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## **PURPOSE**

The purpose of the [Biomedical Engineering Graduate Student Handbook](#) is twofold: to amplify the [Graduate School Handbook \(GSH\)](#) published by the Graduate School of The Ohio State University, and to provide additional information regarding the programs and activities of the Department of Biomedical Engineering.

The [Graduate School Handbook \(GSH\)](#) provides critical information for all prospective and current graduate students at The Ohio State University and is available at the Graduate School website <https://gradsch.osu.edu/handbook>.

The material in this guide is prepared by the Biomedical Engineering Graduate Studies Committee (BMEGSC) and Graduate Program Coordinator to clarify Departmental policies. Where appropriate, it has been approved by the Departmental Faculty via the Biomedical Engineering Graduate Studies Committee (BMEGSC) and is subject to the interpretation of that committee.

Additional important university policies and dates can be found at [buckeyelink](#) including links to the Course Catalog, Schedule of Classes, and University Registrar websites.

It is the responsibility of all graduate students (including combined degree students) to know and follow all Graduate School and Biomedical Engineering policies. During this time of personal and professional growth, graduate students are expected to be self-motivated to fully utilize all resources available for success in Graduate School. It will require initiative and the ability to read carefully and proactively. As well, it will require the building of many different types of relationships with classroom peers, lab mates, professors, faculty advisors, faculty supervisors, and program staff.

Research toward MS and PhD degrees may be conducted in any of the research areas associated with our many [graduate faculty](#). Explore the BME website for a current list of graduate faculty and [research areas](#).

Interdisciplinary and inclusive collaboration is a hallmark of biomedical engineering. There will be differences among the policies and procedures set forth by different graduate programs and colleges: for example, differences may exist among recruitment, qualifying conditions, examinations, funding options, curriculum approval/protocol, and stipend ranges, etc. Please understand that much may vary among units while operating within parameters set forth by the Graduate School. The policies and practices described here have been carefully designed both to benefit and to be followed by all biomedical engineering graduate students.



*Professors Rich Hart (left) and Samir Ghadiali (middle) provide seamless leadership as past and present BME Department Chairs; Past BMES President, Dorma Flemister, thanks Prof. Hart for his service from 2006 – 2018.*



# Biomedical Engineering Graduate Student Handbook

rev Dec10; Jun12; Aug14; Aug15; Aug20

## SECTION 1:

### Graduate Program Advising & Governance

#### 1.1 Faculty Core Contacts & Performance Standards

When a student has been admitted to the Graduate Program in Biomedical Engineering, a student is assigned a "core BME faculty contact" from among the departmental faculty. This "core contact" is a BME faculty member who serves as an academic advisor, different from the staff person most students consulted in undergraduate years. A "core contact" may double as the student's research advisor. Core contacts provide in-depth course advice and referrals, or they may function as a sounding board, or to help a student brainstorm. They periodically may be asked by the BMEGSC to evaluate a student's academic performance to assess reasonable progress, though it is the student's responsibility to initiate contact and request feedback on goals and performance. Students are encouraged to make regular contact with these assigned faculty resources and are welcome to switch to another faculty member as stronger, more natural relationships develop over time.

#### EXTRA MENTORSHIP

Meeting regularly with your core contact is a built-in way to forge a significant relationship with a faculty member who is committed to helping and who is not necessarily supervising or involved in your research.

#### 1.2 Maintaining Satisfactory Academic Standing

To be in good academic standing in the Graduate School, a student must maintain a graduate cumulative point-hour ratio (CPHR) of 3.0 or higher in all graduate credit coursework and must maintain reasonable progress toward degree requirements. Achieving this requires open communication with research advisors; the establishment of clear expectations; and a necessary balance among research, coursework, and wellbeing.

Sources used to judge reasonable progress include:

1. Cumulative point-hour ratio
2. Research advisor's/core contact's recommendations
3. Thesis or dissertation committee members' recommendations
4. The PhD Student Annual Review form

A student's research advisor and/or core contact should apprise the BMEGSC of any student judged not to be making reasonable progress. If the BMEGSC concurs, the student will be notified of such in writing, with an explanation of the reasons for this judgment; actions that the student can take to remedy the situation; and a time limit for rectification. The time limit in most cases will be no less than two terms.

Failure to maintain reasonable progress will result in a recommendation to the Graduate School by the BMEGSC that the student be denied further registration in the program. *This type of break has been known to help students in academic trouble by providing a mandatory opportunity to prioritize wellness. A request to be re-instated can be made by the student at a future time, when the student is in a better position to succeed.*

A doctoral student who has had two unsatisfactory attempts at the Candidacy Examination or the Final Oral Examination or Professional Doctoral Examination is not considered to be in good academic standing and may be dismissed from the program per Graduate School rules.

### 1.3 Selecting a Research Advisor

Participating graduate faculty (many from outside departments and colleges) have diverse research interests and act as research advisors to graduate students, along with those who call Biomedical Engineering their home unit. While the student's assigned core contact fulfills a sort of "helper" role, the research advisor is the main advisor and mentor (and often also functions as Graduate Research Associate GRA supervisor). When a research advisor is new or from an outside unit, a student's core contact can be an invaluable resource for advice on BME culture and practices.

Research advisors and students will work together to define research projects and to develop the program of study and to form an advisory (i.e., examination) committee. For an MS student, the research advisor chairs the MS Examination Committee. For a PhD student, the research advisor chairs the Candidacy Examination Committee and the Final Oral Examination Committee.

Selecting a research advisor is one of the most important decisions students will make during the course of their graduate career. It is important that students take time when choosing their research advisors because they will be a key component in a student's success at the graduate level. It is important to be aware of a research advisor's working style. Talking with current students who work in faculty labs and asking questions about style, funding, and expectations can help new students make proper choices.

The research advisor of a master's student must hold membership at the **Category M** level or higher in Biomedical Engineering. The research advisor of a doctoral student must hold membership at the **Category P** level in Biomedical Engineering. Questions about graduate faculty status may be directed to the Graduate Studies Office.

*For details on [graduate faculty duties and responsibilities](#), see Section 12, GSH.*

Students are strongly encouraged to begin seeking an advisor and research project as soon as possible. Sometimes this automatically happens as a result of funding and project connections made early in the admission process. Others (e.g., fellowship recipients, etc.) may choose to do informal rotations in multiple faculty labs before identifying a research advisor. Regardless, students should select an advisor by the end of their second term of enrollment in the graduate program.

#### Q: How does a Faculty Member get Graduate Faculty Status?

If a faculty member with whom you seek to work does not have graduate faculty status, they can apply for it by writing a letter addressed to the BME Graduate Studies Chair along with a current CV, emailed to the Graduate Studies Coordinator for consideration at the next convened BMEGSC meeting. Letters should include a statement of the faculty member's goals in working with BME graduate students; ability to fund graduate students; and past graduate or engineering advising experience. Graduate Faculty requests are processed 2-3 times per year.

### 1.4 Student Responsibility

Students are responsible for developing programs of study and forming their necessary faculty committees, and for seeking input from faculty core contacts and research advisors. It is the responsibility of the student to enlist the participation of faculty on their committees and to consult with their faculty advisors on a regular basis. It is the graduate student's responsibility to know and follow all departmental and university procedures and deadlines and to submit all BMEGSC requests for approval in a timely fashion, anticipating delays during busier points in the academic year.

Interaction between students and their research advisors will vary. Some may have daily contact and others may consult weekly or even less frequently. To ensure that degree requirements will be met efficiently, remember to be proactive and see your research advisor and/or core contact regularly to:

- Discuss concerns, your research project, opportunities, and problems

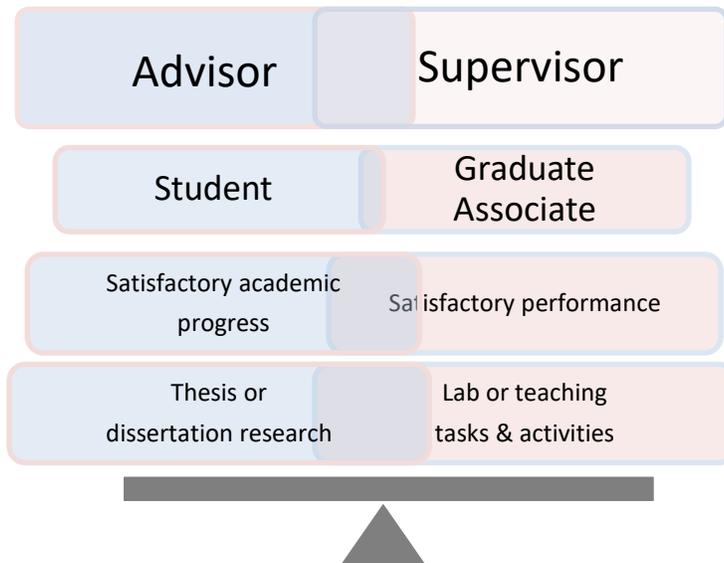
- Ask for help to determine your course schedule
- Get approval for projects
- Get ideas and coordinate plans to apply for external funding and fellowships
- Initiate the PhD Student Annual Review form and review with advisor/core contact (for PhDs only)

PhD Annual Review Forms are due to the Graduate Studies Office by May 31 each year. Students must complete them for review with their research advisor and/or core contact. All must sign to verify that a review has taken place. The purpose of this exercise is to provide an opportunity to reflect on progress, make changes, and set new goals.

For more information on [good standing and responsible student conduct](#), see Section 5, GSH.

Not all research advisors are GA supervisors, but often they are the same person. Below is a reminder of the different roles you and your faculty supervisor may hold.

## **Balancing Roles & Responsibilities**



### **1.5 Biomedical Engineering Graduate Studies Committee (BMEGSC)**

The graduate programs in Biomedical Engineering are administered and governed by the Biomedical Engineering Graduate Studies Committee (BMEGSC) under the guidance of the Graduate School and Faculty. They are the local body that reviews & approves academic and curricular matters at the Department level before we send them on to the Graduate School, the Office of Graduate Admissions, or the Registrar (i.e., the University level).

The BMEGSC must approve all admissions, funding arrangements, proposed programs of study and faculty composition and membership of all examination committees required by the Graduate School. They review faculty requests for “graduate faculty status” as well as anonymous program assessment information gathered via faculty and student surveys.

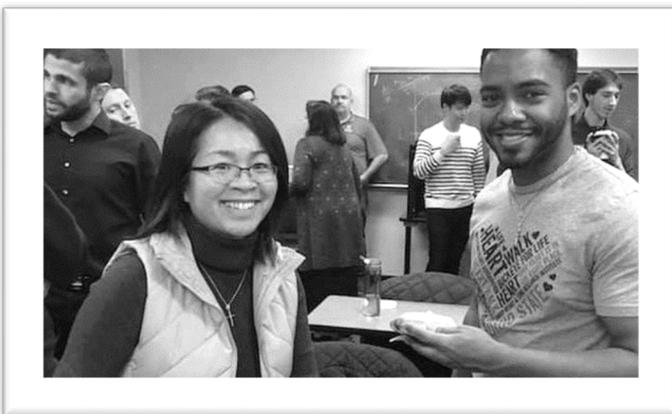
The 8-10 faculty members and Chair of this committee are appointed by the Department Chair from the departmental and participating graduate faculty in Biomedical Engineering. The membership includes the Graduate Program Coordinator and a student representative (an elected BMEGSA Officer) who along with the Graduate Coordinator acts as a liaison between the student body and the committee. The Chairperson of the BMEGSC authorizes the business of the committee, which meets regularly throughout the year to fulfill the responsibilities delegated to it by the Graduate School (see [Section 13](#), GSH). The Graduate Studies Coordinator assists the BMEGSC, graduate students, and tracks agenda items.

Students who have communicated with their core contacts and faculty advisors about problems may bring requests and concerns directly to the attention of the BMEGSC for their advice and consideration by a larger body. Requests about course waivers or substitutions must always be accompanied by a proposed program of study, along with the requisite syllabi. *For details on preparing the Program of Study, see section 3 of this Handbook.* Correspondence addressed to the “Chair of the BME Graduate Studies Committee” should be directed to the Graduate Studies Coordinator by email *at least one full week* in advance of any scheduled meeting. Meetings typically are held once monthly and business agendas fill quickly.

### **1.6 BMEGSC Seasonal Working Calendar: Autumn through Spring**

When submitting requests to the BMEGSC, students should be aware of the seasonal BMEGSC workload. The committee’s primary business typically falls as listed below.

- DEC-FEB: Review and make admission decisions on applications;
- JAN-MAR: Make funding connections, prepare fellowship nominations and events; Visit day
- MAR-MAY: Review student proposed programs of study and/or transfer requests;
- JUN-JULY: *No BMEGSC meetings; annual reviews; orientation; revisions*
- AUG-MAY: Evaluate individual requests for unplanned exceptions to program requirements, review graduate faculty status, manage graduate assessment, review curriculum, and much more.
- SEPT-NOV: Recruitment; GEOH; BMES; scheduling issues



*Graduate Studies Chair, Professor Jun Liu, with doctoral student and 2020-21 BMEGSA President, Jordan Moore.*

## WHERE TO FIND HELP IN BME: FIRST-LINE RESOURCES & CONTACTS FOR GRADUATE STUDENTS

*For general questions about the graduate program, courses, fellowship funding, advisors, how to file BMEGSC requests, transfers, curriculum requirements, registration and late add/drop policies, getting involved with BMEGSA, student organizations, graduate faculty status, and other university resources and wellness/support services:*

- Graduate Program Coordinator, Melanie Senitko – [senitko.1](#)
- [Graduate School Website](#)

*For content-specific course and program questions, forming a committee, learning more about labs, or proposing a research collaboration:*

- Core Contact, Research Advisor, or Graduate Studies Chair, Jun Liu – [liu.314](#)

*For general advice on local Columbus living, BME graduate student culture, finding research resources, and help navigating graduate school processes:*

- BMEGSA Officers, Current Students, or Graduate Program Coordinator, Melanie Senitko – [senitko.1](#)

*For questions about your BME GRA contract, your hiring paperwork, your employment benefits, how to order supplies, get a copy code, or other business-related matters:*

- Department Coordinator, Jada Harmon – [harmon.105](#)
- Department Business Manager, Kirsten Gibbons – [gibbons.40](#)
- If not hired thru BME, you must work with your GRA Supervisor's HR officer

*For keycard access to computer labs:*

- Building Coordinator, Ben Jones – [jones.182](#)

*For local computing, systems, or AV issues:*

- Systems Manager, Jerry Heskett – submit a [work ticket here](#)

## SECTION 2:

### Registration and Enrollment Basics

#### 2.1 Registration and Credit Hour Minima

Course registration is done online using [Buckeyelink](#). Each currently enrolled student will obtain a registration “window” from the [University Registrar](#). Students will schedule courses using the [Course Catalog](#) and [Schedule of Classes](#), as well as the semester [Biomedical Engineering course list](#) on the BME website. Students may take courses offered by all departments and may search their offerings also. All students must complete an initial schedule in advance of the term, meeting [Registrar deadlines](#) and [required Graduate School credit minima](#) in order to avoid late registration and payment fees or funding problems.

#### REQUIRED ENROLLMENT TOTALS:

**Fellows:** 12 credit hours per semester (6 in summer)

**Graduate Associates:** 8 credit hours per semester (4 in summer)

**Post-Candidates:** 3 credits per semester, continuously

**Self-funded Students:** 8 credit hours per semester unless otherwise stipulated by visa, financial aid, or loan providers

**Graduating Students:** 3 credit hours in graduating semester

**Typical Courseload for many MS or pre-candidacy PhD students:** 12-15 credit hours

Students signing up for BME 8193 (Individual Studies) and BME 8999 (Research) must obtain the required call numbers from the BME Graduate Studies Office in order to register each term. These numbers change each term. Students should discuss research hours, their schedule plans, and any schedule changes with their core contacts and research advisors each semester.

Students are responsible for learning all relevant dates (which dictate the types of schedule changes, adds, and drops permitted) as well as all necessary procedures and paperwork, as stipulated by the University Registrar. Students must follow their helpful [registration calendar](#) each semester. Failure to do so can cause expensive penalty fees.

#### 2.2 Registration Pre-requisites and Special Permissions

Students may make adjustments to their schedules electronically through the first Friday of the term. Note that some schedule adjustments (i.e., dropping credit hours) will require the addition of other courses in order to maintain the credit hour totals required for fulltime enrollment and funding. A best practice is to register for 15 or more credits total so that if you run into trouble and must drop courses past the course add deadline, you will not be in danger of dropping below the credit hour minima for your fellowship, GRA, etc.

Students attempting to add a course may receive error messages regarding pre-requisites. Sometimes a class is full; sometimes there is a slight time overlap between courses; sometimes the course is open only to majors. Whatever the reason, cases like this will result in error messages. In such cases, a student should do the following: 1) contact the instructor teaching the course; 2) obtain email approval from the instructor to add the desired course (“OK to add without pre-reqs” or “OK to add over the seat limit”); and 3) submit the email to the Graduate School or [senitko.1@osu.edu](mailto:senitko.1@osu.edu) in the BME Graduate Studies Office in accordance with the posted deadlines.

All of the following information **must** be included, with written instructor permission for any add request, and must be sent from a student’s official osu.edu email account:

- 1) course title and number
- 2) section call number – *most important*

- 3) instructor
- 4) credit hours

## FERPA – protect your rights by using your official buckeyemail.OSU.EDU email account

All requests made of Ohio State offices – should be made from the student’s **buckeyemail.osu.edu** account to help us ensure that your FERPA rights are being protected. Students should not email university offices from their gmail or other accounts. In the rare case that this must happen, it is important that a student include their NAME.#@buckeyemail.osu.edu address in the body of the message.

### 2.3 Continuous Registration for Post-Candidates

All PhD students who successfully complete the doctoral candidacy examination are required to be enrolled for at least 3 credits in every semester following (excluding summers) until graduation. This policy is effective for all students who were admitted to the Graduate School Autumn Quarter 2008 and after. *Harsh penalty fees for those who do not register continuously will be assessed.* Be sure to avoid problems post-candidacy by making sure to sign up for the proper number of credit hours (3) by the appropriate deadline.

### 2.4 Registration Maximum

The maximum number of hours permitted by the Registrar’s Office is 18 credit hours per semester. Enrollment greater than 18 credits must be approved by the student’s research advisor and the Graduate School.

### 2.5 Courses that Count for Graduate Credit

Courses that count for graduate credit must be 5000-level and above. In Biomedical Engineering, courses were designed to meet the needs of advanced undergraduates as well as graduate students; therefore, we list many at 5000-level. Many graduate programs feature graduate courses in the 6000-, 7000-, and 8000-levels. All of these are appropriate on a Biomedical Engineering graduate program of study, pending research advisor and BMEGSC-approval.

### 2.6 Defining and Planning the Distribution of BME Research Credits

The number of research credits (BME 8999) that can be taken after Candidacy is usually limited to 3 credit-hours each semester. Students will want to plan ahead and maximize the number of BME research credits taken before Candidacy, to avoid being forced to take extra time to fulfill total program credit requirements. Note that all credits taken above 8 in a given semester are the same cost. Also, all research credits should be taken under a BME course section unless the primary research advisor’s appointment is in another engineering department. If the latter is true, then at least ½ of the research credits must be taken in BME.

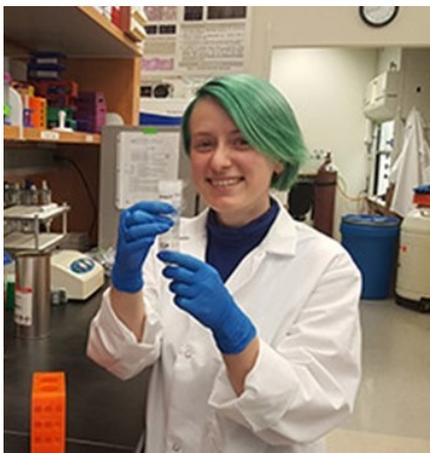
A handy rule of thumb for scheduling research credits is to allow for 3 outside hours of work weekly for each single credit scheduled. That means if you take 4 BME research credits, you may be putting in roughly 12 hours of effort per week on research. However, expectations shared between research advisor and student are most important and take precedence over this equation. Some advisors may wish their students to take as many research credits as possible in the first few semesters; this is OK as long as both advisor and student have a clear understanding of the student’s required course load and obligation to maintain a strong GPA.

After candidacy, when PhD students are expected to take only 3 credits per semester, the time spent on dissertation research-related work actually will be much greater than 9 hours per week. For this reason, it is helpful to think of research hours and expectations of effort as a multi-year combination of “best practices” and a “work ethic” agreed upon by faculty and student. The whole of a student’s efforts will combine over all of the semesters enrolled to amount to *at least* 45 credits of research-related progress. For most, research goals naturally will take priority over credits and will be the guiding principal. PhD students will have a chance to get and give feedback on progress and expectations by completing a required annual review with their research advisors.

## RESEARCH CREDITS, GRA DUTIES & RESEARCH GOALS: SEPARATE BUT RELATED

The academic efforts of a graduate student described above may *or may not* overlap with the responsibilities and duties of a Graduate Research Associateship (GRA) appointment. The requirements of a GRA appointment are contingent on satisfactory performance of a student's degree-related pursuits. However, GRA responsibilities may or may not be related to the student's thesis or dissertation. (This often is why one student's perceived commitments or time spent in the lab may look different than another's.) For a GRA appointment, the student receives tuition coverage and a stipend, and is required to do 20 hours per week of activities and tasks related to the appointment. The student develops technical skills and other professional skills holding this associateship.

The student's performance in a GRA role is evaluated annually by the research supervisor in a separate HR-initiated review. For more information on [GRA and GTA appointments](#), see sections 9 and 11, GSH.



*Caitlin Jones, doctoral student and GRA in the Leight Lab, took top prize in the 2020 Hayes Graduate Research Forum and now holds a postdoctoral position at Nationwide Childrens Hospital.*

## SECTION 3:

### Programs of Study: How to Create an MS or PhD Program of Study and Get it Approved by the BMEGSC

#### 3.1 Program of Study

In consultation with their research advisor (and with input as needed from the core contact), a proposed MS or PhD graduate Program of Study (i.e., course plan) is required to be submitted to the BMEGSC for approval before the end of the second Autumn semester.

The selection of courses is individually tailored to the student's background, interests, and research and is organized by four basic areas: Required Courses; Fundamental Courses; Electives; and Research. The distribution of engineering and life science courses must be appropriate for each individual student's program, as determined by the advisor, in accordance with [BME curriculum requirements](#).

Curriculum requirements for the MS and PhD programs can be found in sections 4, 6, and 8 of this Handbook, along with some sample program “skeletons”.

Customizable templates exist for the purpose of formatting proposed Programs of Study: to help organize the courses in order to more easily determine whether or not all requirements have been met. They are available here in the appendices and on the [BME website](#).

The BMEGSC may accept any or all of the 30 semester credit hours from an earned MS degree (or from prior MS/PhD work) toward the PhD degree course requirements on the recommendation of the student's advisor. However, the fit of the transferred courses into the program template is more important than the number of credit hours. Generally, students will not use all transferred credits toward the program of study even if they are accepted to appear on the student's transcript.

The Program of Study must include a brief cover letter and must be signed by the student's advisor and examination committee members before the student submits it to the BME Graduate Studies Coordinator (by email to senitko.1) for review and approval by the BMEGSC.

- **MS Examination Committees** require 2 faculty.
- **PhD Examination (Candidacy) Committees** require 4 faculty.

For detailed *information* on MS (thesis) and PhD (candidacy and dissertation) committees, see sections 5, 7, and 9 of this handbook and sections 6 and 7 of the GSH.

Individualized study courses (e.g., BME 8193) can be taken with a faculty member for course credit on any topic not covered by an offered course in adequate depth. With documentation (i.e., a syllabus) students may request that these be used in programs of study as electives, with BMEGSC approval.

In developing and approving student programs of study, the BMEGSC will recognize and respond to the needs of students with physical and/or learning disabilities.

Students entering the PhD program from the MS program should submit their proposed program of study to the BMEGSC when requesting admission to the PhD.

Once a Program of Study is approved, any changes in courses, advisors, or examination committee membership must again be requested of the BMEGSC **at least one term in advance of the intended examination or term of graduation**.

After a Program of Study approval, transferring external credits to Ohio State is a one-step process requiring completion of a [transfer request form](#) on the [gradforms.osu.edu](http://gradforms.osu.edu) system. This form should not be completed until the student has consulted with the BME Graduate Program Coordinator. Students may email the form along with an official transcript **with official degree statement** to the BME Graduate Studies Coordinator for review. Once approved it will be forwarded to the Graduate School for final approval and processing.

### 3.2 BMEGSC Petitions and Special Requests

If a student wishes to request a course substitution or exception to the rules, special requests will be considered by the BMEGSC. Students should petition for these changes in the program of study cover letter (or in a separate letter if requested after the original program approval) with a signature of support from the student's advisor. If the request refers to external courses, course descriptions and/or syllabi must be included.

### 3.3 Steps to Submit a Program of Study for Approval

1. The student must complete the template, filling it in with all planned courses and research credits required to meet the degree requirements.
2. If transfer courses or exceptions are requested, syllabi must be attached.
3. The student must get the approval of the advisor, as well as the MS or candidacy committee, who must sign the program or send an email of approval. It is the student's responsibility to gather and compile all approvals for inclusion with the packet.
4. The student must submit by email to [senitko.1@osu.edu](mailto:senitko.1@osu.edu) the advisor-approved program of study template accompanied by a cover letter asking for 1) approval of the program as submitted; 2) approval of any exceptions or substitutions, explaining where they should fit into the program; and 3) approval for the MS or candidacy committee.

The Graduate Program Coordinator will add the request to the next BMEGSC meeting agenda. Depending on the time of year and the fullness of the monthly agenda, requests may be bumped to the next monthly meeting for consideration.

#### Q: Can BMEGSC “just do stuff real quick” anytime?

The BMEGSC meets roughly once per month in AU and SP semesters only. They sometimes do work outside of meetings if they learn that a student is in trouble or need, but many decisions require faculty discussion and can be made only at meetings. They are a governing body and should be addressed formally in writing. BMEGSC policy is NOT to review any program requests in the same term as candidacy or graduation. If you wait too long to get requests approved, you could inadvertently cause yourself trouble and delay.

The BMEGSC tries to be flexible and make as many exceptions as possible. They know everybody needs to make an urgent request sometimes. However, last-minute urgent requests can pile up and place delays on the business of students who submitted their material on time. As with anything, this ends up being least fair to those who are meeting the deadlines and patiently waiting their turn. The most important reason to get your program done early is so you don't end up having to take additional unexpected coursework later.

## SECTION 4:

### BME Thesis-MS Curriculum Requirements

Approved, revised by faculty Winter 2012; updated Summer 2020

A BMEGSC-approved Program of Study and MS Committee must be on file with the BME Graduate Studies Office before the end of second Autumn term (or the student's third term of enrollment). The program cannot be reviewed by BMEGSC without the approval of a proposed MS Committee. The MS Committee will consist of at least 2 faculty members: the faculty research advisor and one additional faculty member, with M or P graduate faculty status (at least one being departmental BME faculty).

#### BME CORE COURSES

##### Required of all MS students – 10-11 crs

|                                    |                           |     |
|------------------------------------|---------------------------|-----|
| BME 6000                           | Scientific Methods in BME | 1   |
| BME 8810-8811                      | BME Seminar (2 semesters) | 1   |
| ChBE 5779 or ISE 5110 or STAT 6410 | Graduate Research Design  | 3-4 |
| BME 6983                           | Graduate Research Ethics  | 2   |
| PhysioCB 6101 or 6102              | Graduate Physiology       | 3   |

##### BME FUNDAMENTALS – 9 crs

Students are required to take **3 fundamental BME graduate courses** from the following list, or subject to BMEGSC approval, *students must take at least 2 OSU BME fundamental courses and may take up to 2 non-BME, BME-type OSU courses, and no more than 1 non-OSU BME course, by petition.* Students must work with their faculty MS research advisor to determine the best courses that will prepare them for their MS research. The MS research advisor must approve courses used to satisfy this requirement. If the MS research advisor does not approve, he/she will not sign the student's program of study.

|          |                                    |   |
|----------|------------------------------------|---|
| BME 5001 | Cardiovascular Bioengineering      | 3 |
| BME 5110 | Biomedical Microscopic Imaging     | 3 |
| BME 5120 | Biomedical Optics                  | 3 |
| BME 5170 | Fundamentals of Biomedical Imaging | 3 |
| BME 5177 | Biomedical AFM                     | 3 |
| BME 5186 | Biomedical Ultrasound              | 3 |
| BME 6113 | Magnetic Res Spectro & Imaging I   | 3 |
| BME 7114 | Magnetic Res Spectro & Imaging II  | 3 |
| BME 5310 | Advanced Biomaterials              | 3 |
| BME 5353 | Hard-Tissue Biomaterials           | 3 |
| BME 5420 | Mechanobiology                     | 3 |
| BME 5421 | Tissue Mechanics                   | 3 |
| BME 5430 | Finite Element Applications in BME | 3 |
| BME 5470 | Cell & Tissue Mechanics            | 3 |
| BME 5510 | Advanced Tissue Engineering        | 3 |
| BME 5550 | Engineering Principles in Cancer   | 3 |
| BME 5560 | Biomedical Apps in Cancer Biology  | 3 |
| BME 5580 | Excitable Cell Engineering         | 3 |
| BME 5610 | Biomedical Microdevices            | 3 |
| BME 5635 | Cellular Nanotechnology            | 3 |
| BME 5639 | Medical Device Design              | 3 |
| BME 5661 | Biomedical Nanotechnology I        | 3 |

|             |  |   |
|-------------|--|---|
| BME 5663    | Intro to Microfluidics and Nanofluidics    | 3 |
| BME 5667    | BioMEMS Microfabrication                   | 3 |
| BME 5668    | Biomedical Microtransducers                | 3 |
| HTRHSC 7410 | Adv Structure & Function of the Human Body | 5 |

**GRADUATE ELECTIVES & FREE ELECTIVES – 6 crs**

1. Students must take at least one **graduate elective** course (3 credit hours) from the appendix or subject to BMEGSC approval by petition. All graduate electives must be letter graded. *Note that any course used to satisfy a **fundamental** requirement above cannot be used to satisfy the **graduate elective** requirement.* All graduate electives must be approved by the student’s MS research advisor as indicated by the MS advisor’s signature on the student’s program of study.
2. Students must take at least one **free elective** course (3 credit hours). Free electives can be in Engineering Sciences, Life Sciences, Teaching, Business/Technology Commercialization, etc. No more than 1 free elective can be S/U graded. All free electives must be approved by the student’s MS research advisor as indicated by the MS advisor’s signature on the student’s program of study.
3. Elective Restrictions: 3 of the 6 credits used to satisfy requirements #1 and #2 (i.e. graduate and free electives) must be an advanced graduate-level math or BMEGSC-approved, strongly quantitative course. With advisor permission, students may petition the BMEGSC to request that a non-Math course be approved satisfy this requirement (e.g., BME 5580, etc.).

**Total Program of Study Requirements = 31 credits**

Total courses: **25 credits**

Total research credit hours (8999): **≥6 credits**

**Minimum Graduation Requirements**

- Completion of ≥25 BMEGSC-approved course hours as described above with a minimum GPA of 3.00
- Completion of ≥6 research hours of thesis research (must be taken under BME advisor section of BME 8999)
- Submission of one (1) manuscript for publication in recognized scientific journals (e.g. indexed by ISI) OR presentation of at least one (1) oral or poster presentation at a regional, national, or international meeting
- Successful completion of the Thesis Defense & Thesis per Graduate School Handbook

*SAMPLE Thesis-MS program: may be compacted or expanded over two full years*

| YEAR | FALL  | SPRING  | SUMMER  |
|------|---|---|---|
| 1    | Sci Methods BME.....1<br>Research Ethics .....2<br>BME Seminar .....0<br>Physiology.....3<br>Research Design .....3<br>Research Hours.....3<br>TOTAL = 12 | BME Fundamental #1 ..... 3<br>BME Fundamental #2..... 3<br>Grad Elective ..... 3<br>BME Seminar ..... 1<br>Free Elective ..... 3<br><br>TOTAL =13 | <i>Research..... 3</i><br><br><i>OR</i><br><br><i>No enrollment</i><br><br><i>TOTAL = 0-3</i> |
|      | BME Fundamental #3 .....3<br>Research .....3<br>Thesis Defense<br>TOTAL = 6   |   |   |

## SECTION 5:

### Thesis-MS Committee and Examinations

#### 5.1 MS Examination Committee Formation and Approval

The MS examination committee will consist of the research advisor and one other faculty member. Of these 2 faculty members, both of whom must have M or P graduate faculty status, at least one must be a BME departmental faculty member. The composition of the MS Examination Committee must be approved by the BMEGSC when the completed MS program of study template is submitted. Faculty signatures imply both approval of the program and membership on the student's advisory/examination committee. The approved program and committee must be on file with the Graduate Studies Office before the end of the second Autumn semester (or the student's third term of enrollment).

Students typically consult their main research advisor -- and sometimes the faculty core contact -- for help selecting the second MS committee member. Approval of the MS committee must be requested in the cover letter attached to the proposed program of study. Students should be sure to work closely with their MS committee to ensure satisfactory and efficient progress on research toward the thesis.

#### 5.2 Thesis MS Examination and Defense Process

Once all courses on the program study and all thesis research are completed, an oral examination (i.e., thesis defense) must be passed before obtaining the MS degree. It must be given by at least two graduate faculty (i.e., the MS Examination Committee). The oral examination may be scheduled in BME or elsewhere on campus.

The Master's examination emphasizes both the thesis investigation and a test of the student's knowledge of the course of study pursued. The thesis must be completed in accordance with [Graduate School regulations](#) and must comply with the [deadlines](#) published by the Graduate School at the beginning of each term. The examination should not exceed two hours. Only examination committee members may be present during a BME Masters examination; however, students and faculty may attend any presentations given before the exam begins.

Early in the term in which a student and advisor anticipate completing and defending the MS thesis, the student must complete an Application to Graduate on the Graduate School's [gradforms.osu.edu](http://gradforms.osu.edu) website.

It is up to the student to arrange a date and time with advisors to hold the thesis defense (i.e., Master's Examination). When the date and time are arranged, it is necessary for the student to notify the BME Graduate Studies Office.

The MS committee's decision on the Master's examination is recorded by the faculty committee members on the Master's Examination Report form via [gradforms.osu.edu](http://gradforms.osu.edu), and acceptance of the thesis is indicated there also on the Thesis Approval form. These forms are generated by the Graduate School as a result of the application to graduate, and links are emailed directly to MS advisors at their [osu.edu](http://osu.edu) email addresses.

Forms must be approved by all committee members online after the examination, and submitted to the Graduate School. A student must be registered for at least three graduate credit hours during the term the Master's Examination is held.

For information on [teleconferencing](#) the MS exam in the event that a committee member may need to participate while off-site or [petitioning to include an extra or non-voting, non-OSU committee member](#), please see the GSH and [gradforms.osu.edu](http://gradforms.osu.edu). (Under normal circumstances, a teleconferenced exam would require a petition; current circumstances require all exams to be teleconferenced via Zoom so no petitions are required unless for external members.)

#### 5.3 Thesis Guidelines

The thesis research project should be an original research project that makes a new contribution to the field. Proposals and protocols should be approved by the student's advisor(s) prior to beginning the research. The thesis must be completed in accordance with Graduate School [policies](#) and must comply with the [deadlines](#) published by the Graduate School at the

beginning of each term. Students may reach out to their lab mates, peers from BMEGSA and/or student mentors for advice on completing the thesis.

Students are encouraged to read the Graduate School Newsletter for leads on Graduate School and [Writing Center](#) workshops on formatting and thesis creation or to schedule a review at the Graduate School ([Graduation Services](#) area) to learn about formatting and electronic document submission. Detailed information on the required format of the thesis may be found at [here](#).

#### 5.4 Graduation for Thesis MS Students

In order to graduate with a Master of Science (MS) degree, students must meet all requirements established by the BME department and the [University](#).

An Application to Graduate must be filed on [gradforms.osu.edu](http://gradforms.osu.edu) no later than the first day of the term in which a student intends to graduate to allow time for a BME graduation audit and approval by the Advisor and Graduate Studies Committee Chair. Graduating students must be enrolled for at least 3 credit hours in the term of graduation. The Graduate School's graduation checklist for MS students in their final term of enrollment can be found [here](#).

If requirements go unmet or exam or thesis deadlines are missed, students may be able to meet the Graduate School's [end-of-semester deadlines](#) without having to register the following term. If the E-O-S deadlines are missed, it will be necessary to resubmit a new Application to Graduate the following term.

### DEGREE COMPLETION REMINDERS FOR THESIS MS

- Students & advisors may jointly petition the BMEGSC for waivers of program or committee requirements. These should be accompanied by a proposed or approved program of study whenever possible.
- Petitions should be submitted in the form of a brief letter addressed to the BMEGSC and sent to [senitko.1@osu.edu](mailto:senitko.1@osu.edu) and will be considered at convened monthly BMEGSC meetings. *Last-minute petitions may not be reviewed.*
- Changes to an approved Program or Committee must be reviewed by the BMEGSC at least **one full semester** before an Application to Graduate is filed.
- Applications to Graduate will not be approved unless the student's final BMEGSC-approved Program and Committees are on file in the Graduate Office and most other graduation requirements, as stated in the GSH and BMEH, are met.
- Applications to Graduate should be submitted via [gradforms.osu.edu](http://gradforms.osu.edu) at least **one full week** in advance of the Graduate School deadline. No forms will be signed by the Chair of the Graduate Studies Committee until a graduation audit has been completed by the BME graduate studies office.
- Remember that all degree requirements must be met and completed by the [graduation deadlines](#) posted by the Graduate School.
- Be sure to build in time for a Graduate School review of the formatting of your thesis draft.
- Review your advising report each semester and contact your faculty about missing/outstanding grades.
- Publication and presentation lists should be emailed to the Graduate Studies Coordinator at [senitko.1@osu.edu](mailto:senitko.1@osu.edu) before the end of the semester in which you plan to graduate.

## SECTION 6:

### BME Non-Thesis-MS Curriculum Requirements

Approved, revised by faculty Winter 2012; updated Summer 2020

A BMEGSC-approved Program of Study and MS Committee must be on file with the BME Graduate Studies Office before the end of second Autumn term (or the student's third term of enrollment). The program cannot be reviewed by BMEGSC without the approval of a proposed MS Committee. The MS Committee will consist of at least 2 faculty members: a primary faculty advisor and one additional faculty member, with M or P graduate faculty status (at least one being a departmental BME faculty member). For non-thesis MS students, the Graduate Studies Chair often functions as the primary faculty advisor. For tips on customizing the non-thesis MS with an emphasis on device design and commercialization, please contact the Graduate Studies Coordinator at [senitko.1@osu.edu](mailto:senitko.1@osu.edu)

#### BME CORE COURSES

##### Required of all MS students – 10-11 crs

|                                    |                           |     |
|------------------------------------|---------------------------|-----|
| BME 6000                           | Scientific Methods in BME | 1   |
| BME 8810-8811                      | BME Seminar (2 semesters) | 1   |
| ChBE 5779 or ISE 5110 or STAT 6410 | Graduate Research Design  | 3-4 |
| BME 6983                           | Graduate Research Ethics  | 2   |
| PhysioCB 6101 or 6102              | Graduate Physiology       | 3   |

#### BME FUNDAMENTALS – 12 crs

Students are required to take 4 **fundamental BME graduate courses** from the following list, or subject to BMEGSC approval, *students must take at least 2 OSU BME fundamental courses and may take up to 2 non-BME, BME-type OSU courses, and no more than 1 non-OSU BME course, by petition.* Students must work with their faculty MS research advisor to determine the best courses that will prepare them for their MS research. The MS research advisor must approve courses used to satisfy this requirement. If the MS research advisor does not approve, he/she will not sign the student's program of study.

|          |                                    |   |
|----------|------------------------------------|---|
| BME 5001 | Cardiovascular Bioengineering      | 3 |
| BME 5110 | Biomedical Microscopic Imaging     | 3 |
| BME 5120 | Biomedical Optics                  | 3 |
| BME 5170 | Fundamentals of Biomedical Imaging | 3 |
| BME 5177 | Biomedical AFM                     | 3 |
| BME 5186 | Biomedical Ultrasound              | 3 |
| BME 6113 | Magnetic Res Spectro & Imaging I   | 3 |
| BME 7114 | Magnetic Res Spectro & Imaging II  | 3 |
| BME 5310 | Advanced Biomaterials              | 3 |
| BME 5353 | Hard-Tissue Biomaterials           | 3 |
| BME 5420 | Mechanobiology                     | 3 |
| BME 5421 | Tissue Mechanics                   | 3 |
| BME 5430 | Finite Element Applications in BME | 3 |
| BME 5470 | Cell & Tissue Mechanics            | 3 |
| BME 5510 | Advanced Tissue Engineering        | 3 |
| BME 5550 | Engineering Principles in Cancer   | 3 |
| BME 5560 | Biomedical Apps in Cancer Biology  | 3 |
| BME 5580 | Excitable Cell Engineering         | 3 |

|              |  |   |
|--------------|--|---|
| BME 5610     | Biomedical Microdevices                    | 3 |
| BME 5635     | Cellular Nanotechnology                    | 3 |
| BME 5639     | Medical Device Design                      | 3 |
| BME 5661     | Biomedical Nanotechnology I                | 3 |
| BME 5663     | Intro to Microfluidics and Nanofluidics    | 3 |
| BME 5667     | BioMEMS Microfabrication                   | 3 |
| BME 5668     | Biomedical Microtransducers                | 3 |
| HTHRHSC 7410 | Adv Structure & Function of the Human Body | 5 |

### GRADUATE ELECTIVES & FREE ELECTIVES – 9 crs

1. Students must take at least two **graduate elective** courses (6 credit hours) from the appendix or subject to BMEGSC approval by petition. All graduate electives must be letter graded. *Note that any course used to satisfy a **fundamental** requirement above cannot be used to satisfy the **graduate elective** requirement.* All graduate electives must be approved by the student’s MS research advisor as indicated by the MS advisor’s signature on the student’s program of study.

2. Students must take at least one **free elective** course (3 credit hours). Free electives can be in Engineering Sciences, Life Sciences, Teaching, Business/Technology Commercialization, etc. No more than 1 free elective can be S/U graded. All free electives must be approved by the student’s MS research advisor as indicated by the MS advisor’s signature on the student’s program of study.

3. Elective Restrictions: A.) 3 of the 9 credits used to satisfy requirements #1 and #2 (i.e. graduate and free electives) must be an advanced **graduate-level math** or a BMEGSC-approved, strongly quantitative course. With advisor permission, students may petition the BMEGSC to have a non-Math course satisfy this requirement (e.g., BME 5580, etc.). B.) 3 of the 9 credits used to satisfy requirements #1 and #2 (i.e. graduate and free electives) must be in the **Engineering Sciences** as approved by the MS research advisor.

### Total Program of Study Requirements = 31 credits

Total courses: **31 credits**

### Minimum Graduation Requirements

- Completion of ≥31 BMEGSC-approved course hours as described above with a minimum GPA of 3.00
- Successful completion of the non-thesis final project document and MS Exam Form, approved via gradforms.osu.edu by the non-thesis MS faculty advisor and MS committee member

*SAMPLE Non-thesis MS program: may be compacted or expanded over two full years*

| YEAR | FALL  | SPRING  | SUMMER               |
|------|---|---|----------------------|
| 1    | Sci Methods BME.....1<br>Research Ethics .....2<br>BME Seminar .....0<br>Physiology.....3<br>BME Fundamental #1 .....3<br>TOTAL = 9 | BME Fundamental #2 ..... 3<br>BME Fundamental #3..... 3<br>Grad Elective ..... 3<br>BME Seminar ..... 1<br>Free Elective ..... 3<br>TOTAL =13 | <i>No enrollment</i> |
| 2    | BME Fundamental #4 .....3<br>Grad Elective #2.....3<br>Research Design.....3<br>TOTAL = 9   |   |                      |

## SECTION 7:

### Non-Thesis MS Committees and Culminating Experience

#### 7.1 MS Examination Committee Formation and Approval

The MS examination committee will consist of the research advisor and one other faculty member. For non-thesis MS students, the main advisor often is the Graduate Studies Chair, and the second committee member may be someone whose lab the student is observing. Of these 2 faculty members, both of whom must have M or P graduate faculty status, at least one must be a BME departmental faculty member. The composition of the MS Examination Committee must be approved by the BMEGSC when the completed MS program of study template is submitted. Faculty signatures imply both approval of the program and membership on the student's advisory/examination committee. The approved program and committee must be on file with the Graduate Studies Office before the end of the second Autumn semester (or the student's third term of enrollment).

Approval of the MS committee must be requested in the cover letter attached to the proposed program of study. Students should be sure to work closely with their MS committee to ensure satisfactory and efficient progress on research toward the thesis.

#### 7.2 Non-thesis MS Culminating Experience

In addition to completion of all courses on the approved program of study, a non-thesis Master's student will be required to arrange and complete a 12-hour culminating experience involving the application of biomedical engineering. This could involve an internship or practicum in an industrial setting; a mentored patient-contact experience; a community service experience; research rotations, or some similar experience. The objective of this experience should be to experience BME "in situ".

Following the completion of this culminating experience, a written Master's Exam consisting of a 1000-1500 word written document explaining the experience and its relevance to the field must be submitted to the MS committee members. An oral presentation or meeting discussing the experience may also be included at the discretion of the advisor, but it is not required.

This experience and written project/Master's Exam must be coordinated and completed by the student in accordance with published Graduate School Master's Exam [deadlines](#). This means the written project will be submitted by the student and reviewed by the MS committee with enough time for the committee members to submit their approval of it (via the MS Examination link emailed to them by the Graduate School) by the published MS Exam deadline. The written project will not be submitted to the Graduate School.

Students may reach out to their lab mates, peers from BMEGSA and/or student mentors for advice on completing the culminating experience, but requirements and timing to meet the Graduate School deadline will be determined by the MS advisor and committee member.

#### 7.3 Graduation for Non-Thesis MS Students

In order to graduate with a Master of Science (MS) degree, students must meet all requirements established by the BME department and the [Graduate School](#).

An Application to Graduate must be filed no later than the first day of the term in which a student intends to graduate to allow time for a BME graduation audit and approval by the Advisor and Graduate Studies Committee Chair. Graduating students must be enrolled for at least 3 credit hours in the term of graduation. The Graduate School's graduation checklist for MS students in their final term of enrollment can be found [here](#).

If requirements go unmet or the MS exam deadline is missed, students may be able to meet the Graduate School's [end-of-semester deadlines](#) without having to register the following term. If the E-O-S deadlines are missed, it will be necessary to resubmit a new Application to Graduate the following term.

## DEGREE COMPLETION REMINDERS FOR NON-THESIS MS

- Students & advisors may jointly petition the BMEGSC for waivers of program or committee requirements. These should be accompanied by a proposed or approved program of study whenever possible.
- Petitions should be submitted in the form of a brief letter addressed to the BMEGSC and sent to [senitko.1@osu.edu](mailto:senitko.1@osu.edu) and will be considered at convened monthly BMEGSC meetings. *Last-minute petitions may not be reviewed.*
- Changes to an approved Program or Committee must be reviewed by the BMEGSC at least **one full semester** before an Application to Graduate is filed.
- Applications to Graduate will not be approved unless the student's final BMEGSC-approved Program and Committees are on file in the Graduate Office and most other graduation requirements, as stated in the GSH and BMEH, are met.
- Applications to Graduate should be submitted via [gradforms.osu.edu](http://gradforms.osu.edu) at least **one full week** in advance of the Graduate School deadline. No forms will be signed by the Chair of the Graduate Studies Committee until a graduation audit has been completed by the BME graduate studies office.
- Remember that all degree requirements must be met and completed by the [graduation deadlines](#) posted by the Graduate School.
- Review your advising report each semester and contact your faculty about missing/outstanding grades.

## SECTION 8:

### BME PhD Curriculum Requirements

Approved, revised by faculty Winter 2012; updated Summer 2020

A BMEGSC-approved Program of Study and Candidacy Committee must be on file with the BME Graduate Studies Office before the end of second Autumn term (or the student's third term of enrollment). The program cannot be reviewed by BMEGSC without the approval of a proposed Candidacy Committee. The Candidacy Committee will consist of at least 4 faculty members: the faculty research advisor, with P graduate faculty status, and 3 additional faculty members, with M or P (at least one being a departmental BME faculty member).

### BME CORE COURSES

#### Required of all PhD students – 11-12 crs

|                                    |                           |     |
|------------------------------------|---------------------------|-----|
| BME 6000                           | Scientific Methods in BME | 1   |
| BME 8810-8813                      | BME Seminar (4 semesters) | 2   |
| ChBE 5779 or ISE 5110 or STAT 6410 | Graduate Research Design  | 3-4 |
| BME 6983                           | Graduate Research Ethics  | 2   |
| PhysioCB 6101 or 6102              | Graduate Physiology       | 3   |

### BME FUNDAMENTALS – 12 crs

Students are required to take 4 **fundamental BME graduate courses** from the following list, or subject to BMEGSC approval, *students must take at least 2 OSU BME fundamental courses and may take up to 2 non-BME, BME-type OSU courses, and no more than 1 non-OSU BME course, by petition.* Students must work with their faculty PhD research advisor to determine the best courses that will prepare them for their PhD research. The PhD research advisor must approve courses used to satisfy this requirement. If the PhD research advisor does not approve, he/she will not sign the student's program of study.

|          |   |   |
|----------|---|---|
| BME 5001 | Cardiovascular Bioengineering           | 3 |
| BME 5110 | Biomedical Microscopic Imaging          | 3 |
| BME 5120 | Biomedical Optics                       | 3 |
| BME 5170 | Fundamentals of Biomedical Imaging      | 3 |
| BME 5177 | Biomedical AFM                          | 3 |
| BME 5186 | Biomedical Ultrasound                   | 3 |
| BME 6113 | Magnetic Res Spectro & Imaging I        | 3 |
| BME 7114 | Magnetic Res Spectro & Imaging II       | 3 |
| BME 5310 | Advanced Biomaterials                   | 3 |
| BME 5353 | Hard-Tissue Biomaterials                | 3 |
| BME 5420 | Mechanobiology                          | 3 |
| BME 5421 | Tissue Mechanics                        | 3 |
| BME 5430 | Finite Element Applications in BME      | 3 |
| BME 5470 | Cell & Tissue Mechanics                 | 3 |
| BME 5510 | Advanced Tissue Engineering             | 3 |
| BME 5550 | Engineering Principles in Cancer        | 3 |
| BME 5560 | Biomedical Apps in Cancer Biology       | 3 |
| BME 5580 | Excitable Cell Engineering              | 3 |
| BME 5610 | Biomedical Microdevices                 | 3 |
| BME 5635 | Cellular Nanotechnology                 | 3 |
| BME 5639 | Medical Device Design                   | 3 |
| BME 5661 | Biomedical Nanotechnology I             | 3 |
| BME 5663 | Intro to Microfluidics and Nanofluidics | 3 |

|             |  |   |
|-------------|--|---|
| BME 5667    | BioMEMS Microfabrication                   | 3 |
| BME 5668    | Biomedical Microtransducers                | 3 |
| HTHRHS 7410 | Adv Structure & Function of the Human Body | 5 |

**GRADUATE ELECTIVES & FREE ELECTIVES – 12 crs**

1. Students must take at least two **graduate elective** courses (6 credit hours) from the appendix or subject to BMEGSC approval by petition. All graduate electives must be letter graded. *Note that any course used to satisfy a **fundamental** requirement above cannot be used to satisfy the **graduate elective** requirement.* All graduate electives must be approved by the student’s PhD research advisor as indicated by the PhD advisor’s signature on the student’s program of study.
2. Students must take at least two **free elective** course (6 credit hours). Free electives can be in Engineering Sciences, Life Sciences, Teaching, Business/Technology Commercialization, etc. No more than 1 free elective can be S/U graded. All free electives must be approved by the student’s PhD research advisor as indicated by the MS advisor’s signature on the student’s program of study.
3. Elective Restrictions: A.) 3 of the 12 credits used to satisfy requirements #1 and #2 (i.e. graduate and free electives) must be an advanced **graduate-level math** or a BMEGSC-approved, strongly quantitative course. With advisor permission, students may petition the BMEGSC to have a non-Math course satisfy this requirement (e.g., BME 5580, etc.). B.) 3 of the 12 credits used to satisfy requirements #1 and #2 (i.e. graduate and free electives) must be in the **Engineering Sciences** as approved by the PhD research advisor.

**Total Program Requirements = 80 credits**

Total course requirement: **35 credits**

Research hour requirement: **≥45 credits BME 8999**

**Minimum Graduation Requirements**

- Completion of ≥35 course hours as described above with a minimum GPA of 3.00
- Completion of ≥45 hours of dissertation research (must be BME 8999)
- Successful completion of the Candidacy Examination and Dissertation Defense
- Presentation of dissertation research in a scheduled BME 8810 seminar or an advertised open defense
- Submission of two (2) manuscripts for publication in recognized scientific journals (e.g. indexed by ISI). The student should be the first author on at least one of these manuscripts
- Presentation of at least one (1) oral or poster presentation at a regional, national, or international meeting

*SAMPLE PhD program: may be compacted or expanded over 4+ years*

| YEAR   | FALL                         | SPRING                    | SUMMER                      |
|--------|------------------------------|---------------------------|-----------------------------|
| 1 (30) | Sci Methods BME .....1       | BME Fundamental #1 .....3 | Research .....4             |
|        | Research Ethics .....2       | BME Fundamental #2 .....3 | OR                          |
|        | BME Seminar .....0           | Grad Elective #1 .....3   | No enrollment               |
|        | Physiology .....3            | BME Seminar .....1        |                             |
|        | Research Design .....3       | Research .....5           |                             |
|        | Research Hours .....6        |                           |                             |
|        | TOTAL = 15                   | TOTAL = 15                | TOTAL = 0-3                 |
| 2 (32) | BME Fundamental #3.....3     | BME Fundamental #4 .....3 | Research or Candidacy.....4 |
|        | Grad Elective #2 .....3      | Free Elective #2 .....3   | OR                          |
|        | Free Elective #1 .....3      | BME Seminar .....1        | No enrollment               |
|        | BME Seminar .....0           | Research .....9           |                             |
|        | Research.....8               |                           |                             |
|        | TOTAL = 16                   | TOTAL = 16                | TOTAL = 0-3                 |
| 3 (9)  | Research or Candidacy .....3 | Research .....3           | Research .....3             |
| 4 (9)  | Research .....3              | Research .....3           | Research .....3             |

## SECTION 9:

### PhD Candidacy Examination: Overview, Committee, and Process

#### 9.1 Candidacy Overview

Qualifying conditions and the candidacy examination, written and oral portions, must be passed prior to the student's admission to candidacy for the PhD degree (i.e., the part of the program dealing mainly with research and dissertation progress). The purpose of the Candidacy Examination is to assess the student's knowledge base and thinking ability to make a determination of their suitability to continue towards independent research and a doctoral degree. The sequence and timing of the examination is at the discretion of the student's research advisor after all courses on the approved program of study have been taken. Exceptions typically can be made for required credit hours for seminar.

With advisor approval, requests to take the exam concurrent with a final course can be made to the BMEGSC. Students who pass candidacy should have no more classes to take, and are expected to register for no more than 3 credits per term unless approved by the student's GRA or GTA supervisor or funding source.

A student must be registered for at least 3 credit hours in each term in which any part of the candidacy examination is taken. A unanimous vote of the committee members is required for the student to pass the exam. The student is admitted to candidacy at the end of the term in which the Candidacy Examination is passed. The examination can be taken only twice and the second time, only on recommendation of the Candidacy Examination Committee. [For complete details, see the GSH.](#)

#### 9.2 Composition of the Candidacy Examination Committee

The candidacy examination committee will consist of at least 4 graduate faculty members, including at least one core BME departmental faculty member, and will be chaired by the research advisor, who must have level-P graduate faculty status in BME. The composition of the committee must be approved by the BMEGSC when the completed PhD program of study is submitted. Faculty signatures imply both approval of the program and membership on the student's candidacy committee. The approved program and committee must be on file with the Graduate Studies Office before the end of the second Autumn semester (or the student's third term of enrollment). Approval of the candidacy committee must be requested in the cover letter attached to the proposed program of study. Students should be sure to work closely with their candidacy committee to ensure satisfactory and efficient progress and preparation toward the dissertation topic.

#### 9.3 Identifying Candidacy Committee Members

The student and research advisor are responsible for identifying faculty in areas related to the student's program of study and research. The additional committee members must have M or P graduate faculty status. Questions about graduate faculty status may be directed to the Graduate Studies Coordinator. The student is responsible for carefully screening and asking faculty to serve on their committee and for obtaining their approvals to serve via the program of study.

#### Can external non-voting members serve on the candidacy examination committee?

With BMEGSC permission, a petition can be made to the Graduate School to include additional members. In some cases, it may work well to add unofficial non-voting members to the dissertation committee instead. Clinical faculty and external researchers commonly serve on dissertation committees. See [GSH for petition details.](#)

#### 9.4 Qualifying Conditions for Candidacy: Courses, Fundamental GPA, and Proposal

The purpose of qualifying conditions is to determine if a student's academic record is strong enough to indicate a good chance of success towards a doctoral degree. Prior to taking the Candidacy Examination a student must:

1. Satisfactorily complete the approved program of study. (The BMEGSC will consider requests for students to take the exam prior to completing their entire course of study in unusual circumstances.)
2. Attain a GPA of  $\geq 3.35$  in the four courses used to satisfy the four BME **fundamental** graduate course requirements.
  - a. Students achieving an average GPA between 3.00 and 3.35 on the four BME fundamental courses may petition the BMEGSC for permission to take a 5<sup>th</sup> required BME fundamental course – selected with the help of their advisor – and have their average recomputed after dropping the lowest grade.
  - b. Students achieving less than a 3.00 in the four required BME fundamental courses (or less than 3.35 after the recomputation above) will be allowed to continue towards an MS degree but will not be allowed to sit for their candidacy examination.
3. The student will prepare a research proposal in their chosen domain(s) which will include a clearly stated goal: either an original (i.e., distinct from the advisor's current research) Hypothesis, or a Technology Development objective; Specific Aims; a review and analysis of the relevant literature; a series of proposed experiments; and a discussion of the data to be collected and the means by which it will be analyzed.

Adherence to a standard grant format (e.g., NIH R-21 or NSF format) as selected by the Candidacy Examination committee is suggested. The candidate will provide the proposal to his/her research advisor at least three full weeks prior to the oral portion of the candidacy exam. The advisor or student is responsible for distributing the proposal to the candidacy examination committee, who will evaluate the quality of the proposal and determine if the student has satisfactorily completed this condition.

### 9.5 Written Candidacy Examination

The written portion of the exam will consist of one question from each of the candidacy committee members, sent to the research advisor. The student's research advisor is responsible for overseeing and coordinating the exam, and must make sure the student has no less than one full week to complete all parts of the written exam, not including holidays. Each candidacy examination committee member will provide one question to the advisor that may be directly based on the research proposal (i.e. typical review-type question) or may be based on the research area described by the candidate. Questions also may be based on coursework and/or ask for a critical review of the literature in a certain area. Each question may include multiple parts. The student is required to submit all written responses to both the committee member and the research advisor in the time period set by the advisor.

The entire written exam may be taken over an extended period of time, not to exceed one month. It is not uncommon for written exams to be completed over the course of 7 to 10 days. The oral portion should take place no later than one month past the date of the last written exam, but no sooner than one week after the date of the last written exam. The advisor is responsible for communicating with the committee about BME procedures and policies. This is especially important when the committee is composed of faculty outside of BME who will require guidance on what to expect.

### 9.6 Oral Candidacy Examination

The student may give a brief presentation of their pre-candidacy/qualifying research proposal before the oral examination begins. This typically lasts between 15-20 minutes. Immediately following, the committee will examine the student on the proposal and his/her understanding of the engineering and life science disciplines underlying the proposed research. The GSH states that the oral examination should last no more than two hours, with at least one hour devoted to questioning of the student and that questioning of the student should occupy the entire period of the examination. In BME, oral exams tend to run closer to two full hours, with additional time allotted for the pre-examination presentation. Students should be prepared for oral questions that examine (but are not limited to):

- general knowledge and reasoning skills in the area of biomedical engineering (especially in the domains of their coursework and in the area of their undergraduate background), and topics raised in the written portion of the candidacy exam
- the fitness of the student to formulate and address a research problem including knowledge of background materials, current literature, experimental design, methods, alternative techniques, statistical analysis, likely outcomes, etc.

See [Section 7.3 – 7.7 of the GSH](#) for complete candidacy policies.

## 9.7 Candidacy Results

At the conclusion of the oral portion, the committee determines pass or fail of the entire Candidacy Examination, based on both the written and oral performance. Attendance at the oral portion of the exam is limited to the student and the members of the Examination Committee. Successful completion of the Candidacy Examination requires a unanimously affirmative decision of the Committee. If the examination is not passed, a supplemental examination may be taken with the permission of the Candidacy Committee and in accordance with Graduate School policies. See [Section 7.6 of the GSH](#) for more information.

## 9.8 Candidacy Processes

It is the student's responsibility, with the approval of the advisor, to contact all examiners on the candidacy committee and schedule the candidacy examination. When the date and time for the oral examination are arranged, students may schedule a room for a 2-hour block of time in BME or elsewhere on campus if it is more convenient for the committee. (Under normal circumstances, a teleconferenced exam would require a petition; due to COVID 19, all exams are currently required to be teleconferenced via Zoom so no petitions are needed unless for external members.)

An Application for Candidacy form should be submitted by the student (approved by the advisor) to the Graduate School via [gradforms.osu.edu](http://gradforms.osu.edu) when starting the written examination, but must be submitted at least two full weeks before the date of the oral examination. The location (or indication of teleconference via Zoom) and 2-hour time block must be listed on the form.

Once the oral examination is complete, the candidacy committee will complete the Candidacy Examination Report via [gradforms.osu.edu](http://gradforms.osu.edu). Links will be sent to their osu.edu email addresses for this purpose. Candidacy status established in one doctoral program or at another institution is not transferable to another doctoral program.

### ***Q: Are there deadlines for candidacy like there are for defenses?***

With two-week notice, you may take the candidacy exam up until the day before the start of the next semester (i.e., the end-of-semester deadline) and candidacy exams may span one to the next semester. You will be considered a post-candidate the semester immediately following passage of the oral exam.

### ***Q: How long after passing candidacy should I defend my dissertation?***

It is up to your advisor and dissertation committee; however, it must be no longer than 5 years after passing the candidacy exam. If the dissertation is not completed in that time, candidacy will be cancelled and a supplementary candidacy exam will be required.

### ***Q: I am a new student with transfer credits. Can I take candidacy right away?***

No, you will need to complete the BME program of study which will allow you to use up to 30 transfer credits but will require you to take at least the required “fundamental” BME courses here, as a qualifying condition. In order to graduate with a PhD you will need 80 credit hours total, or 50 post-master’s hours, at least 24 of which must be taken here. Nearly half of the 24 credits are taken post-candidacy as research.

### ***Q: My research advisor is new, from a home unit outside of BME. Who can they contact for guidance on running their first BME candidacy exam?***

Advisors with questions about coordinating the written and oral exams are welcome to contact the Graduate Studies Chair, Jun Liu at [liu.314@osu.edu](mailto:liu.314@osu.edu); a BME colleague; or the student’s core faculty contact.

### 9.9 Post-Candidacy and Continuous Enrollment

All students who successfully complete the doctoral candidacy examination will be required to be enrolled in every term of their candidacy (summer excluded) until graduation. Students must be enrolled for at least 3 credits per semester. More than 3 credits may be taken, *only with written permission of the research supervisor and funding source*. It ultimately will be the responsibility of each student to ensure that they are meeting the enrollment provisions of the continuous enrollment policy. For more information, review the GSH. Before registering for the next term, students should complete the BME assessment post-candidacy survey and remind their Candidacy Committee members to do the same. (Contact the graduate studies coordinator for the survey at [senitko.1@osu.edu](mailto:senitko.1@osu.edu).)

### 9.10 Obtaining the Master's Degree as a Result of Passing Candidacy

Students who pass candidacy may earn an MS credential en route to completing the doctoral degree by completing an Application to Graduate with an MS on [gradforms.osu.edu](http://gradforms.osu.edu) in any semester after candidacy has been passed. There it is indicated that the student is continuing on for a PhD and is earning the Master's as a result of passing the candidacy examination, and will be approved by the student's advisor and BMEGSC Chair.

#### WORK BACKWARDS TO PLAN CANDIDACY: Possible timeline using random dates

The qualifying proposal and examinations may take the better part of a semester, but the actual examinations should aim to take place in no less than one month, no more than two. Here is one sample of a common examination timeline, as agreed upon by student and advisor:

#### ***If the Oral Examination is planned for Nov 27:***

- At least one full week and no more than one full month before the Oral Exam:  
Last Written Exam question completed by student no later than Nov 20
- At least 2 full weeks before the Oral Exam:  
Candidacy Application submitted to Grad School by student via [gradforms.osu.edu](http://gradforms.osu.edu) no later than Nov 13 or *preferably sooner* to allow time for faculty signatures. On the application, students may list a time range for writtens (e.g., Nov 13 thru Nov 20) and must include the date/time/location of the Oral Exam. (May indicate Zoom, as circumstances dictate).
- In no less than one full week and no more than one full month:  
Written Exam questions distributed by Advisor between Nov 13 and date TBD by advisor:  
Collected no sooner than Nov 20, excluding holidays

*The timeline could look like this:*

Oral Exam – Nov 27

Written 4 due – Nov 20

Written 3 due – Nov 18

Written 2 due – Nov 16

Written 1 due – Nov 14

Start Written 1 – Nov 13

- Send completed proposal to the advisor/committee no later than Nov 6
- Achieve a 3.35 in 4 approved fundamental courses before the semester in which the exam begins.

## SECTION 10:

### PhD Dissertation Defense: Final Oral Examination Overview, Committee, and Process

#### 10.1 Composition of the Final Oral Examination Committee & Process

The dissertation committee will consist of at least three graduate faculty members, including at least one core BME departmental faculty member, and will be chaired by the research advisor, who must have level-P graduate faculty status in BME. Soon after passing candidacy, students should obtain official approval of a dissertation committee by emailing a brief request, addressed to the BMEGSC, to the Graduate Studies Coordinator at [senitko.1@osu.edu](mailto:senitko.1@osu.edu). For most students, this simply will be the candidacy committee minus one member. These three BMEGSC-approved dissertation committee members plus one assigned Graduate School Representative comprise the final oral examination committee. Petitions to add external, non-voting members must be completed via [gradforms.osu.edu](http://gradforms.osu.edu). Students should be sure to work closely with members of their dissertation committee.

It is the student's responsibility, with the approval of the research advisor, to contact all examiners on the dissertation committee and schedule the final oral examination (also called the dissertation defense). Typically the student provides committee members with a dissertation draft when doing this. Students also must take a copy of their dissertation draft to the Graduate School for a required formatting review. When the date and time for the dissertation defense are arranged, students may schedule a room for a 2-hour block of time in BME or elsewhere on campus if it is more convenient for the committee. (Under normal circumstances, a teleconferenced exam would require a petition; due to COVID 19, all exams are currently required to be teleconferenced via Zoom so no petitions are needed unless for external members.)

The final oral examination committee will examine the student on the research project and dissertation in accordance with [Graduate School regulations](#) and must comply with the [deadlines](#) published by the Graduate School at the beginning of each term. The examination should not exceed two hours. Only examination committee members may be present during a BME PhD examination; however, students and faculty may attend presentations given before the exam begins. Students are welcome to advertise their presentations.

The graduate faculty representative is assigned by the Graduate School after the student files the *Application for Final Oral Examination*. This form is to be submitted by the student to the Graduate School via [gradforms.osu.edu](http://gradforms.osu.edu) and approved by the advisor at least two full weeks before the date of the oral examination. Failure to meet this deadline will result in the rescheduling of the exam. The location (or indication of teleconferencing) and 2-hour time block must be listed. (Note that a copy of the dissertation must be sent to the assigned graduate faculty representative at least one full week before the defense, if not longer.) This application generates a link to the Final Oral Examination Report form, which is sent to the osu.edu email addresses of the final oral examination committee. The committee's decision is recorded by each committee member via [gradforms.osu.edu](http://gradforms.osu.edu).

The student is considered to have completed the final oral examination successfully only when the decision of the final oral examination committee is unanimously affirmative. A student must be registered for at least three graduate credit hours during the term in which the final oral exam is held. For information on [teleconferencing](#) the doctoral defense in the event that a committee member may need to participate while off-site or [petitioning to include an extra or non-voting, non-OSU committee member](#), please see [gradforms.osu.edu](http://gradforms.osu.edu). For [policies governing the Final Oral Examination](#) rules see the GSH.

#### 10.2 Dissertation Guidelines

The dissertation should be an original research project that makes a new contribution to the field. Proposals and protocols should be approved by the student's advisor(s) prior to beginning research. The dissertation must be completed in accordance with Graduate School [policies](#) and must comply with the [deadlines](#) published by the Graduate School at the beginning of each term. Students may reach out to their lab mates, peers from BMEGSA and/or student mentors for advice on completing the thesis. For Dissertation [formatting and submission procedures](#), see the Graduate School website.

Students are encouraged to read the Graduate School Newsletter for leads on Graduate School and [Writing Center](#) workshops on dissertation writing or to schedule a review at the Graduate School ([Graduation Services](#) area) to learn about formatting and electronic document submission. Detailed information on the required format may be found [here](#). If a student fails to submit the final copy of the dissertation document to the Graduate School within five years of being admitted to candidacy, their candidacy is cancelled. In such a case, with the approval of the advisor and the Graduate Studies Committee, the student may request to take a supplemental candidacy examination. If the student passes this supplemental candidacy examination, the student is readmitted to candidacy and must then complete a dissertation or D.M.A. document within two years. [See GSH](#). Students who do not complete the requirements above within the timeframe may be dismissed from the program.

### FINAL ORAL EXAMINATION PLANNING: A SAMPLE TIMELINE

Results for the Defense (Final Oral Examination) and Dissertation must be reported by the Dissertation Committee by Graduate School deadlines. Exam dates should be chosen to meet the deadlines.

- [Application to Graduate](#): Department Deadline - first day of the intended semester; Graduate School deadline - 3<sup>rd</sup> Friday of the semester of graduation
- [Application for Final Oral Exam](#): File 3-4 weeks ahead of time to ensure meeting Graduate School deadline of at least 2 full weeks before the actual defense
- [Dissertation Formatting check at Graduate School](#): as early as possible, aligned with the Application for Final Oral Examination
- Send copy of dissertation to Graduate Faculty Representative as soon as one is assigned, no less than one full week before the defense

#### AFTER THE DEFENSE:

- Make sure your Dissertation Committee completes the [Exam Report](#) by posted deadline
- Revise and submit approved [Dissertation](#) by posted deadline via Ohiolink
- Make sure your Dissertation Committee completes the [Dissertation Approval](#) by posted deadline
- Remind your Dissertation Committee to complete the BME Assessment Dissertation survey (Contact the graduate studies coordinator for the survey at [senitko.1@osu.edu](mailto:senitko.1@osu.edu).)

### 10.3 Required Seminar Presentation & Publication Submissions

PhD students are expected to present an open seminar on their dissertation as part of the BME seminar series. To avoid delays in graduation, this should be done at least one or two semesters before graduation is anticipated. It is the student's responsibility to contact the seminar faculty coordinator to get scheduled before all spaces are filled. In the event that there is a conflict, students may advertise the presentation portion of their dissertation defense to be counted as a seminar presentation, making sure to notify the BMEGSC via email to the graduate studies coordinator. As detailed in the curriculum requirements, PhD students also are expected to have submitted two manuscripts for publication and to have made one oral or poster presentation at a scientific meeting in order to graduate. This information is to be emailed to the graduate studies coordinator when applying to graduate.

### 10.4 Graduation for PhD Students

In order to graduate with a Doctoral (PhD) degree students must meet all requirements established by the department and the Graduate School. An Application to Graduate must be filed on [gradforms.osu.edu](http://gradforms.osu.edu) no later than the first day of the term in which a student intends to graduate to allow time for a BME graduation audit and approval by the Advisor and Graduate Studies Committee Chair. Graduating students must be enrolled for at least 3 credit hours in the term of graduation. The Graduate School's graduation checklist for PhD students in their final term of enrollment can be found [here](#). If requirements go unmet or exam or thesis deadlines are missed, students may be able to meet the Graduate School's

[end-of-semester deadlines](#) without having to register the following term. If the E-O-S deadlines are missed, it will be necessary to resubmit a new Application to Graduate the following term.

## DEGREE COMPLETION REMINDERS FOR PhD

- Students & advisors may jointly petition the BMEGSC for waivers of program or committee requirements. These should be accompanied by a proposed or approved program of study whenever possible.
- Petitions should be submitted in the form of a brief letter addressed to the BMEGSC and sent to [senitko.1@osu.edu](mailto:senitko.1@osu.edu) and will be considered at convened monthly BMEGSC meetings. *Last-minute petitions may not be reviewed.*
- Changes to an approved Program or Committee must be reviewed by the BMEGSC at least **one full semester** before an Application to Graduate is filed.
- Applications to Graduate will not be approved unless the student's final BMEGSC-approved Program and Committees are on file in the Graduate Office and most other graduation requirements, as stated in the GSH and BMEH, are met.
- Applications to Graduate should be submitted via [gradforms.osu.edu](http://gradforms.osu.edu) at least **one full week** in advance of the Graduate School deadline. No forms will be signed by the Chair of the Graduate Studies Committee until a graduation audit has been completed by the BME graduate studies office.
- Be sure to build in time for a Graduate School review of the formatting of your dissertation draft.
- Be sure to build in time for any [gradforms.osu.edu](http://gradforms.osu.edu) committee member petitions.
- Review your advising report each semester and contact your faculty about missing/outstanding grades.
- Publication and presentation lists should be emailed to the Graduate Studies Coordinator at [senitko.1@osu.edu](mailto:senitko.1@osu.edu) before the end of the semester in which you plan to graduate.
- Complete the BME assessment graduation survey. (Contact the graduate studies coordinator for the link at [senitko.1@osu.edu](mailto:senitko.1@osu.edu).)

## SECTION 11:

### Combined Medical Scientist Training Program: MD/PhD Degree

#### 11.1 Earn an MD/PhD degree in BME:

It is possible for a student to pursue a PhD degree in biomedical engineering and the MD degree simultaneously. The combined degree curriculum is a mixture of BME and the life sciences. Some medical school courses may be used to count as life science credit; in addition students will take the required graduate level engineering, math, and statistics courses. At least 45 credits of dissertation research are also required.

The Medical Scientist Training Program is administered through the College of Medicine and the Graduate School. Admission to the Medical Scientist Program requires application to both the Medical School and Graduate Program, but your graduate application will be built from your AMCAS application, courtesy of the MSTP program.

#### 11.2 Deadlines to apply to the MD/PhD program in BME via the MSTP:

Admission to the Medical Scientist Training Program (MSTP) can be made through one application process. This is initiated through the American Medical College Applications Service (AMCAS). To apply to the MSTP you should designate The Ohio State University on the electronic application, and select Combined Medical Degree/PhD.

Later you will receive an e-mail from the College of Medicine directing you to the web-based secondary application which also serves as your application to the MSTP and to graduate school.

AMCAS applications will be accepted starting June 1 until Nov. 1 of the year prior to anticipated matriculation. No applications are accepted by AMCAS after Nov. 1. The Ohio State University secondary application forms are due 30 days after receipt of the AMCAS application. Early application is strongly encouraged, as MSTP interview slots fill up quickly.

Our Biomedical Engineering graduate program will use the medical school materials to review graduate application file. The only additional item for applicants to provide directly to the Office of Graduate Admissions is an official GRE score report. *Biomedical Engineering (BME) requires the GRE.* However, this GRE requirement is waived for applicants who have majored in an engineering field during their undergraduate or graduate education.

#### 11.3 Evaluation Criteria used by the MSTP Review Committee:

An earned cumulative grade-point average (GPA) equivalent to at least 3.0 out of 4.0 in all previous undergraduate college-level course work is required by the OSU Graduate School, but considerably higher scores will be required to gain admission to the MSTP. Students should apply to be admitted for the summer term.

An MSTP student is selected based on:

1. Previous academic record
2. Research experience
3. Biographical statement that explains why the applicant wants to pursue a combined MD/PhD
4. Four letters of recommendation, at least two of which should address the applicant's previous research experience and potential for a research career
5. MCAT scores (and/or GRE scores if required)
6. Personal interviews

Although all of these criteria are taken into account, particular emphasis is placed on research experience. If an applicant is not admitted to the MSTP but still wishes to pursue a PhD in BME, please contact the BME Graduate Studies Chair at [liu.314@osu.edu](mailto:liu.314@osu.edu).

## YEAR-BY-YEAR MSTP SCHEDULE: INTEGRATING BME COURSEWORK AND DISSERTATION RESEARCH

### Program Years 1 and 2

- Summer lab rotations
- Medical School Year 1 coursework, Medical School Year 2 coursework, MSTP Roundtable, MSTP-specific seminar OR for students who select to start with their first year of graduate coursework, the curriculum would include: graduate coursework, MSTP Roundtable, MSTP-specific seminar. The second year in the program would start with Medical School Year 1 coursework as listed above.

### Program Years 3-6

- Graduate or Medical School Year 2 coursework, grant writing, patient-centered research, ethics, MSTP-specific seminar, clinical preceptorship.

### Program Years 7 and 8

- Medical School Year 3 and 4 curriculum, MSTP-specific seminar

The Candidacy Exam is taken after all courses are completed. The dissertation should be defended before returning to Med 3.

### 11.4 Academic Progress and Pace

Current MSTP students may find it helpful to speak with faculty who have mentored BME MSTP students in the past to get a sense of how best to organize one's time and efforts. The workload and timing may look different for those not on a solo PhD path. For BME MSTP referrals, contact the graduate studies coordinator at [senitko.1@ou.edu](mailto:senitko.1@ou.edu).

### 11.5 Funding

Admitted MD/PhD students will be assigned a BME core faculty contact to help with BME rules and culture. This will be an especially important relationship if the student's research advisor is external to BME. Students are urged to plan well with their advisors and core faculty contacts, to follow all instructions sent by the MSTP program, and to read all reminders sent by the BME program. Most important, students should follow-up on changes in their funding appointments well in advance of each semester to make sure everything is in place ahead of time. The BME Grad Coordinator often can help point students in the right direction to be proactive and productive about planning for appointment changes.

### 11.6 For more information

Questions about the Medical Scientist Training Program may be directed to:

Ashley Bertran at [ashley.bertran@osumc.edu](mailto:ashley.bertran@osumc.edu)

To talk with current MSTP students in BME and to be connected with their student organization:

<https://medicine.osu.edu/education/dual-degree/mstp/for-current-students> or contact BME Grad Studies Coordinator at [senitko.1@osu.edu](mailto:senitko.1@osu.edu).

For more MSTP advice:

<https://medicine.osu.edu/education/dual-degree/mstp/admissions/faqs>

## SECTION 12:

### Combined BS/MS Program in BME

#### 12.1 Earn a BS/MS degree in BME:

The BS/MS program allows well-qualified undergraduate students at Ohio State to start graduate study before completing their undergraduate degree. By enrolling in a combined BS/MS program, you are eligible to count up to 12 semester credit-hours of courses taken as a graduate student toward your bachelor's degree - and these credit-hours also count toward your master's degree, but at the graduate tuition rate. This allows students to be more efficient during their tenure at Ohio State and creates a potential advantage for them in the marketplace. Students interested in this path should discuss their goals with BME undergraduate advisors. Typically, the MS and BS/MS options in BME are self-funded. The BS/MS generally is not recommended for those interested in pursuing a PhD as it eliminates funding opportunities. *Some students may choose to be admitted directly to the PhD program with a funded position instead of starting down the MS path.*

#### 12.2 Eligibility & Application Deadlines

You must meet all requirements imposed by the Graduate School for combined BS/MS programs. Section II of the official OSU Graduate School Handbook contains up-to-date information about these requirements. You are eligible to apply for a combined graduate & undergraduate program in Engineering if:

- you are an OSU undergraduate student
- you have at least a 3.5 GPA in all previous undergraduate work
- you have completed at least 90 undergraduate semester credit hours toward the BS degree.

The MS graduate application deadlines for a combined degree program in BME:

##### Autumn start deadline:

- May 1 – graduate application
- After MS admission, 3 weeks before semester starts – BS/MS Combined Degree form

##### Spring start deadline:

- Oct 15 – graduate application
- After MS admission, 3 weeks before semester starts – BS/MS Combined Degree form

In addition to meeting MS program application deadlines, applications to a BS/MS program are due no later than three weeks before the start of each term. *International student applications are due no later than nine weeks before the start of each term in order to allow sufficient time for the Graduate School's financial review process.* It is best to apply early in order to allow time for programs to review the application before the final deadlines.

#### 12.3 Multi-step Application Process

There are several steps you will need to complete before enrolling as a Combined Degree student. First, talk with the graduate program chair or coordinator to make sure the BS/MS is the correct fit for you. Review the MS requirements independently in order to pre-plan your MS program of study and identify the classes you would like to double-count for both the undergraduate and the graduate degree. Meet with the undergraduate advisor to get approval for your proposed double-counts. No more than 12 credit hours can be double-counted; you can double-count only courses taken after admission to the BS/MS program; no coursework from past terms may be double-counted.

Next, you will need to apply to the graduate program and indicate on the application your desire to enter the combined BS/MS program. (You must complete the typical MS application process before you can officially apply to the BS/MS Combined Degree program, so be sure to build in the time you need.) In addition to the [graduate application form](#) and fee, applicants must include a statement of purpose, a CV/Resume, ALL post-secondary transcripts for credit received at any institution and 2-3 letters of recommendation, preferably from BME professors. GRE scores are not required for BME

undergraduates pursuing the BS/MS. Finally, indicate on the MS application and on your Statement of Purpose your desire to enter the combined BS/MS program. If you are admitted to the graduate program, then you become eligible to enroll in its combined BS/MS program by completing the last steps below.

After completing these first steps and earning admission to the MS graduate program, you must access the online application form for the BS/MS Combined Degree program at [gradforms.osu.edu](http://gradforms.osu.edu). Note: you will not be able to edit the form after submitting it, so you need to plan your coursework carefully and be sure you have discussed these plans and received approval from BOTH your undergraduate advisor and the graduate program coordinator BEFORE submission.

After your Combined Program application form has been reviewed by the Graduate School, the undergraduate advisor for the BS program, the graduate coordinator for the MS program, the Graduate Studies Chair for the MS program, and the College of Engineering BS/MS Coordinator, you will receive an email notifying you of your admission status. After admission to the BS/MS Combined Degree program, you will be charged with graduate-level tuition and fees.

#### **12.4 Registration Protocol for Combined Degree Courses**

When you schedule the courses on your BS/MS Combined Degree, be sure to choose the undergraduate option as you enroll in Buckeyelink. If you schedule any courses on the graduate option, they will only apply to the MS and cannot be double-counted. Please read important BS/MS tips from the College of Engineering, distilled below:

- Before each semester begins, if you change your plans, you can request that the form be updated with a revised course list.
- After a semester begins, the deadline to request that a course be added to the form is Friday of the second week
- After a semester begins, the deadline to request that a current course be removed from the form is Friday of the fourth week
- If you do not enroll in a course on your BS/MS Combined Degree form, you can request that it be removed.
- The final deadline for any changes, will be the Friday of the fourth week of the semester in which you are completing your BS degree

If you are a current BS/MS student and have a request to change your BS/MS Combined Degree course list within these deadlines, you should submit any of the above requests by email to:

1. Undergraduate advisor
2. Graduate program coordinator
3. College of Engineering BS/MS Program Coordinator at [ENG-BSMS@osu.edu](mailto:ENG-BSMS@osu.edu).

#### **12.5 Advising for BS/MS Students**

Most students who do the BS/MS program choose to pursue the non-thesis MS because it can be done more quickly. MS students must get their MS committee approved before the start of their second term. The BS/MS student's main advisor (the lead of the two committee members) typically is the graduate studies chair, Jun Liu, or the lead developer of a new medical product development BS/MS curriculum, Tanya Nocera. The second is chosen by the student based on the experiential component of the non-thesis MS program.

Non-thesis MS students in the regular track must complete a 12-hour culminating experience involving the application of biomedical engineering. This could take the form of an internship or practicum in an industrial setting; a mentored patient-contact experience; or a community service project followed by a written Master's Exam (i.e., a final paper: a 1000-1500 word written document explaining the experience and its relevance to the field). An oral presentation discussing the experience may also be included at the discretion of the MS Committee, who must approve the student's program of study and culminating experience/MS examination.

For more information on MS requirements and processes, see the BMEH sections on non-thesis MS information. Students interested in completing a thesis would, with permission of the BS/MS Advisor and Graduate Studies Chair, follow the BME Thesis MS Requirements also detailed here.

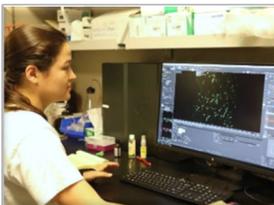
Some additional points you should consider:

- Once you are enrolled in a combined BS/MS program, you become a graduate student and are charged graduate tuition and fees, even before you complete the undergraduate degree.
- You will have two GPAs – one for undergraduate and one for graduate. You will be subject to academic standards and enrollment deadlines at both levels.

For information about general requirements, the Combined Degree Approval Forms, or other questions, please contact the College of Engineering BS/MS Program Coordinator, at [ENG-BSMS@osu.edu](mailto:ENG-BSMS@osu.edu).

For information on financial aid: <https://advising.engineering.osu.edu/current-students/combined-graduate-undergraduate-programs>

*Heather Struckman (left) joined the lab of Professor Sai Veeraraghavan after meeting him at the College's Annual GEOH, won an NSF award for her proposal "Stoked for Scopes" which focuses on building a microscopy-based outreach program. BMEGSA 2019 5K Color Run Fundraiser (middle) spearheaded by doctoral student, Sunny Kwok.*



*Professor Tanya Nocera, creator of the BS/MS medical product development program (right) congratulating doctoral student, Alexis Burns, first-ever BME winner of Ohio State's 2017-18 GTA award.*

## SECTION 13:

### Funding Sources and Policies

#### 13.1 Funding Opportunities for Graduate Students

The BME graduate program regards all applicants as having interest in funding. The majority of funding is awarded to admitted PhD students. The MS typically is a self-funded degree, though there are times when funding is available for MS students. The Biomedical Engineering Graduate Studies Committee (BMEGSC) works to find research and funding matches for prospective PhD admits, and all applicants are encouraged at the time of application to contact faculty of interest directly to learn more about fellowship and GRA opportunities in their labs.

The search for funding is student-driven, with the BMEGSC working behind the scenes to find additional opportunities. Three sources of funding in BME are department-nominated OSU [Fellowships](#) and research-based external and [National Fellowships](#) (sometimes based on undergraduate research experiences); [Graduate Research Associateships](#) in faculty labs; and [Graduate Teaching Associateships](#) in BME.

#### 13.2 Application Deadlines for Fellowships, GRAs, GTAs, and GAAs

University and College fellowship nominations are available only to applicants who meet the application deadlines for Autumn admission: November 30 for Internationals and December 15 for Domestic. The BMEGSC nominates outstanding students for fellowship awards in different college- and university-wide competitions. Graduate fellowship awards include a tuition waiver and a stipend for living expenses. Fellowships are very competitive, like merit scholarships. Applicants will be notified if they are considered for nomination in these award pools.

Faculty work with the BMEGSC to select students to work on funded research projects as Graduate Research Associates (GRAs). These positions provide a tuition waiver and stipend (see page 11). These positions generally are awarded on the basis of academic merit, research experience, and the particular skills required by a given project. GRAs can start in any semester if the appointment deadlines are met.

The BMEGSC also awards departmental GTA positions, with most of them reserved for current PhD students seeking teaching experiences and/or needing funding. A call for GTA applications is sent to all current students near the end of each semester. International students interested in a GTA position must learn more about the required [Oral Proficiency Assessment](#).

Biomedical Engineering reviews application files for admission throughout the year; however, the majority of our applications come in during the months December through March – most meeting the fellowship deadline for admission in the following autumn semester. As a result, much of the available funding at Ohio State is distributed during the winter and spring months.

In addition to possibilities within BME, there are university-wide opportunities such as Graduate Administrative Associateships (GAAs) in student service areas like the libraries and advising and retention offices; and Graduate Teaching Associateships (GTAs) for students looking for ways to use their undergraduate degrees in chemistry, math, or Spanish, just to name some examples. All of these appointments require 20 hours per week of tasks and activities in exchange for a tuition waiver and stipend. Students are encouraged to inquire directly about job possibilities at individual offices throughout the university. There are no central collections of these opportunities, but Ohio State's website is a good place to start: <http://sfa.osu.edu/Jobs/>.

Information on the above as well as loans, scholarships, and student employment can be found [here](#).

Additional funding resources including external fellowships are listed at the [Graduate School website](#).

Additional funding opportunities can be explored at InfoEd SPIN: <https://spin.infoedglobal.com/Home/GridResults>.

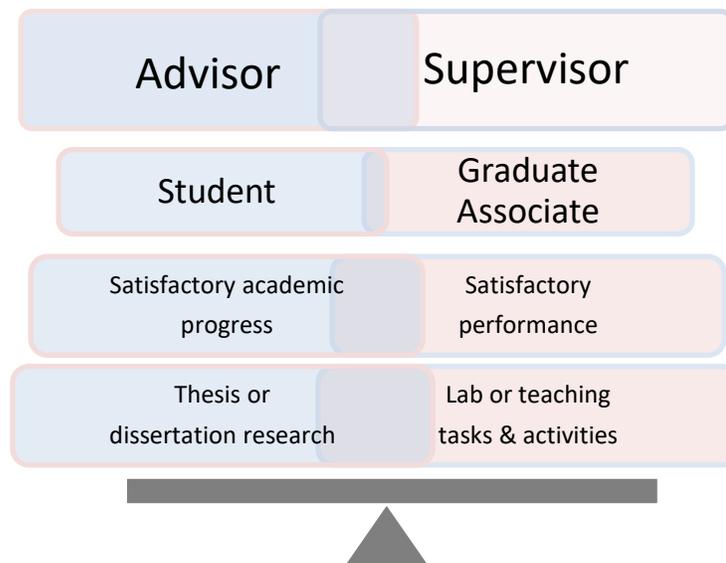
Watch for workshops at the University Library geared toward helping students and faculty explore this search engine.

### 13.3 Graduate School Governance of GA Appointments

Graduate Associates must adhere to the rules of their employing units and Supervisors on such matters as work responsibilities, outside employment, work schedules, and the like. Information on stipend amounts and Employing Unit Responsibilities with respect to Graduate Associates can be obtained from the BME HR officer. For comprehensive policy information, see the [university HR website](#) or the [section 9 of the GSH](#).

### 13.4 GA Rights and Progress

Supervisors and GAs will follow the rules regarding GA appointments set forth in the Graduate School Handbook. Likewise, supervisors should make clear their expectations of Graduate Associates. The Annual Review is an excellent opportunity to make sure faculty and students are on the same page with regard to progress and best practices. Communication is key, as not all Supervisors have the same style. Not all research advisors are GA supervisors, but often they are the same person. Below is a reminder of the different roles you and your faculty supervisor may hold. It is important that students and faculty be up to date with regard to GA rights and policies and that they make sure to discuss expectations with regard to any time spent away from the lab. Supervisors and GAs must be sure to discuss and follow university policy on breaks or on any special requests for time away.



### 13.5 Preventing problems through communication

The BME graduate program recommends the following for resolving GA-related grievances locally: open-minded discussions first with the supervisor; then with the core faculty contact, graduate studies coordinator and/or graduate studies committee chair, hiring officer, and/or department chair, in whatever order feels most comfortable. Graduate associates should also consult their appointment documents. *GAs are encouraged to make sure their Human Resources representatives and/or hiring officers will have provided these documents at the time of appointment.* Students also may work with the graduate studies coordinator to seek guidance in writing from the BMEGSC, anonymously.

As stated in the GSH: “The Graduate School becomes involved in such matters only after all reasonable local efforts to resolve the problem have failed. In accordance with university policy, complaints of harassment, sexual or otherwise, and allegations of scholarly misconduct are directed to the appropriate offices authorized to address them.” See [GSH Appendix D](#) for grievances that cannot be solved locally.

Review [GA appointment and leave policies](#) in the GSH.

## SECTION 14:

### Student Organizations, University Services & Wellness Resources

#### 14.2 BME Graduate Student Association ([BMEGSA](#))

This active group of graduate students serves as an information base for prospective graduate students and organizes tours, events, and activities designed especially for BME graduate students. BMEGSA collaborates with the BMES on the annual Engineering Healthcare in Research Symposium and recently has held a successful department-wide 5K to raise funds for BMEGSA and the new BME building. BMEGSA has taken different names and forms through the years and has championed many causes. Currently, BMEGSA is serving the graduate student community and department at large by focusing on wellness and has inspired the creation of a department-wide Wellness Subcommittee. Contact them for more.

#### 14.2 Biomedical Engineering Student Society ([BMES](#))

Undergraduates and graduate students from all departments may join the Biomedical Engineering Society. The purpose of the Ohio State chapter of the BMES is two-fold: to promote an interest in biomedical engineering on campus, and to involve students and faculty having an interest in biomedical engineering in campus activities. This award-winning group is very active nationally and attends the national BMES conference regularly. BMES serves as an information base for undergraduates. BMES also plans several events each year and collaborates with the Biomedical Engineering Graduate Student Association.

#### 14.3 College of Engineering and University-wide Organizations

College of Engineering groups with an emphasis on diversity and inclusion in which BME graduate students have served as officers include [Women in Engineering Graduate Council](#) (WEGC); [Society of Black Graduate Engineers](#) ([sbge.osu@gmail.com](mailto:sbge.osu@gmail.com)); and [Latino/Latina Engineering Graduate Student Association](#) ([LLEGA@osu.edu](mailto:LLEGA@osu.edu)). The [Council of Graduate Students](#) provides a forum for graduate students university-wide to discuss and evaluate academic or social issues and aspects of graduate student life. Membership in this group provides BME students with a voice in the university community.

#### 14.4 Popular Academic and Professional Resources for Graduate Students

We are committed to providing a positive, safe, and inclusive community in order to promote an environment of academic achievement and integrity. Students, faculty, and staff have mutual responsibility to insure that classroom and lab environments support teaching and learning, are respectful of the rights and freedoms of all members, and promote a civil and open exchange of ideas. Students are urged to take responsibility for their own education by working hard to develop or strengthen an internal locus of control and a growth mindset. Students also are encouraged to seek help when needed. Here are some tools to help all graduate students be successful forging their own paths and serving their biomedical engineering community.

##### **Employment and Internships**

- [Engineering Career Services](#)
- [University Career Resources](#)

##### **International Student Support Systems & Policies**

- We value our international students. Find help the [cultural adjustment](#) and stay current on [policies](#) with the [Office of International Affairs](#)

##### **Researching and Writing the Thesis and Dissertation**

- [The Writing Center](#)
- [University Research Resources](#)
- [Younkin Success Center](#)
- [Office of Diversity and Inclusion Dissertation Boot Camp](#)

### **Learning about Teaching**

- [Michael V. Drake University Institute for Teaching and Learning](#)

### **Support for Your Learning**

- Free [Academic Coaching](#) through the Dennis Learning Center connects you with individualized support as you develop new study strategies.
- Students always have a right to privacy and are never under any obligation to divulge anything. In many cases, however accommodation cannot be granted until you have registered with the [Office of Disability Services \(SLDS\)](#). If you need in-class accommodation (more time on the exam, a note-taker, dealing with test anxiety, etc.) then you need to register with [SLDS](#). Disability is a broad term that includes but is not limited to mental health, chronic conditions, temporary injuries, physical/learning disabilities, and ADHD.

### **Recognizing & Avoiding Misconduct or Plagiarism**

- You may be surprised at how your own personal definition of academic integrity differs from Ohio State's. Being aware of [academic misconduct](#) and the [Code of Student Conduct](#) can prevent trouble not just for you, but for your peers. Look out for each other.
- The [Student Advocacy Center](#) can help you navigate academic issues such as appeals to the Committee on Academic Misconduct, communicating with faculty about hospitalizations, assault, or other issues.

## **14.5 Resources for Wellness and Living**

Graduate School is filled with challenge and growth. As a student you may experience a range of issues that can cause barriers to learning, from feeling down to difficulty concentrating or increased anxiety. Stressful events or strained relationships may lead to diminished academic performance or even reduce a student's ability to participate in daily activities. Therefore, we encourage students to explore the many services offered by The Ohio State University to help address these concerns, and more. Graduate students do not always have a lot of time and energy to spare, but thankfully, the list below has done much of the work for you.

All of the services and resources listed below exist to assist Ohio State students. *If any of the services below are unable to attend to your needs immediately, alternatives and referrals are listed.* Please try to take advantage of the alternatives, enlisting the help of a friend or colleague if necessary to follow through. Taking the extra step to see a community provider or making a small investment of time in a group setting can result in significant improvements and even lifelong relationships as you await additional university services.

### **Your Health Matters**

- You can learn more about the broad range of free confidential mental wellness services available including individual appointments, workshops, and groups via the Office of Student Life's [Counseling and Consultation Service \(CCS\)](#) by visiting [ccs.osu.edu](http://ccs.osu.edu) or calling [614-292-5766](tel:614-292-5766). CCS is located on the 4th Floor of the Younkin Success Center and 10th Floor of Lincoln Tower. You can reach an on-call counselor when CCS is closed at [614-292-5766](tel:614-292-5766) and 24 hour emergency help is also available through the 24/7 National Suicide Prevention Hotline at 1-800-273--TALK or at [suicidepreventionlifeline.org](http://suicidepreventionlifeline.org).
- [ODI Embedded Therapist](#) and [Engineering Embedded Therapist](#)
- Free Wellness Coaching through the [Student Wellness Center](#) can also help you with concerns such as relationship difficulties, adjustment to college, loss and grief, stress management, financial and personal wellness.
- [SMART Lab](#) Stress management & resiliency training – check it out!
- [Student Health Services](#)
- [Buckeye Peer Access Line \(PAL\)](#)

### **Practicing Antiracism and Social Justice**

- Do [Implicit Bias training](#) and earn an [Inclusive Excellence Certificate](#)
- Study racial justice via reading and trainings at [The Office of Diversity and Inclusion](#) or the [Kirwan Institute](#)

- [Diversity at OSU in all aspects](#)
- [Diversity in STEMM](#) reading list

### **Be Sure to Report Harassment & Assault**

- [Sexual Assault](#) Title IX and support resources
- [Bias Assessment & Response Team](#) (BART) acts or behaviors that create unsafe, negative or unwelcome environment motivated by bias against age, ancestry, color, disability, gender identity or expression, military status, and more
- [Discrimination is against the Law](#) *Reporting harassment is everyone's job.*
- Learn about your rights to be free from harassment and discrimination; connect with support resources; file a report online [equity.osu.edu](http://equity.osu.edu); call – 614-247-5838; or email [equity@osu.edu](mailto:equity@osu.edu)
- You can report harassment and discrimination concerns anonymously through [EthicsPoint](#)

Members of The Ohio State community have the right to be free from *all forms of harassment and discrimination based on age, ancestry, color, disability, gender, gender identity or expression, genetic information, HIV/AIDS status, military status, national origin, pregnancy, race, religion, sex, sexual orientation, or protected veteran status.*

### **Foster Inclusivity and Find Support**

- The Women's Place has compiled a helpful list of [LGBTQ resources](#)
- The [Student Life Multicultural Center](#) offers resources for students, faculty and staff while supporting and celebrating specific constituency groups including African and African American, Asian Pacific Islander Desi American (APIIDA), American Indian/Indigenous, Latino, DACA, Gay, Lesbian, Bisexual, Transgender, Queer, Women, Men and Faith communities.
- [Inclusion and racial justice](#) in the classroom
- Learn about and contribute to initiatives of the BME Department's Diversity Committee

### **Ways to Get and Give Help in Times of Transition**

- If you or anyone you know is experiencing food insecurity, please be sure to find out what is available at [Buckeye Food Alliance](#) Food Pantry; [\(ACES\) Food Pantry](#), PAES Building Suite A100, Monday-Friday 8am-5pm, no appointment necessary
- [Career Closet](#) can help for those interviewing in a pinch
- [Military & Veterans Services](#): Going from military life to the life of a college student can be a big change

### **Take Care of Business**

- [Student Legal Services](#) Off-campus housing, scams targeting students, name changes, etc.
- [iGrad](#) and [Financial Literacy Resources](#) can provide tools to help anyone manage their money

For more resources and information, please see the Graduate School's [Graduate Student Guide](#):

Search Office of Student Activities [Graduate Student Groups by Area of Interest](#)

## SECTION 15:

### Development of Ethics in Scholarly Activities

#### 15.1 Ethical Standards

The Biomedical Engineering faculty believe that a thorough graduate education must include the development of ethical standards. This is evidenced by the requirement of a core Biomedical Engineering Ethics course for all degree seekers. The faculty further believe that since Biomedical Engineering includes engineering and the life and health sciences, Biomedical Engineers should perform scholarly activities with due regard to the scholarly misconduct definitions put forth by both the National Institutes of Health (NIH) and the National Science Foundation (NSF). Consequently, all Biomedical Engineering students, in all their academic and research activities, are expected to avoid the following practices:

1. Intentional misrepresentation of data
2. Plagiarism
3. Breach of confidentiality

#### 15.2 Graduate Student Code of Research and Scholarly Conduct

Students are expected to follow [The Graduate Student Code of Research and Scholarly Conduct](#) introduced in the GSH as follows: *“Graduate students and Graduate Faculty aspire to professional behavior that is consistent with the highest ethical and moral standards. The Graduate School at The Ohio State University expects that graduate students will demonstrate responsibility and integrity in pursuing their creative and scholarly interests. The academic enterprise is dependent upon such behavior. Graduate students are responsible for learning about appropriate standards for ethical research and scholarly conduct and for following all university policies related to ethical research and scholarly conduct.”*

#### 15.3 The Role of Awareness in Academic Integrity

At first glance, you may not think policies on misconduct apply to you at all, but you may be surprised at how simple definitions of misconduct might differ. As a student, you may read something here that helps you realize, now or years from now, that a friend or classmate unknowingly is engaging in some sort of misconduct and jeopardizing their career. Either way, being aware of the Student Code of Conduct and the resources available to help avoid misconduct can be a game changer for you or a friend at some point in the future. Students may find the following piece from the Office of Academic Affairs website to be particularly helpful: [Ten Suggestions for Preserving Academic Integrity](#).

#### 15.4 Academic Misconduct

[Ohio State’s Committee on Academic Misconduct \(COAM\)](#) is charged with investigating allegations of academic misconduct. Graduate students are expected to be familiar with relevant policies and procedures governing academic and scholarly conduct at Ohio State. For complete information, please consult the [Office of Academic Affairs](#).

Student should take advantage of workshops on campus designed to define and reduce plagiarism such as [Preparing Papers](#) at the Dennis Learning Center or investigate [plagiarism and copyright resources](#) compiled by the University Libraries.

*“I did then what I knew how to do. Now that I know better, I do better.”*

*Maya Angelou,  
Activist/Writer*

## WHAT IS ACADEMIC MISCONDUCT?

In the University Rules and Bylaws, the [Code of Student Conduct](#) defines academic misconduct as "any activity that tends to compromise the academic integrity of the University, or subvert the educational process." While many people associate academic misconduct with "cheating," the term encompasses a wider scope of student behaviors which include, but are not limited to, the following:

- Violation of course rules;
- Violation of program regulations;
- Knowingly providing or receiving information during a course exam or program assignment;
- Possession and/or use of unauthorized materials during a course exam or program assignment;
- Knowingly providing or using assistance in the laboratory, on field work, or on a course assignment, unless such assistance has been authorized specifically by the course instructor or, where appropriate, a project/research supervisor;
- Submission of work not performed in a course: This includes (but is not limited to) instances where a student fabricates and/or falsifies data or information for a laboratory experiment (i.e., a "dry lab") or other academic assignment. It also includes instances where a student submits data or information (such as a lab report or term paper) from one course to satisfy the requirements of another course, unless submission of such work is permitted by the instructor of the course or supervisor of the research for which the work is being submitted;
- Submitting plagiarized work for a course/program assignment;
- Falsification, fabrication, or dishonesty in conducting or reporting laboratory (research) results;
- Serving as or asking another student to serve as a substitute (a "ringer") while taking an exam;
- Alteration of grades in an effort to change earned credit or a grade;
- Alteration and/or unauthorized use of university forms or records.

## SECTION 16:

### MS and PhD Application & Admission Requirements

#### 16.1 General Information

Students can apply to Biomedical Engineering (BME) MS and PhD programs for Autumn and less commonly, for Spring Semester. Below are the application deadlines and requirements. (Applicants to the BS/MS program, see section 12. Applicants to the MD/PhD - MSTP, see Section 11.)

#### 16.2 Application Deadlines

##### ***For Autumn*** – August

*For admission & fellowship consideration for PhD & MD/PhD and admission to MS*

- Nov 30** International applicants for fellowship consideration
- Dec 15** Domestic applicants for fellowship consideration
- May 1** Last-minute deadline for general admission

##### ***For Spring*** – January

*For admission to MS or PhD*

- Oct 15** Recommended for all, required for International applicants
- Nov 1** Last-minute deadline for all general admission

#### **When should I visit Ohio State?**

BME works closely with the College of Engineering Office of Graduate Recruitment and Support on annual events such as the [Graduate Engineering Open House \(GEOH\)](#) and participates with the university's Office of Diversity and Inclusion on their [Graduate and Professional Student Recruitment Initiative \(GPS\)](#). Some travel stipends available. Visit their pages to find out how to attend or apply.

#### 16.3 Basics of Filing the Application

Applicants must submit the application, fee, and all required materials by the deadlines above in order for the application to be considered for admission to BME graduate programs.

There are two main offices involved in processing applications: The Ohio State University Office of Graduate Admissions and the BME Graduate Studies Office. The Graduate Studies Office within BME works with the University's Graduate Admissions Office application system to manage the application process and provide assistance.

The following materials must be submitted to the Ohio State Office of Graduate Admissions via the online application system:

- [Graduate school application](#)
- Nonrefundable application fee: \$60.00 for domestic applicants; \$70.00 for international applicants
- Official [transcripts](#) from all universities attended (exception: Ohio State students do not need to provide Ohio State transcripts but must provide transcripts for transfer work done at a separate institution)
- Official [TOEFL score](#) for international applicants
- A [statement of purpose](#) of no more than 2 pages describing your career goals, research interests and experience, desired program of study, etc. (Please see writing prompt ideas on the next page.)
- Three [letters of recommendation](#), preferably from academic sources (exception: Ohio State BME BS applying to the non-thesis MS may submit 2 from Ohio State BME)
- Abstract of the MS thesis (if you are applying to the PhD and have earned an MS degree) or a list of research experiences, conference presentations, or publications, if you have any
- CV or Resume

Find complete application instructions [here](#).

Find helpful tips to solve common application tech issues [here](#).

**If the [Graduate Admissions Office tips](#) don't help, here are a few more:**

Can I get an application fee waiver?

There may be some opportunities for you [here](#).

What if I need more details on transcript submissions?

Check [here](#) or [ask a graduate admissions counselor](#).

How do I check my application status?

First, check your [applicant center](#) to see if items have been received properly.

If there are questions about a special case such as committee decision wait times or replacing a document, contact application staff in the [BME graduate studies office](#).

Help! I need to upload material after I have applied.

Use the [document uploader](#) but please avoid multiple submissions.

#### **16.4 Things to Do Before and During the Application Process:**

The Biomedical Engineering Graduate Studies Committee (BMEGSC) meets roughly once per month to review applications that have been filed with Ohio State's Office of Graduate Admissions. Decision times vary depending on time of the year, funding availability, and faculty recruitment needs.

As you may have discovered, admission philosophies and practices differ among programs and departments, even within the same university. In BME, we aim for the long-term success of PhD students and therefore emphasize a research interest and funding match between the applicant and the faculty advisor. We recommend that all PhD applicants explore the [research areas](#) and [faculty](#) on our website and contact them directly about their interest and availability to advise and/or fund new graduate students. PhD applicants with a strong academic background and a solid research and funding match with Ohio State faculty will receive a high priority for admission and fellowship nomination. All PhD applicants are encouraged to introduce themselves to and connect with potential faculty advisors. [Email is often the best way to reach faculty](#).

The MS is a self-funded degree. However, those interested in pursuing research toward a thesis will want to make sure there are faculty doing research in your area of interest. This step is not as necessary for non-thesis MS students for whom the program is course-based.

#### **16.5 How and When the BMEGSC Makes Admission Decisions**

Once a complete application is received, the BMEGSC will make your application information available to all BME faculty. Some recruiting faculty members are able to offer Graduate Research Associateships (GRAs): positions for which students do lab tasks and activities in exchange for tuition and a stipend. Recruiting faculty also assist the BMEGSC in nominating applications in university- and college-wide fellowship (i.e., scholarship) competitions that can pay tuition and a stipend if awarded. An early and complete application, along with a good match with faculty research, is critical to being nominated in fellowship competitions.

Once the BMEGSC learns the results of fellowship competitions (typically during February and March) we will begin to make admission offers and invite recruited students for campus visits (often with a travel stipend). All admission considerations happen between January and April 15<sup>th</sup>, the nationally agreed upon date by which most schools require an acceptance decision. Applicants are encouraged to stay in touch with faculty and BME graduate studies office staff during this time period and to let us know if we can help with enrollment decisions.

### Things to think about when drafting your statement of purpose

1. What are your most significant attributes? How do you think these attributes will contribute to your success in the degree program(s) to which you are applying (non-thesis MS or thesis MS or PhD)? Describe one instance in which you have used these attributes to accomplish your goals.
2. Describe succinctly a personal or academic challenge (small or large) you have faced and how you successfully handled this challenge. What did you learn? What would you do differently?
3. For PhD or thesis-MS applicants only: Summarize highlights of your research experience (including methods, lab or company, advisor, publications, conference presentations, etc.); tell us about a successful research experience (which may include some failures); and describe your process for progressing in or completing your research.
4. After reading faculty research interests on the BME Department website, please name the specific areas and faculty with whom you would like to work and explain why.
5. State your long-term career goals. How does earning your degree of choice (non-thesis MS or thesis-MS or PhD) assist with achieving these goals?

### 16.6 Required Application Background

Most applicants to the MS or PhD programs have an engineering background. A list of **Required Background Courses for Non-engineers** is available in the **Appendix I** of this handbook. Note that applicants typically are not considered for admission without earning at least a 3.0/4.0 in most of the required background courses, with an emphasis on math through differential equations. Our past experiences have confirmed that an engineering background is essential for success in a graduate-level engineering program; lesser preparation could jeopardize successful completion of the degree.

### 16.7 Admission Requirements

Admission to The Ohio State University Biomedical Engineering Graduate Program is based in part on several university requirements:

1. **The equivalent of a four-year bachelor's or advanced degree** from an accredited college or university, earned by the expected date of entry into your graduate program. Students who have not completed a bachelor's degree in an engineering discipline are expected to take the courses necessary to acquire an appropriate engineering background before applying. Students may apply directly to the PhD without a master's degree.
2. **A minimum 3.0 cumulative GPA** (on a [4.0 scale or equivalent](#)) for the last bachelor's degree earned. Although this is the minimum for consideration by the university's Graduate School, prospective students should be aware that the average GPA of *admitted* BME students may be higher.
3. **A minimum of 3.3 cumulative point-hour ratio or GPA** (on the [4.0 scale or equivalent](#)) in all previous graduate work. This is the GPA required for an applicant to be considered for admission. *In general, applicants for the PhD program are expected to have earned a higher cumulative point-hour ratio than is expected of applicants for the MS degree.*
4. For applicants whose native language is not English, who have been educated primarily outside of the U.S., or who have held U.S. permanent resident, asylee or refugee status for less than one year from the first term of enrollment: **A minimum score of 19 on each section of the paper-based TOEFL; 79 on the Internet Based TOEFL or TOEFL Special Home Edition; or 7.0 on the IELTS exam or IELTS Indicator.** (See [exemptions](#) and [Duolingo exceptions](#) for 2021 applicants.)
5. **An abstract of the MS thesis/project or similar published work**, when available, is required of PhD applicants. The requirement may be waived for students who are applying directly to the PhD from a bachelor's degree program.

## 16.8 Application Advice & Events

Applicants may apply directly to the PhD program without a master's degree; we admit directly to PhD program.

In very rare circumstances, the BMEGSC may petition the Graduate School to request conditional admission for an applicant not meeting the 3.0/4.0 university GPA cut. This is an option used for applicants demonstrating outstanding achievement amidst extenuating circumstances, with other mitigating factors and experience. If approved by the Graduate School, a student would need to meet conditions set forth by them in the first semester before an official offer of admission could be made.

Choose recommenders who can speak to your academic and research skills: professors and research supervisors are preferred to academic advisors or employers, but there can always be exceptions for a good letter of reference.

Prospective students seeking guidance on applying may contact the BME Graduate Studies Coordinator ([senitko.1@osu.edu](mailto:senitko.1@osu.edu)) or for more in-depth discussions of the field, BMEGSC Chair ([liu.314@osu.edu](mailto:liu.314@osu.edu)).

Be sure to reply to emails from the BME Graduate Studies Coordinator – as well as staff of all programs to which you have applied – and make sure your application email address is current. *This can make all the difference when last-minute application problems are caught or new funding or research leads are found.*

In addition to making connections at local [Graduate Engineering Open House \(GEOH\)](#) and [Graduate and Professional Student Recruitment Initiative \(GPS\)](#) events, students attending professional conferences such as the national meeting of the [Biomedical Engineering Society \(BMES\)](#) or [Annual Biomedical Research Conference for Minority Students \(ABRCMS\)](#) should be sure to visit the Ohio State booths; seek out Ohio State research; and make connections with faculty, students, and graduate program staff.

## 16.9 Applying from BME MS to BME PhD

Current students enrolled in the BME master's program who wish to apply to the doctoral program must submit the request for admission in writing and with approval of their advisor to the BMEGSC for consideration. A program of study must be included. Previously enrolled students who have not been enrolled in the Graduate School for more than two years must submit a petition to the BMEGSC for permission to re-enroll in the program. Each case will be judged on its individual merit.

## 16.10 Transferring from an Ohio State Graduate Program to BME

Applicants to the graduate program who have enrolled in another graduate program at Ohio State and wish to [transfer into a new graduate program](#) follow different application procedures. Contact Graduate School Registration Services at [grad-schoolregistrationservices@osu.edu](mailto:grad-schoolregistrationservices@osu.edu) or 614-292-6031 for information about eligibility to re-enroll or procedures to change programs. Neither fellowships nor candidacy exams can transfer into a new program.

## Appendices to BME Handbook

Revised July 2012; AU2015; AU2018; SU2020



*Post-docs, graduate students, staff, and faculty strike a pose at the Buckeye reception during the national BMES annual meeting.*

**APPENDIX A:****Suggested Courses for MS and PhD Programs of Study**

Rev SP20

*These courses may be used as listed or may be petitioned for use in a different category. Courses not on this list also may be proposed.*

| <b>Department</b> | <b>Course Title</b>  | <b>Type</b>      | <b>Category</b> |
|-------------------|--|------------------|-----------------|
| ANATOMY 6900      | Human Anatomy for Graduate Students                          |                  | Elective        |
| ANATOMY 7500      | Imaging in Human Anatomy                                     |                  | Elective        |
| BIOCHEM 6701      | Advanced Biochemistry: Molecular Biology                     |                  | Elective        |
| BIOCHEM 6761      | Advanced Biochemistry: Macromolecular Structure and Function |                  | Elective        |
| BIOCHEM 6762      | Advanced Biochemistry: Enzymes                               |                  | Elective        |
| BIOCHEM 6763      | Advanced Biochemistry: Membranes and Lipids                  |                  | Elective        |
| BIOCHEM           | Advanced Biochemistry: Nucleic Acids                         |                  | Elective        |
| BIOCHEM           | Advanced Biochemistry: Protein Engineering                   |                  | Elective        |
| BIOCHEM 8990      | Advanced Topics in Biochemistry                              |                  | Elective        |
| BIOMEDE 5001      | Cardiovascular Bioengineering                                | Engineering      | Fundamental     |
| BIOMEDE 5110      | Biomedical Microscopic Imaging                               | Engineering      | Fundamental     |
| BIOMEDE 5120      | Biomedical Optics  | Engineering      | Fundamental     |
| BIOMEDE 5177      | Biomedical Atomic Force Microscopy                           | Engineering      | Fundamental     |
| BIOMEDE 5186      | Biomedical Ultrasound  | Engineering      | Fundamental     |
| BIOMEDE           | Group Studies in Biomedical Engineering                      | Engineering      | Fundamental     |
| BIOMEDE           | Mechanobiology of Musculoskeletal                            | Engineering      | Fundamental     |
| BIOMEDE           | Polymers in Bioengineering                                   | Engineering      | Fundamental     |
| BIOMEDE           | Cell Plasticity  | Engineering      | Fundamental     |
| BIOMEDE           | Ocular Biomechanics  | Engineering      | Fundamental     |
| BIOMEDE 5310      | Advanced Biomaterials  | Engineering      | Fundamental     |
| BIOMEDE 5353      | Hard-Tissue Biomaterials                                     | Engineering      | Fundamental     |
| BIOMEDE 5359      | Extracellular Matrix in BME                                  | Engineering      | Fundamental     |
| BIOMEDE 5420      | Mechanobiology   | Engineering      | Fundamental     |
| BIOMEDE 5421      | Tissue Mechanics   | Engineering      | Fundamental     |
| BIOMEDE 5430      | Finite Element Applications in BME                           | Engineering      | Fundamental     |
| BIOMEDE 5470      | Cell & Tissue Mechanics                                      | Engineering      | Fundamental     |
| BIOMEDE 5510      | Tissue Engineering   | Engineering      | Fundamental     |
| BIOMEDE 5550      | Eng Principles in Cancer                                     | Engineering      | Fundamental     |
| BIOMEDE 5560      | BME Apps in Cancer Biology                                   | Engineering      | Fundamental     |
| BIOMEDE 5580      | Excitable Cell Engineering                                   | Math/Engineering | Fundamental     |
| BIOMEDE 5610      | Biomedical Microdevices                                      | Engineering      | Fundamental     |
| BIOMEDE 5635      | Cellular Nanotechnology                                      | Engineering      | Fundamental     |
| BIOMEDE 5639      | Medical Device Design  | Engineering      | Fundamental     |
| BIOMEDE 5663      | Intro to Microfluidics and Nanofluidics                      | Engineering      | Fundamental     |
| BIOMEDE 5667      | BioMEMS Microfabrication                                     | Engineering      | Fundamental     |
| BIOMEDE 5668      | Biomedical Microtransducers                                  | Engineering      | Fundamental     |
| BIOMEDE 5669      | Principles and Design Theory for Adv Med Devices             | Engineering      | Fundamental     |
| BIOMEDE 6113      | Magnetic Res Spectro & Imaging I                             | Engineering      | Fundamental     |
| BIOMEDE 7114      | Magnetic Res Spectro & Imaging II                            | Engineering      | Fundamental     |

| Department   | Course Title   | Type             | Category |
|--------------|--|------------------|----------|
| BIOPHRM 5300 | Molecular Pharmacology   |                  | Elective |
| BIOPHRM 5600 | Introduction to General Pharmacology                                 |                  | Elective |
| BIOPHRM 5852 | Biology of Aging   |                  | Elective |
| BIOPHRM 7050 | Neurobiology of Disease  |                  | Elective |
| BIOPHRM 7560 | Clinical Trials I: Design and Regulation                             |                  | Elective |
| BIOPHRM 8300 | Molecular Pharmacology and Human Disease                             |                  | Elective |
| BIOPHYS 6702 | Advanced Experimental Methods in Biophysics                          |                  | Elective |
| BUSMHR 7525  | Global Innovation and Entrepreneurial Leadership                     | Business/Tech    | Elective |
| BUSMHR 7531  | Technology Ventures Lab  | Business/Tech    | Elective |
| CBE 5765     | Principles of Biochemical Eng  | Engineering      | Elective |
| CBE 5774     | Polymer Membranes  | Engineering      | Elective |
| CBE 5775     | Rheology of Fluids   | Engineering      | Elective |
| CBE 5777     | Introduction to Polymer Engineering at Macro-, Micro-, and Nanoscale | Engineering      | Elective |
| CBE 5779     | Design and Analysis of Experiments                                   | Engineering      | Req      |
| CBE 8815     | Advanced Transport   | Engineering      | Elective |
| CHEM 5520    | Nanochemistry  |                  | Elective |
| CHEM 7160    | Nuclear Magnetic Resonance Spectroscopy                              |                  | Elective |
| CHEM 7370    | Nanochemistry and Nanomaterials                                      |                  | Elective |
| CHEM 7380    | Inorganic Materials  |                  | Elective |
| CHEM 7590    | Molecular Simulation of Materials                                    |                  | Elective |
| CSE 5526     | Introduction to Neural Networks                                      | Math/Engineering | Elective |
| DENT 8209    | Biomechanics I   | Engineering      | Elective |
| DENT 8211    | Orthodontic Materials  |                  | Elective |
| DENT 8471    | Dental Materials Metals and Polymers                                 |                  | Elective |
| DENT 8472    | Dental Materials: Ceramics and Polymers                              |                  | Elective |
| DENT 8840    | Current Issues in Oral Biology                                       |                  | Elective |
| ECE 5012     | Integrated Optics  | Engineering      | Elective |
| ECE 5025     | Power Electronic Devices, Circuits, & Applications                   | Engineering      | Elective |
| ECE 5033     | Surfaces and Interfaces of Electronic Materials                      | Engineering      | Elective |
| ECE 5037     | Solid-state Electronics and Photonics Lab                            | Engineering      | Elective |
| ECE 5070     | Neuroengineering and Neuroprosthetics                                | Engineering      | Elective |
| ECE 5131     | Lasers   | Engineering      | Elective |
| ECE 5200     | Intro to Digital Signal Processing                                   | Engineering      | Elective |
| ECE 5206     | Medical Imaging and Processing                                       | Engineering      | Elective |
| ECE 5207     | Real-Time Digital Signal Processing Laboratory                       | Engineering      | Elective |
| ECE 5362     | Computer Architecture and Design                                     | Engineering      | Elective |
| ECE 5460     | Image Processing   | Engineering      | Elective |
| ECE 5530     | Fund of Semicond for Micro- & Opto-elect and Photonics               | Engineering      | Elective |
| ECE 6001     | Probability and Random Variables                                     | Engineering      | Elective |
| ECE 6010     | Electromagnetic Field Theory I                                       | Engineering      | Elective |
| ECE 6011     | Bioelectromagnetics  | Engineering      | Elective |
| ECE 6030     | Micro-Electro-Mechanical Systems Design                              | Engineering      | Elective |
| ECE 6202     | Stochastic Signal Processing   | Engineering      | Elective |
| ECE 6531     | Fundamentals of Semiconductor Devices                                | Engineering      | Elective |
| ECE 6532     | Nanofabrication and Nanoscale Devices                                | Engineering      | Elective |
| ECE 6750     | Linear Systems Theory  | Engineering      | Elective |

| Department   | Course Title  | Type               | Category    |
|--------------|---|--------------------|-------------|
| ECE 7868     | Pattern Recognition and Machine Learning                          | Engineering        | Elective    |
| ENGREDU 7780 | Research Design in Engineering Education                          | Teaching/Education | Elective    |
| FABENG 7220  | College Teaching in Engineering                                   | Teaching/Education | Elective    |
| FABENG 7230  | Probabilistic Methods in Engineering Design                       | Engineering        | Elective    |
| HTHRHSC 5100 | Introduction to Assistive Technology                              | Engineering        | Elective    |
| HTHRHSC 5200 | Assistive Technology for Seating and Mobility                     | Engineering        | Elective    |
| HTHRHSC 5400 | Computer, Communication and Control Technologies for Individuals  | Engineering        | Elective    |
| HTHRHSC 5450 | Assistive Technology for Sports and Recreation                    | Engineering        | Elective    |
| HTHRHSC 5500 | Introduction to Pathophysiology                                   | Engineering        | Elective    |
| HTHRHSC 5510 | Pharmacological Aspects of Practice in Health and Rehabilitation  | Engineering        | Elective    |
| HTHRHSC 7100 | Introduction to Health & Rehabilitation Science I                 | Engineering        | Elective    |
| HTHRHSC 7400 | Injury Biomechanics: Topics in Mechanisms and Prevention          | Engineering        | Elective    |
| HTHRHSC 7410 | Advanced Structure and Function of the Human Body                 | Engineering        | Elective    |
| HTHRHSC 7411 | Injury Biomechanics-Foundations and Experience                    | Engineering        | Fundamental |
| HTHRHSC 8680 | Experimental Methods in Biomechanics                              | Engineering        | Elective    |
| ISE 5110     | Design of Engineering Experiment                                  | Engineering        | Req         |
| ISE 5600     | Principles of Occupational Biomechanics and Ergonomics            | Engineering        | Elective    |
| ISE 5610     | Ergonomics in the Product Design Process                          | Engineering        | Elective    |
| ISE 5683     | Fundamentals of Product Design Engineering Laboratory             | Engineering        | Elective    |
| ISE 7610     | Adv Topics: Spine Biomechanics                                    | Engineering        | Elective    |
| ISE 7615     | Biomechanics Research Practicum: Experience in Spine Biomechanics | Engineering        | Elective    |
| ISE 7620     | Adv Topics: Upper Extremity Biomech                               | Engineering        | Elective    |
| ISE 7625     | Biomechanics Research Practicum: Experience in Upper Extremity    | Engineering        | Elective    |
| MATH 5101    | Linear Mathematics in Finite Dimensions                           | Math               | Elective    |
| MATH 5401    | Applied Differential Equations I                                  | Math               | Elective    |
| MATH 5421    | Mathematics of Infectious Disease Dynamics                        | Math               | Elective    |
| MATH 5601    | Essentials of Numerical Methods                                   | Math               | Elective    |
| MATH 5651    | Mathematical Modeling of Biological Processes                     | Math               | Elective    |
| MATH 8650    | Topics in Mathematical Biology                                    | Math               | Elective    |
| MATSCEN 5532 | Electronic, Optical, and Magnetic Properties Lab                  | Engineering        | Elective    |
| MATSCEN 5552 | Nanoscale Synthesis and Processing of Electronic Materials        | Engineering        | Elective    |
| MATSCEN 5571 | Electroceramics   | Engineering        | Elective    |
| MATSCEN 5611 | Materials in Medicine   | Engineering        | Fundamental |
| MATSCEN 5631 | Biomaterials Lab  | Engineering        | Elective    |
| MATSCEN 5641 | Structure-Property Relationships of Polymers                      | Engineering        | Elective    |
| MATSCEN 5651 | Biomaterials Processing   | Engineering        | Elective    |
| MATSCEN 5711 | Intro to Composites   | Engineering        | Elective    |
| MATSCEN 5761 | Mechanical Behavior of Crystalline Solids                         | Engineering        | Elective    |
| MATSCEN 5774 | Polymer Membranes   | Engineering        | Elective    |
| MATSCEN 6715 | Principles of Characterization of Materials                       | Engineering        | Elective    |
| MATSCEN 6730 | Thermodynamics of Materials                                       | Engineering        | Elective    |
| MATSCEN 6756 | Computational Materials Modeling                                  | Engineering        | Elective    |
| MATSCEN 6765 | Mechanical Behavior of Materials                                  | Engineering        | Elective    |
| MATSCEN 6777 | Electronic Properties of Materials                                | Engineering        | Elective    |
| MATSCEN      | Additive Manufacturing  | Engineering        | Fundamental |
| MATSCEN 7855 | Electron Diffraction, Imaging, and Spectroscopies                 | Engineering        | Elective    |

| Department   | Course Title  | Type             | Category    |
|--------------|---|------------------|-------------|
| MECHENG 4510 | Heat Transfer   | Engineering      | Elective    |
| MECHENG 5134 | Introduction to Vibrations of Deformable Solids             | Engineering      | Elective    |
| MECHENG 5139 | Applied Finite Element Method                               | Engineering/Math | Fundamental |
| MECHENG 5144 | Eng Fracture Mechanics                                      | Engineering      | Elective    |
| MECHENG 5162 | Introduction to Laminated Composite Materials               | Engineering      | Elective    |
| MECHENG 5180 | Mechanics of Biomolecular Systems                           | Engineering      | Elective    |
| MECHENG 5372 | Design and Control of Mechatronic Systems                   | Engineering      | Elective    |
| MECHENG 5374 | Smart Materials & Intelligent Systems                       | Engineering      | Elective    |
| MECHENG 5539 | Applied Computational Fluid Dynamics and Heat Transfer      | Engineering      | Elective    |
| MECHENG 5680 | Computer Aided Design and Manufacturing                     | Engineering      | Elective    |
| MECHENG      | Fundamentals of Product Design Engineering                  | Engineering      | Elective    |
| MECHENG      | Product Design Engineering for Entrepreneurs                | Engineering      | Elective    |
| MECHENG 5683 | Fundamentals of Product Design Engineering Laboratory       | Engineering      | Elective    |
| MECHENG 5700 | Introduction to Musculoskeletal Biomechanics                | Engineering      | Fundamental |
| MECHENG 5751 | Design and Manufacturing of Compliant Mechanisms and Robots | Engineering      | Elective    |
| MECHENG 6505 | Intermediate Fluid Dynamics                                 | Engineering      | Elective    |
| MECHENG 6507 | Intermediate Numerical Methods                              | Engineering/Math | Elective    |
| MECHENG 6510 | Intermediate Heat Transfer                                  | Engineering      | Elective    |
| MECHENG 6515 | Intro to Microfluids and Nanofluids                         | Engineering/Math | Fundamental |
| MECHENG 6665 | Reliability Engineering I                                   | Engineering      | Elective    |
| MECHENG 6700 | Musculoskeletal Biomechanics                                | Engineering      | Fundamental |
| MECHENG 7100 | Intro to Continuum Mech                                     | Engineering      | Elective    |
| MECHENG 7163 | Adv Strength of Materials and Elasticity Theory             | Engineering      | Elective    |
| MECHENG 7385 | Adv Methods in the Dynamics and Control of Human and Animal | Engineering      | Elective    |
| MECHENG 7837 | Nanotechnology and Biomimetics                              | Engineering      | Elective    |
| MECHENG 8372 | Fault Diagnosis In Dynamic Systems                          | Engineering      | Elective    |
| MECHENG 8514 | Optical Techniques in Fluid Flows                           | Engineering      | Elective    |
| MICRBIO 5122 | Immunology  |                  | Elective    |
| MICRBIO 7010 | Cellular and Molecular Immunology                           |                  | Elective    |
| MOLGEN 5300  | Cancer Genetics   |                  | Elective    |
| MOLGEN 5607  | Cell Biology  |                  | Elective    |
| NEUROSC 7001 | Foundations of Neuroscience I                               |                  | Elective    |
| NEUROSC 7002 | Foundations of Neuroscience II                              |                  | Elective    |
| NEUROSC 7050 | Neurobiology of Disease                                     |                  | Elective    |
| NEUROSC 7500 | Neuroimmunology   |                  | Elective    |
| NURSING 7560 | Clinical Trials I: Design and Regulation                    |                  | Elective    |
| NURSING 7770 | Fund of Med Product Design and Regulation                   | Business/Tech    | Elective    |
| NURSING 7782 | Clinical Research Design and Methods                        |                  | Elective    |
| NURSING 8783 | Quantitative Design for Nursing Research                    |                  | Elective    |
| NURSING 8784 | Qualitative Design for Nursing Research                     |                  | Elective    |
| NURSING 8786 | Advanced Design for Nursing                                 |                  | Elective    |
| PATHOL 7847  | Cellular Mechanisms and Pathogenesis of Inflammation        |                  | Elective    |
| PHR 5270     | Antibiotics and Microbial Natural Products                  |                  | Elective    |
| PHR 7350     | Drug Discovery and Drug Design                              |                  | Elective    |
| PHR 7570     | Pharmaceutical Safety and Risk Management                   |                  | Elective    |
| PHR 7572     | Global Regulation of Medical Products                       | Business/Tech    | Elective    |

| Department   | Course Title  | Type        | Category |
|--------------|---|-------------|----------|
| PHR 7782     | Clinical Research Design and Methods                    |             | Elective |
| PHR 8750     | Molecular and Cellular Pharmacology I                   |             | Elective |
| PHR 8760     | Molecular and Cellular Pharmacology II                  |             | Elective |
| PHYS 6809    | Topics in Biophysics                                    | Engineering | Elective |
| PHYS 7501    | Quantum Mechanics I                                     | Engineering | Elective |
| PHYS 7502    | Quantum Mechanics II                                    | Engineering | Elective |
| PHYS 8805.01 | Topics in Nuclear Physics I                             | Engineering | Elective |
| PHYS 8809.01 | Topics in Biophysics                                    | Engineering | Elective |
| PHYSIO 6101  | Advanced Human Physiology I                             |             | Req      |
| PHYSIO 6102  | Advanced Human Physiology 2                             |             | Req      |
| PHYSIO 8101  | Advanced Cardiac Physiology                             |             | Elective |
| PHYSTHR 6250 | Neural Basis of Movement                                |             | Elective |
| PHYSTHR 7235 | Biomechanics for Physical Therapy I                     |             | Elective |
| PHYSTHR 8610 | Advanced Orthopedic Physical Therapy                    |             | Elective |
| PHYSTHR 8650 | Advanced Neurologic Rehabilitation                      |             | Elective |
| PHYSTHR 8680 | Experimental Methods in Biomechanics                    |             | Elective |
| PSYCH 5425   | Introduction to Functional Magnetic Resonance Imaging   |             | Elective |
| PSYCH 5614   | Cognitive Neuroscience                                  |             | Elective |
| PSYCH 5618   | Introduction to Computational Cognitive Neuroscience    |             | Elective |
| PSYCH 5621   | Introduction to the Event-Related-Potentials            |             | Elective |
| PSYCH 5628   | Developmental Cognitive Neuroscience                    |             | Elective |
| PUBHBIO 6210 | Design and Analysis of Studies in the Health Sciences I |             | Elective |
| RADIOLG 6813 | Magnetic Resonance Spectroscopy and Imaging I           |             | Elective |
| STAT 5301    | Intermediate Data Analysis I                            | Math        | Elective |
| STAT 6410    | Design and Analysis of Experiments                      | Math        | Elective |
| STAT 6450    | Applied Regression Analysis                             | Math        | Elective |
| STAT 6540    | Applied Stochastic Processes                            | Math        | Elective |
| STAT 6625    | Statistical Analysis of Genetic Data                    |             | Elective |
| STAT 8460    | Special Topics in Design of Experiments                 | Math        | Elective |
| VETBIOS 7790 | Electrocardiography                                     |             | Elective |
| VISSCI 8002  | Ocular Motility and Binocular Vision                    |             | Elective |
| VISSCI 8101  | Designing Clinical Studies                              |             | Elective |
| VISSCI 8111  | Advanced Topics in Low Vision                           |             | Elective |
| VISSCI 8112  | Advanced Binocular Vision and Visual Plasticity         |             | Elective |

**APPENDIX B:  
SAMPLE BME PhD Program Template**

Customize your own template for Candidacy Committee approval and submit to the BMEGSC:  
<https://bme.osu.edu/forms-templates-current-graduate-students>

Program of Study Template for  
 PhD Program  
 Biomedical Engineering  
 rev Sept 2010; 2012; 2018; 2020

6/25/2020

Please complete this form to show how you plan to meet program requirements. Some "example" text is shown in the template below. Delete and customize. Courses from outside OSU must be labeled, italicized, and accompanied by a syllabus.

Name *Brutus Buckeye* Start Term *AU20*

| REQUIRED COURSES |                                    |         |                        |        |         |       |           |             |
|------------------|------------------------------------|---------|------------------------|--------|---------|-------|-----------|-------------|
| Category         | Course Name                        | Term/YR | Department             | Number | Credits | Grade | Professor | Institution |
| Req Core         | Scientific Methods in BME          | AU20    | Biomedical Engineering | 6000   | 1       | A     | Roberts   | OSU         |
| Req Core         | Seminar Biomedical Engineering     | SP22    | Biomedical Engineering | 8814   | 2       | S     |           | OSU         |
| Req Core         | Design and Analysis of Experiments | AU20    | ChBE                   | 5779   | 3       | A     | Ratzman   | OSU         |
| Req Core         | Research Ethics                    | AU20    | Biomedical Engineering | 6983   | 2       | A-    | Litsky    | OSU         |
| Req Core         | Organ System Physiology            | AU21    | Physio CB              | 6101   | 3       | B+    | Group     | OSU         |

| FUNDAMENTALS |                       |         |                        |        |         |       |           |             |
|--------------|-----------------------|---------|------------------------|--------|---------|-------|-----------|-------------|
| Category     | Course Name           | Term/YR | Department             | Number | Credits | Grade | Professor | Institution |
| Fund 1       | Biomedical Optics     | AU20    | Biomedical Engineering | 5120   | 3       | A-    | Xu        | OSU         |
| Fund 2       | Biomedical Ultrasound | SP21    | Biomedical Engineering | 5186   | 3       | A-    | Liu       | OSU         |
| Fund 3       |                       |         |                        |        |         |       |           |             |
| Fund 4       |                       |         |                        |        |         |       |           |             |

| ELECTIVE COURSES: 1 ENG, 1 Math, 2 Other |   |         |            |        |         |       |           |             |
|--|---|---------|------------|--------|---------|-------|-----------|-------------|
| Category                                 | Course Name                                   | Term/YR | Department | Number | Credits | Grade | Professor | Institution |
| Math                                     | Mathematical Modeling of Biological Processes |         | Math       | 5651   | 3       | A     | Brown     | OSU         |
| Eng                                      |   |         |            |        |         |       |           |             |
| Elect                                    |   |         |            |        |         |       |           |             |
| Elect                                    |   |         |            |        |         |       |           |             |

|                    |  |                    |
|--------------------|--|--------------------|
| REQUIRED COURSES   | 11 cr hours required   |                    |
| 4 FUND             | 12 cr hours required   | GPA: 4 FUND > 3.35 |
| 2 ELECTIVE         | 6 cr hours required  |                    |
| 2 FREE ELECTIVES   | 6 cr hours required  |                    |
| COURSE TOTAL       | 35 cr hours required   | 35                 |
| BME RESEARCH HOURS | 45 cr hours required   | 45                 |
| GRAND TOTAL        | 80 cr hours required   | 80                 |
| DISSERTATION TOPIC | Description of dissertation topic here   |                    |
| PETITION?          | Y or N List proposed BME Fundamental course if GPA listed above is between 3.00-3.34 |                    |

| 4 Candidacy Committee Members |                  | Area of Expertise | Signatures or emails REQUIRED before BMEGSC review       |
|-------------------------------|------------------|-------------------|--|
| Advisor                       | Print names here |                   | Signature or emails of approval needed for all 4 members |
| 2nd Member                    |                  |                   |  |
| 3rd Member                    |                  |                   |  |
| 4th Member                    |                  |                   |  |

**APPENDIX C:  
SAMPLE BME Thesis-MS Program Template**

Customize your own template for Candidacy Committee approval and submit to the BMEGSC:  
<https://bme.osu.edu/forms-templates-current-graduate-students>

Program of Study Template for  
 Thesis MS Program  
 Biomedical Engineering  
rev Sept 2010; 2012; 2018; 2020

6/25/2020

Please complete this form to show how you plan to meet program requirements. Some "example" text is shown in the template below. Delete and customize. Courses from outside OSU must be labeled, italicized, and accompanied by a syllabus.

Name *Brutus Buckeye* Start Term *AU20*

| REQUIRED COURSES |                                    |         |                        |        |         |       |           |             |
|------------------|------------------------------------|---------|------------------------|--------|---------|-------|-----------|-------------|
| Category         | Course Name                        | Term/YR | Department             | Number | Credits | Grade | Professor | Institution |
| Req Core         | Scientific Methods in BME          | AU20    | Biomedical Engineering | 8000   | 1       | A     | Roberts   | OSU         |
| Req Core         | Seminar Biomedical Engineering     | SP22    | Biomedical Engineering | 8812   | 1       | S     |           | OSU         |
| Req Core         | Design and Analysis of Experiments | AU20    | ChBE                   | 5779   | 3       | A     | Rathman   | OSU         |
| Req Core         | Research Ethics                    | AU20    | Biomedical Engineering | 8983   | 2       | A-    | Litsky    | OSU         |
| Req Core         | Organ System Physiology            | AU21    | Physio CB              | 6101   | 3       | B+    | Group     | OSU         |

| FUNDAMENTALS |                       |         |                        |        |         |       |           |             |
|--------------|-----------------------|---------|------------------------|--------|---------|-------|-----------|-------------|
| Category     | Course Name           | Term/YR | Department             | Number | Credits | Grade | Professor | Institution |
| Fund 1       | Biomedical Optics     | AU20    | Biomedical Engineering | 5120   | 3       | A-    | Xu        | OSU         |
| Fund 2       | Biomedical Ultrasound | SP21    | Biomedical Engineering | 5186   | 3       | A-    | Liu       | OSU         |
| Fund 3       |                       |         |                        |        |         |       |           |             |

| ELECTIVE COURSES: 1 ENG, 1 Math |   |         |            |        |         |       |           |             |
|---------------------------------|---|---------|------------|--------|---------|-------|-----------|-------------|
| Category                        | Course Name                                   | Term/YR | Department | Number | Credits | Grade | Professor | Institution |
| Math                            | Mathematical Modeling of Biological Processes |         | Math       | 5651   | 3       | A     | Brown     | OSU         |
| Eng                             |   |         |            |        | 2 or 3  |       |           |             |

|                    |                                  |    |
|--------------------|----------------------------------|----|
| REQUIRED COURSES   | 10 cr hours required             |    |
| 3 FUND             | 9 cr hours required              |    |
| 1 ELECTIVE         | 3 cr hours required              |    |
| 1 FREE ELECTIVE    | 2-3 cr hours required            |    |
| COURSE TOTAL       | at least 24 cr hours required    |    |
| BME RESEARCH HOURS | 6 cr hours required              |    |
| GRAND TOTAL        | 30 cr hours required             | 30 |
| THESIS TOPIC       | Description of thesis topic here |    |

| Master's Committee Members |                  | Area of Expertise | Signatures or emails REQUIRED before BMEGSC review       |
|----------------------------|------------------|-------------------|--|
| Advisor                    | Print names here |                   | Signature or emails of approval needed for all 4 members |
| 2nd Member                 |                  |                   |  |

**APPENDIX D:  
SAMPLE BME Non-Thesis MS Program Template**

Customize your own template for Candidacy Committee approval and submit to the BMEGSC:  
<https://bme.osu.edu/forms-templates-current-graduate-students>

Program of Study Template for  
Non-Thesis MS Program  
Biomedical Engineering  
rev Sept 2010; 2012; 2018; 2020

6/25/2020

Please complete this form to show how you plan to meet program requirements. Some "example" text is shown in the template below. Delete and customize. Courses from outside OSU must be labeled, italicized, and accompanied by a syllabus.

Name *Brutus Buckeye* Start Term *AU20*

| REQUIRED COURSES |                                    |         |                        |        |         |       |           |             |
|------------------|------------------------------------|---------|------------------------|--------|---------|-------|-----------|-------------|
| Category         | Course Name                        | Term/YR | Department             | Number | Credits | Grade | Professor | Institution |
| Req Core         | Scientific Methods in BME          | AU20    | Biomedical Engineering | 8000   | 1       | A     | Roberts   | OSU         |
| Req Core         | Seminar Biomedical Engineering     | SP22    | Biomedical Engineering | 8812   | 1       | S     |           | OSU         |
| Req Core         | Design and Analysis of Experiments | AU20    | ChBE                   | 5779   | 3       | A     | Rathman   | OSU         |
| Req Core         | Research Ethics                    | AU20    | Biomedical Engineering | 8983   | 2       | A-    | Litsky    | OSU         |
| Req Core         | Organ System Physiology            | AU21    | Physio CB              | 8101   | 3       | B+    | Group     | OSU         |

| FUNDAMENTALS |                       |         |                        |        |         |       |           |             |
|--------------|-----------------------|---------|------------------------|--------|---------|-------|-----------|-------------|
| Category     | Course Name           | Term/YR | Department             | Number | Credits | Grade | Professor | Institution |
| Fund 1       | Biomedical Optics     | AU20    | Biomedical Engineering | 5120   | 3       | A-    | Xu        | OSU         |
| Fund 2       | Biomedical Ultrasound | SP21    | Biomedical Engineering | 5186   | 3       | A-    | Liu       | OSU         |
| Fund 3       |                       |         |                        |        |         |       |           |             |
| Fund 4       |                       |         |                        |        |         |       |           |             |

| ELECTIVE COURSES: 1 ENG, 1 Math, 1 Free |   |         |            |        |         |       |           |             |
|---|---|---------|------------|--------|---------|-------|-----------|-------------|
| Category                                | Course Name                                   | Term/YR | Department | Number | Credits | Grade | Professor | Institution |
| Math                                    | Mathematical Modeling of Biological Processes |         | Math       | 5651   | 3       | A     | Brown     | OSU         |
| Eng                                     |   |         |            |        |         |       |           |             |
| Elect                                   |   |         |            |        |         |       |           |             |

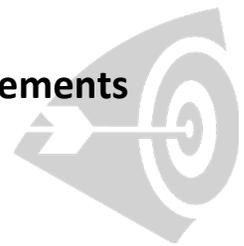
|                  |                               |    |
|------------------|-------------------------------|----|
| REQUIRED COURSES | 10 cr hours required          |    |
| 4 FUND           | 12 cr hours required          |    |
| 2 ELECTIVES      | 6 cr hours required           |    |
| 1 FREE ELECTIVE  | 2-3 cr hours required         |    |
| COURSE TOTAL     | at least 30 cr hours required |    |
| GRAND TOTAL      | 30 cr hours required          | 30 |

Description of Culminating Experience topic here

| 2 Master's Committee Members |                  | Area of Expertise | Signatures or emails REQUIRED before BMEGSC review       |
|------------------------------|------------------|-------------------|--|
| Advisor                      | Print names here |                   | Signature or emails of approval needed for all 4 members |
| 2nd Member                   |                  |                   |  |

## PhD sequence: Stay on target to meet your BME degree requirements

Revised 2003; 2008; 2012; 2015; 2017; 2018; 2019; 2020



### ➔ 1st Term Here

**Learn Important Dates, Deadlines & Credit Minima:** <https://gradsch.osu.edu/handbook/3-1-registration-course-load>

- AVOID late fees by knowing how many credits to add and when <http://registrar.osu.edu/registration/>
- Deadlines for graduation, oral exam, and dissertation on Graduate School site: <https://gradsch.osu.edu/calendar>.
- **Student Accountability:** All students are responsible for learning policies/deadlines in **BME and Graduate Student Handbooks (BMEH & GSH)** <https://bme.osu.edu/bme-graduate-student-handbook>
- Students must consult **once per semester with BME Core Faculty Contact:** a great resource for advice on arrangement & sequencing of courses, committee formation, oral exam tips, career exploration, department culture/protocols, & more.
- Watch for and read BME graduate student listserve emails from Senitko.1. Contact ETS if you are not receiving emails.

### ➔ 2nd Term Here

Start drafting Program of Study using **TEMPLATE** on the BME website  
<https://bme.osu.edu/forms-templates-current-graduate-students>

**Get your Program of Study (PoS) approved by the BME Graduate Studies Committee**

- **PoS** should be submitted with cover letter to BME Grad Studies Coordinator as early as possible to allow for revisions.
- Must be BMEGSC-approved **prior to end of your 2<sup>nd</sup> Autumn** to avoid graduation delays.
- PoS must be signed by advisor & all members of PhD (AKA candidacy) committee **before** BMEGSC-review.
- BMEGSC meets roughly once per month. Students are responsible for making requests for the agenda EARLY.
- **Candidacy Committees** are approved with program, consisting of Advisor (Level P in BME) and at least 3 other graduate faculty members (1 P in BME; 2 M or P in Grad School). These are the 4 faculty who evaluate and approve the Candidacy Exam Report Form via [gradforms.osu.edu](http://gradforms.osu.edu). At least one member must be a BME department faculty member.
- After **PoS** approval, transfer 30 bulk-credits for prior MS degrees via **Transfer of Graduate Credit Form:** *BE SURE to get pre-approval from Grad Studies Coordinator before completing any online forms on [gradforms.osu.edu](http://gradforms.osu.edu).*

### ➔ & Beyond

**Candidacy Exam – in a nutshell**

- As per BME Handbook regulations, your research advisor coordinates with candidacy committee members the sequence, timing, and content of written and oral candidacy exams, including the pre-required dissertation proposal, only after all approved *coursework is completed*.
- In consultation with advisor, the oral portion of the exam must be scheduled by student with permission of committee.
- Once date/time is determined, students must submit **Application for Candidacy Examination** via [gradforms.osu.edu](http://gradforms.osu.edu), with all required signatures, typically initiated when beginning the written portion of the exam. The written exam should take no less than one week. Leave at least one week for rest between the last written exam and the oral exam.
- The application must be started via [gradforms.osu.edu](http://gradforms.osu.edu) early enough to get advisor and GSC Chair approval before the Grad School hard deadline of at least **TWO FULL WEEKS PRIOR** to the oral exam.

**Get a Dissertation Committee Approved by the BMEGSC**

- Consists of **3** members (Advisor at Level P in BME and **2** others at Level M or P in the Graduate School as deemed appropriate to your research area by your advisor.) Must be approved by the BMEGSC. May be different from Candidacy Committee. Chaired by advisor or by co-advisors.
- Advises on dissertation progress; conducts **Final Oral Exam** (i.e., dissertation defense).
- Must be BMEGSC-approved **no later than** one term after the student passes **Candidacy Exam**. Be sure to send an advisor-approved email request to the BME Grad Coordinator for inclusion on the next available BMEGSC meeting agenda. (Last minute requests may not be reviewed in time. Agenda items sometimes get bumped.)

Have you met these requirements and sent them to Mel?

### **BME Seminar Presentation & Publication Submissions**

- Students must schedule BME Seminar Presentation with seminar faculty at least one term in advance of intended presentation in order to secure spot on the schedule. Avoid delays in graduation by doing this early. Students also may hold and advertise open dissertation defenses if seminar presentation is impossible.
- Submission of 2 manuscripts for publication in recognized scientific journals. Student should be first author on at least one of these manuscripts
- Presentation of at least 1 oral or poster presentation at a regional, national, or international meeting

### **Application to Graduate**

Graduate School **DEADLINES:**

<https://gradsch.osu.edu/calendar>

- Submit **Application** via [gradforms.osu.edu](https://gradforms.osu.edu) before the **1st** day of the term in which you plan to graduate.
- Be sure your advisor approves it online. We must do a degree audit and get the signature of the BMEGSC Chair before the Graduate School can accept it. *Applications may NOT be signed if Programs of Study are submitted past deadline.*
- Helpful checklists at <https://gradsch.osu.edu/completing-your-degree>

The application for Final Oral Exam must be started early enough to get advisor and GSC Chair approval before submitting to the Grad School by their deadline of at least **TWO FULL WEEKS PRIOR** to the oral exam

**STUDENTS** must coordinate with committee members to build in time to meet Graduate School deadlines for exams, documents, and final projects.

### **Final Oral Examination**

- To be scheduled by student with permission of Advisor and dissertation committee. Contact BME Grad Studies Coordinator to reserve BME Conference Room once a date/time is confirmed.
- Once a date is determined, student must submit **Application for Final Oral Examination** via [gradforms.osu.edu](https://gradforms.osu.edu) to the Graduate School. They must receive it **at least two full weeks before the defense** is held, so you might wish to initiate this a bit earlier.
- Be prepared to have dissertation draft reviewed by Grad School for formatting; call Grad School for details at 2-6031. Dissertation guidelines are published by the Graduate School.
- **Final Oral Examination Report** and **Final Dissertation Approval** forms will be generated via [gradforms.osu.edu](https://gradforms.osu.edu) for your advisors and must be approved and submitted by Grad School graduation deadlines.: <https://gradsch.osu.edu/calendar>
- For policies and checklists on exams, dissertation formatting, electronic submission, please review **GSH:** <https://gradsch.osu.edu/completing-your-degree>
- Details on commencement will be sent by the Graduate School.

### **Random Reminders:**

The BMEGSC meets roughly once per month.  
Students are responsible for getting on the agenda early in case of postponement.

**Always** use your [buckeyemail.osu.edu](mailto:buckeyemail.osu.edu) email address for all academic and university business.

DON'T  
FORGET  
TO BE  
AWESOME

*If BME and GS Handbooks do not address your questions, please consult your Core Faculty Contact, Graduate Studies Coordinator at [senitko.1@osu.edu](mailto:senitko.1@osu.edu), or the Graduate Studies Chair. The BMEGSC is happy to help make decisions and recommendations for students with special requests or questions. Tips for submitting BMEGSC requests can be found in the in **BME Handbook**.*

# MS sequence: Stay on target to meet your BME degree requirements

Revised 2003; 2008; 2012; 2015; 2017; 2019; 2020



## ➔ 1st Term Here

**Learn Important Dates, Deadlines & Credit Minima:** <https://gradsch.osu.edu/handbook/3-1-registration-course-load>

- AVOID late fees by knowing how many credits to add and when <http://registrar.osu.edu/registration/>
- Deadlines for graduation, oral exam, and dissertation on Graduate School site: <https://gradsch.osu.edu/calendar>.
- **Student Accountability:** All students are responsible for learning policies/deadlines per **BME and Graduate Student Handbooks (BMEH & GSH)** <https://bme.osu.edu/bme-graduate-student-handbook>
- Students must consult **once per semester with BME Core Faculty Contact:** a great resource for advice on arrangement & sequencing of courses, committee formation, oral exam tips, career exploration, department culture/protocols, & more.
- Watch for and read BME graduate student listserve emails from Senitko.1. Contact ETS if you are not receiving emails.

## ➔ 2nd Term Here

Start the **TEMPLATE** on the BME website

<https://bme.osu.edu/forms-templates-current-graduate-students>

**Get a Program of Study approved by the BME Graduate Studies Committee**

- **Program of Study** should be submitted to Grad Studies Coordinator as early as possible to allow for revisions if necessary.
- Must be BMEGSC-approved **prior to end of your 2nd Autumn** to avoid graduation delays.
- Program of Study must be signed by advisor & MS committee members **before** BMEGSC-review.
- BMEGSC meets roughly once per month. Students are responsible for making requests for the agenda EARLY
- **MS Committees** are approved with program, consisting of Advisor (Level M or P in BME) and at least one other graduate faculty member (Level M or P in Graduate School). These are the 2 faculty who evaluate and approve MS Exam Report Forms for the thesis & defense OR for the non-thesis MS culminating experience, via gradforms.osu.edu.

## ➔ & Beyond

**Application to Graduate**

Graduate School **DEADLINES:** <https://gradsch.osu.edu/calendar>

- Submit **Application** via gradforms.osu.edu before the **1st** day of the term in which you plan to graduate.
- Be sure your advisor approves it online. We must do a degree audit and get the signature of the BMEGSC Chair before the Graduate School can accept it. *Applications may NOT be signed if Programs of Study are submitted past deadline.*
- Helpful checklists at <https://gradsch.osu.edu/completing-your-degree>

**STUDENTS** must coordinate with MS committee to build in time to meet Graduate School deadlines for exams, documents, and final projects.

**Final MS Exam (AKA Thesis Defense -or- Final Non-Thesis Project wrap-up)**

- Scheduled by student with permission of MS Committee members, careful to meet Graduate School exam deadlines.
- **MS Examination Report** and/or **Thesis Approval** forms will be generated for MS committee members via gradforms.osu.edu. MS Exam Report Forms must be submitted by MS committee members by deadlines: <https://gradsch.osu.edu/calendar>. *For thesis MS, it reflects the defense; for non-thesis MS, the culminating experience.*
- For policies and checklists on exams, thesis formatting, graduate school review, electronic submission, please review **GSH:** <http://www.gradsch.osu.edu/graduate-school-handbook1.html>
- Details on commencement will be sent by the Graduate School.
- Thesis-MS students: Did you do this? Submission of one (1) manuscript for publication in recognized scientific journals OR presentation of at least one (1) oral or poster presentation at a regional, national, or international meeting.

### Random Reminders:

The BMEGSC meets roughly once per month.

Students are responsible for getting on the agenda early in case of postponement.

**Always** use your buckeyemail.osu.edu email address for all academic and university business.

*If BME and GS Handbooks do not address your questions, please consult your Core Faculty Contact, Graduate Studies Coordinator at [senitko.1@osu.edu](mailto:senitko.1@osu.edu), or the Graduate Studies Chair.*

*The BMEGSC is happy to help make decisions and recommendations for students with special requests or questions. Tips for submitting BMEGSC requests can be found in the **BME Handbook**.*

DON'T  
FORGET  
TO BE  
AWESOME

**APPENDIX G:**

**BME Graduation Check-up:**

**Customize this checklist to help you track PhD Program Graduation Requirements**

*This is a supplemental tool to assist you in tracking the requirements stated in the BME and Graduate School Handbooks. Please use in conjunction with PhD checklists available at the Graduate School <https://gradsch.osu.edu/final-semester-procedures-and-timelines> and amend as needed so you can assure that all department and university requirements are met.*

|  |  |
|--|--|
| QTR-YR enrolled  |  |
| Core Contact Assigned at Orientation or Chosen   |  |
| Research Advisor OR 2 Co-Advisors  |  |
| Date Program of Study Approved by BMEGSC   |  |
| - All courses listed on the transcript as approved on the Program of Study by the BMEGSC and were changes requested via the BMEGSC at least a term in advance of graduation?                       |  |
| Date Candidacy Cmte Approved and/or Changed per BMEGSC   |  |
| - List 4 Candidacy Cmte members here   |  |
| - Qualifying GPA requirement met?  |  |
| - Discuss plans for writtens and arrange exam with advisor & committee   |  |
| - Dissertation Proposal submitted to Advisor?  |  |
| - Submit App for Candidacy Exam form via <a href="https://gradforms.osu.edu">gradforms.osu.edu</a> at least two full weeks in advance of Oral Candidacy Exam leaving time for approvals            |  |
| Date Candidacy Exam Passed   |  |
| Post-candidate graduate assessment survey?   |  |
| Continuously registered post-candidacy at 3 credit hours each term?  |  |
| Date Dissertation Committee Approved or Changed per BMEGSC   |  |
| - List 3 Dissertation Cmte members here  |  |
| Date Presentation Given in BME Seminar Class   |  |
| BME 8810 – 8813 Completed?   |  |
| Apply to Graduate: due for BME degree audit in advance of graduation term  |  |
| - Submit via <a href="https://gradforms.osu.edu">gradforms.osu.edu</a> before Dept & Graduate School deadline  |  |
| - Register for at least 3 credits in term of graduation  |  |
| - Discuss plans for defense and arrange final oral exam with advisor & committee   |  |
| - Grad School formatting review of dissertation draft?   |  |
| - Submit App for Final Oral Exam form to Graduate School via <a href="https://gradforms.osu.edu">gradforms.osu.edu</a> at least two weeks in advance of Final Oral Exam leaving time for approvals |  |
| - Submit relevant material to assigned Graduate School Exam committee Rep  |  |
| - Be aware of Graduate School deadlines for final oral exam and dissertation submission  |  |
| 2 publications submitted?  |  |
| 1 presentation at professional meeting?  |  |
| 45 BME 8999 credit hours taken   |  |
| 80 total credit hours taken  |  |
| No missing grades?   |  |
| Date Final Oral Exam Passed  |  |
| Dissertation Title   |  |
| Graduate Assessment Survey?  |  |
| Submit new contact and employment information to BME Graduate Studies Office   |  |
| Return Keys to Department and Lab Administrators   |  |

**APPENDIX H:**

**BME Graduation Check-up:**

**Customize this checklist to help you track MS Program Graduation Requirements**

*This is a supplemental tool to assist you in tracking the requirements stated in the BME and Graduate School Handbooks. Please use in conjunction with MS checklists available at the Graduate School <https://gradsch.osu.edu/final-semester-procedures-and-timelines> and amend as needed to ensure that all department and university requirements are met.*

|   |  |
|---|--|
| <i>QTR-YR enrolled</i>  |  |
| <i>Core Contact</i>   |  |
| <i>Research Advisor OR Co-Advisors</i>  |  |
| <i>Date MS Program of Study Approved by BMEGSC</i>  |  |
| <i>- Are all courses listed on the transcript as approved on the Program of Study by the BMEGSC and were changes requested via the BMEGSC at least a term in advance of graduation?</i> |  |
| <i>Date MS Cmte Approved or Changed per BMEGSC</i>  |  |
| <i>- List 2 MS Cmte members here</i>  |  |
| <i>Registered for appropriate number of credit hours each term?</i>   |  |
| <i>Date BME 8811 Completed</i>  |  |
| <i>Apply to Graduate: due to BME Grad Studies Office in week-one of intended graduation term</i>  |  |
| <i>- Submit BMEGSC-approved form to Graduate School by Graduate School deadline leaving time for approvals</i>  |  |
| <i>- Register for at least 3 credits in term of graduation</i>  |  |
| <i>- Discuss plans for defense or culminating experience and arrange MS oral exam with advisor &amp; committee</i>  |  |
| <i>- Grad School formatting review of thesis draft?</i>   |  |
| <i>- Be aware of Graduate School deadlines for MS exam and thesis submission; Note that the non-thesis culminating experience must be completed by the exam deadline.</i>               |  |
| <i>9 BME 6999 or 8999 credit hours taken</i>  |  |
| <i>30 total credit hours taken</i>  |  |
| <i>No missing grades?</i>   |  |
| <i>For thesis-MS: Publication submission? Presentation?</i>   |  |
| <i>Date MS Exam Passed</i>  |  |
| <i>Thesis Title</i>   |  |
| <i>Graduate Assessment Survey?</i>  |  |
| <i>Submit new contact and employment information to BME Graduate Studies Office</i>   |  |
| <i>Return Keys to Department and Lab Administrators</i>   |  |

## APPENDIX I:

### Admission Prerequisites for Non-engineers

Revised and approved by BMEGSC, Spring 2010; 2020

#### Required to be taken before application:

Courses must be completed with a minimum 3.0/4.0 cumulative grade point. Equivalent courses may be taken at another institution prior to applying to The Ohio State University Graduate BME Program. The transfer credit database below may be helpful: <https://www.transferology.com/index.htm>

#### 1. Calculus I

Math 1151 (5)

Differential and integral calculus of one real variable.

Prereq: A grade of C- or above in 1148 and 1149, or in 1144, 1150, or 150, or Math Placement Level L. Not open to students with credit for 1152 or 152.xx, or above.

This course is available for EM credit.

#### 2. Calculus II

Math 1152 (5)

Integral calculus, sequences and series, parametric curves, polar coordinates, (optional: vectors).

Prereq: A grade of C- or above in 1114, 1151, 1156, 114, 152.xx, 161.xx, or 161.01H. Not open to students with credit for any higher numbered Math class, or with credit for quarter-system Math courses numbered 153.xx or above. This course is available for EM credit.

#### 3. Calculus III

Math 2153 (4)

Multivariable differential and integral calculus.

Prereq: A grade of C- or above in 1152, 1161.xx, 1172, 1534, 1544, 1181H, or 4181H, or credit for 153.xx, 154, 162.xx, or 162.01H. Not open to students with credit for any course 2153 or above, or for any quarter-system class 254.xx or above. This course is available for EM credit.

#### 4. Ordinary and Partial Differential Equations

Math 2415 (3)

Ordinary and partial differential equations: Fourier series, boundary and initial value problems.

Prereq: 2153, 2162.xx, 2173, 2182H, or 4182H; or both 1172 and 2568; or 254.xx, 263.xx, 263.01H, or 264H. Not open to students with credit for 2255 (255), 5520H (521H), 2174, or 415.xx.

#### 5. Electrical Circuits and Electronic Devices

ECE 2300 (3)

Introduction to circuit analysis; circuit analysis concepts and mechanical systems analogies; theory and applications of electronic devices; operational amplifiers; electrical instruments and measurements.

Prereq: Physics 1251 (132) or 1261, and Math 1172 (254), and CPHR 2.0 or above, and enrollment in College of Engineering. Not open to students with credit for 300, 309, or 320. Not open to students majoring in ECE.

#### 6. Statics

ME 2010 (2)

Vector concepts of static equilibrium for isolated and connected bodies, centroids, inertia, truss, frame and machine analysis, and friction.

Prereq: Engr 1182 (Engineer 183) or 1187 (187) or 1192 (192H), and Physics 1250 (131), and Math 1152 or 1172 (254) or 1544 (154) or 2162 (263). Not open to students with credit for 2010H (210H), 2040 (410), or 400.

#### 7. Introduction to Mechanics of Materials

ME 2020 (3)

Stress and strain analysis of deformable structural components subjected to unidirectional and combined loads; pressure vessels; stress transformations (Mohr's Circle); beam deflections; column buckling. Prereq: 2010 (410) or 2010H (210H). Not open to students with credit for 2040 (420).

-OR-

#### 6 & 7. Statics & Strength of Materials

ME 2040 (4)

Vector concepts of static equilibrium, truss, frame and machine analysis. Stress and strain analysis of deformable structural components; stress transformations; beam deflections; column buckling. Prereq: Engr 1182 or 1187 (Engineer 187) or 1282H (192H) or Engineer 183, and Physics 1250 (131), and Math 1172 (254) or Math 1544 (C- or better) or Math 2162 (263). Not open to students with credit for 2020 (420).

#### 8. Mechanics, Thermal Physics, Waves

Physics 1250 (5)

Calculus-based introduction to classical physics: Newton's laws, fluids, thermodynamics, waves; for students in physical sciences, mathematics, and engineering.

Prereq: 1 entrance unit of Physics or Chem. Concur: Math 1151 (152), 1161 (161), 1181H (161H), or 4181H (190H) or above. Not open to students with credit for 131.

This course is available for EM credit. NS Admis Cond course. GE nat sci physical course.

#### 9. Electricity & Magnetism, Optics, Modern Physics

Physics 1251 (5)

Calculus-based introduction to electricity and magnetism, simple optics, modern physics including special relativity and quantum mechanics; for students in physical sciences, mathematics, engineering. Prereq: 1250 (131), 1250H (131H), or 1260, and Math 1151 (152) or above; or permission of instructor. Concur: Math 1152 (153), 1161, 1172, 1181H, or 4181H. Not open to students with credit for 132. This course is available for EM credit. GE nat sci phys course. NS Admis Cond course.

## APPENDIX J:

### Mission and Research of The Ohio State University Department of Biomedical Engineering

The [mission](#) of the Department of Biomedical Engineering is to promote learning and discovery that integrate engineering and life sciences for the advancement of human health.

The Department of Biomedical Engineering offers interdisciplinary MS and PhD graduate programs in biomedical engineering; participates through the Graduate School in a combined degree program with the College of Medicine leading to the MD/PhD degrees; and offers both undergraduate major and minor degrees as well as the combined BS/MS. All programs emphasize the direct interaction of the life sciences and engineering.

The Department's educational and research programs provide preparation for employment in the clinical setting, in biomedical industry, and in engineering research. The educational objective of our graduate program is to provide students with the necessary background and experience in both engineering and medicine/life science, and with practical application experience, so that they are prepared to accept positions of responsibility in their chosen areas of specialization.

The participating faculty represent a broad spectrum of research programs, providing collaborative opportunities for student research in many fields. Detailed areas of research pursued by all of the faculty affiliated with the department can be found at <https://bme.osu.edu/bme-department-research-areasdomains>. Our research and educational offerings center on the following domain areas with a significant emphasis on translational research and the application of these techniques to address problems in different areas of medicine and health:

- [Bioimaging](#)
- [Biotransport](#)
- [Biomaterials](#)
- [Biomechanics](#)
- [Molecular, Cell, and Tissue Engineering](#)
- [Micro/Nanotechnology and Biomedical Devices](#)



Professor Herman Weed (left) shakes the hands of grateful graduate students at the 2005 BME Department Inauguration.

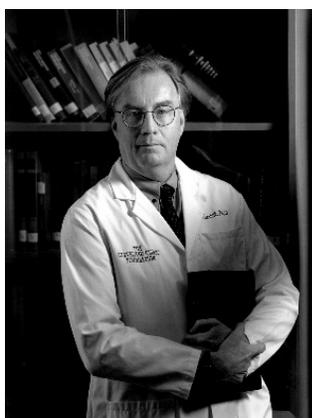
Next to him, only Professors Cynthia Roberts and Alan Litsky (right) come close to dedicating as many years to the BME graduate program.



**APPENDIX K:  
A Brief History and Background of Biomedical Engineering at The Ohio State University**



In 1971, Herman Weed created the interdisciplinary Biomedical Engineering Center within the Department of Electrical Engineering after winning one of eight NSF grants to coordinate the educational, research, and clinical programs in biomedical engineering at The Ohio State University. The Center awarded its first MS degree in 1975 and its first PhD degree in 1977. Professor Weed’s legacy lives not only in the BME Department but in his important work with Project HOPE, bringing medical technologies and training to developing countries and starting clinical engineering departments in hospitals across the world.



In 1988, the Biomedical Engineering Center evolved into an independent academic unit within the College of Engineering responsible for its own degree programs, courses, and faculty research. Led by Professor Weed’s successor, J. Fredrick Cornhill, with a full-time "core" faculty and over 70 "participating" faculty in more than 30 departments in 9 colleges, the Center was given 17,000 square feet of space in Bevis Hall. The BME Center flourished under the leadership of Professor Cornhill, appointed in the Ohio State Department of Surgery and as Chair of Biomedical Engineering at the Cleveland Clinic Foundation (CCF). Graduate student enrollment was at its peak and many did research at CCF while doing coursework on the Ohio State campus. Upon his resignation, Morton H. Friedman – former BMES President known for his work in biological transport – served as Interim Director until the appointment of Mauro Ferarri, who directed the Center briefly with a focus in the area of nanotechnology.



From Top, Herman Weed; Second Row: Drs. Cornhill and Friedman, with BME Center logo created by visiting scientist and longtime staff member, Vlad Marukhlenko; Third Row: Drs. Ferrari and von Recum; Last Row: Dr. Hart.

Andreas von Recum, expert in the field of biocompatibility, oversaw the transition from research Center to full Department in the fall of 2005, laying the groundwork for Richard T. Hart, who came from Tulane University to grow the faculty, develop the undergraduate program, and oversee its ABET accreditation. His work led to the construction of the Biomedical and Materials Engineering Complex (Mars G. Fontana Laboratories) for Biomedical Engineering and Materials Science and Engineering. After over 30 years on Ohio State’s West Campus, the BMEC is set to open doors in 2020.