology, including cell biology, physiology, molecular biology, genetics, and biotechnology.
Credits: 3.0 **Lec-Rec-Lab:** (3-0-0)
Semesters Offered: Spring
OR
KIP 5500 - Systems Physiology A comprehensive systemic study of the physiological functions of the adult human, including an introduction to the underlying etiologies and clinical indicators of molecular, cellular, and tissue bases for common organ system diseases in humans.
Credits: 3.0
Semesters Offered: Fall
(This course is offered every fall and can be taken in place of BE5200 Cellular and Molecular Biology II.)

BE 5230 – Stem Cell and Tissue Engineering This course will introduce (1) basic concepts of tissue engineering, (2) scaffold materials and biotechnologies for tissue engineering, (3) basic concept of stem cells, (4) review of stem cell sources and related policies, (5) current progress in stem cell research, (6) application of stem cells in tissue engineering and regenerative medicine.
Credits: 3.0 **Lec-Rec-Lab:** (3-0-0)
Semesters Offered: Spring

BE 5250 - Biomedical Optics Light plays a significant role in modern clinical diagnostics and in the clinical treatment of disease. Examples include non-invasive surgery, optical biopsy, and cancer therapy. This course will focus on the study of how light propagates through biological tissue.
Credits: 3.0 **Lec-Rec-Lab:** (3-0-0)
Semesters Offered: Spring - Offered alternate years beginning with the 2014-2015 academic year.

Continued next page.

BE 5300 - Polymeric Biomaterials This course focuses on the use of polymeric materials in biomedical engineering. Topics will include synthesis and characterization of polymers, structure-properties relationships, degradation behavior, and biomedical applications for polymeric biomaterials.
Credits: 3.0 **Lec-Rec-Lab:** (3-0-0)
Semesters Offered: Spring - Offered alternate years beginning with the 2020-2021 academic year.

BE5410 – Medical Imaging This course covers the physical nature of the interactions between the waves and matter, especially the biological tissues, principle imaging modalities used in modern medicine and the common techniques used for the processing of the resulting images.
Credits: 3.0
Semesters Offered: Spring – Offered alternate years beginning with the 2018-2019 academic year.

BE 5412 – Theory of Medical Imaging This course is a one semester course on the theoretical aspects of medical imaging. Course consists of three main components:
1. Wave – matter interactions generating the signals for image formation, 2. Techniques for image construction, and 3. Mathematical techniques and computer algorithms for processing images.
Credits: 3.0
Semesters Offered: Spring – Offered alternate years beginning with the 2025-2026 academic year.

BE 5650 - Neural Basis of Rehab Engineering This course will cover the basic neuroscience topics underlying sensorimotor control will be introduced. Different types of neuromuscular disorders and current techniques used for diagnosis, assessment, and rehabilitation
interventions will be studied.
Credits: 3.0
Semesters Offered: Spring – Offered alternate years beginning with the 2021-2022 academic year.

BE5655 - Neural Prosthetic Systems This course will cover several systems that use electrical stimulation to restore normal function following injury or disease. The underlying biophysical basis and technology for the treatment, and the associated clinical applications and challenges will be studied. The systems to be covered include cochlear implants, spinal cord stimulation for pain relief, brain stimulation for movement disorders, and neuromuscular electrical stimulation for restoration of movement.
Credits: 3.0
Semesters Offered: Spring – Offered alternate years beginning with the 2022-2023 academic year.

BE 5900 – Biomedical Engineering Master's Topics Biomedical engineering courses will be offered as professional electives dependent upon the interest of the faculty.
Credits: variable to 6.0; May be repeated
Semesters Offered: Fall, Spring, Summer

Continued next page.

BE 6000 – Biomedical Engineering Doctoral Research Includes the study of an acceptable biomedical engineering problem and the preparation of a report or thesis.
Credits: variable to 12.0; May be repeated; Graded Pass/Fail Only
Semesters Offered: Fall, Spring, Summer

BE 6900 - Biomedical Engineering Doctoral Topics Biomedical engineering courses will be offered as professional electives dependent upon the interest of the faculty.
Credits: variable to 6.0; May be repeated
Semesters Offered: Fall, Spring, Summer

REQUIRED CORE COURSE: **MA 5701 - Statistical Methods** Introduction to design, conduct, and analysis of statistical studies, with an introduction to statistical computing and preparation of statistical reports. Topics include design, descriptive, and graphical methods, probability models, parameter estimation and hypothesis testing.
Credits: 3.0 **Lec-Rec-Lab:** (0-3-0)
Semesters Offered: Fall and Spring

REQUIRED CORE COURSES MUST HAVE A GRADE OF "B" OR BETTER. STUDENTS WILL BE REQUIRED TO RE-TAKE THE COURSE WITH GRADES LESS THAN "B".

These courses are offered spring semester by the department. If your faculty advisor has recommended you take courses that are 4000 level, you must see the staff in H-STEM Complex 339 for a waiver to take these courses.

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Instructions for changing your Advisor:

Before initiating the process to change your graduate advisor, please consider all the options listed on the Graduate School's website for ***how to address difficulties in the student-advisor relationship:***

Once you have decided to change your graduate advisor, you must follow the steps listed below.

1. Meet with your graduate program director to initiate the process to change advisor. If meeting with the graduate program director is not feasible or appropriate, meet with the Chair or School Dean of the department or school. If you are in a non-departmental program, you may meet with the Chair or School Dean of your administrative home department or school.
2. Discuss the following with the graduate program director (or Chair/School Dean) and, if appropriate, the current advisor:
   - Whether additional resources within or outside the department (such as the Ombuds office) could help resolve the situation.
   - The impact of the change of advisor on your time to complete the degree. Coursework, qualifying exam(s), and the research proposal examination are all factors that could be impacted with a change in advisor.
   - Your current and future funding.
   - Research already conducted. Whether this will be incorporated into the dissertation, thesis, or report, and if so, how.
   - Impact on immigration status (if any). Consult International Programs and Services (IPS), if necessary.
   - Complete the BME Change of Advisor form and record the agreement from the discussions in writing, including indications of agreement from all affected faculty advisors, and provide copies to the student, the graduate program director, and all affected faculty advisors.
3. File an updated *Advisor and Committee Recommendation Form* for approval by the Graduate School.
4. If the student and the graduate program director are unable to reach agreement on the advisor change, contact the assistant dean of the Graduate School to determine additional steps to resolve the situation.

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Michigan Technological University

Biomedical Engineering

Change of Advisor Form

I will be changing Advisors effective (date) _____

Student Name (printed):	Student Signature:	Date:
_____	_____	_____
Current Advisor (printed):	Current Advisor Signature:	Date:
_____	_____	_____
Future Advisor (printed):	Future Advisor Signature:	Date:
_____	_____	_____

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Transferring from Master's to PhD

At times, a student pursuing a master's degree in biomedical engineering decides that they would like to increase their scope to pursue a PhD. A discussion should be held with the student's advisor prior to form submission. The advisor will indicate if they feel the student is prepared for the PhD program or if they recommend further courses, research, or other, before applying to the PhD program. If it is determined that the advisor recommends the student move into the PhD program, the student need only to fill out the Acceptance Form: (This form is located on the Graduate School website, under - Forms - Current Students - Special Purpose Forms).

The form must be approved by the department chair or BME graduate program director, then submitted to the Graduate School. The Graduate School will return a signed form to the student, and graduate program assistant of the department.

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