

The BME PhD Handbook

The PhD Program in
Biomedical Engineering

in

The McCormick School of Engineering and
Applied Science

at

Northwestern University



Last Updated: July 2025

Northwestern University reserves the right to change without notice any statement in this publication concerning, but not limited to, rules, policies, tuition, fees, curricula, and courses.

In addition to TGS and program policies, graduate students are subject to and should be aware of University policies pertaining to students. Failure to read this information does not excuse a student from knowing and complying with its content.

CONTENTS

1. NONDISCRIMINATION STATEMENT

2. PERSONNEL

3. ACADEMIC INFORMATION

- 3.1. Overall Learning Goals and Assessment Strategies for the Program**
- 3.2. Documenting Academic Progress**
- 3.3. Coursework requirements**
- 3.4. Research advisor, thesis committee, and annual committee meetings**
- 3.5. PhD qualifying exams**
- 3.6. MS degree requirement for students in the PhD program**
- 3.7. Teaching requirement**
- 3.8. Prospectus**
- 3.9. Publication Requirement**
- 3.10. Thesis/dissertation requirements**
- 3.11. Summary of milestones in the program: typical PhD timeline**

4. ADMINISTRATIVE INFORMATION

- 4.1. Registration**
- 4.2. Financial Aid**
- 4.3. Leaves, internships, and vacations**
- 4.4. Alternative circumstances**
- 4.5. Conflict resolution**

1. NONDISCRIMINATION STATEMENT

Northwestern University prohibits discrimination on the basis of actual or perceived race, color, religion, creed, national origin, ethnicity, caste, sex, pregnancy, sexual orientation, gender identity, gender expression, parental status, marital status, age, disability, citizenship status, veteran status, genetic information, reproductive health decision making, height, weight, or any other class of individuals protected from discrimination under federal, state, or local law, regulation, or ordinance or any other classification protected by law in the matters of admissions, employment, housing or services or in the educational programs or activities it operates, as required by Title IX of the Education Amendments of 1972; Title III of the Americans with Disabilities Act of 1990, as amended in 2008; Section 504 of the Rehabilitation Act of 1973; Title VI and VII of the Civil Rights Act of 1964; the Age Discrimination Act of 1975; the Age Discrimination in Employment Act of 1967; and any other federal, state, or local laws, regulations, or ordinances that prohibit discrimination, harassment, and/or retaliation.

The University has designated the Associate Vice President for Civil Rights and Title IX Compliance to coordinate the University's compliance with federal and state civil rights laws regarding protected characteristics, including Title IX and those other laws and regulations referenced above:

Emily Babb

Associate Vice President for Civil Rights and Title IX Compliance | Title IX Coordinator
Office of Civil Rights and Title IX Compliance
1800 Sherman Ave., Suite 4500
Evanston, IL 60201
(847) 467-6165
OCR@northwestern.edu

Tiffany Little

Senior Director. Civil Rights and Title IX Compliance | Deputy Title IX Coordinator
Office of Civil Rights and Title IX Compliance
1800 Sherman Ave., Suite 4500
Evanston, IL 60201
(847) 467-6165
OCR@northwestern.edu

The University complies with all federal and state laws that protect individuals with disabilities from discrimination based on their disability or perceived disability status. As such, reasonable accommodations and auxiliary aids and services are available to individuals with disabilities when such modifications and services are necessary to access the institution's programs and services. The University's ADA/504 Coordinator is:

Laura Conway

Director, ADA Compliance | ADA Coordinator
Office of Civil Rights and Title IX Compliance
1800 Sherman Ave., Suite 4500
Evanston, IL 60201
(847) 467-6165
Accommodations@northwestern.edu

Sam Milgrom

Deputy ADA Coordinator
Office of Civil Rights and Title IX Compliance
1800 Sherman Ave., Suite 4500
Evanston, IL 60201
(847) 467-6165
Accommodations@northwestern.edu

Inquiries about Title IX or the University's prohibitions against discrimination, harassment, and retaliation can be directed to the Associate Vice President for Civil Rights and Title IX Compliance, the ADA/504 Coordinator (for

disability-related questions) or to the U.S. Department of Education Office for Civil Rights at the contact information listed below. Complaints and inquiries regarding discrimination, harassment, and retaliation involving federal laws may be directed to:

U.S. Department of Education
Office for Civil Rights
John C. Kluczynski Federal Building
230 S. Dearborn St., 37th Floor
Chicago, IL 60604
(312) 730-1560
OCR.Chicago@ed.gov

U.S. Equal Employment Opportunity Commission
John C. Kluczynski Federal Building
230 S. Dearborn St., Suite 1866
Chicago, IL 60604
(312) 872-9777

Any person who believes that the University as a federal contractor has violated nondiscrimination or equal opportunity obligations may contact the Office of Federal Contract Compliance Programs (OFCCP) at

OFCCP
U.S. Department of Labor
200 Constitution Ave. NW
Washington, D.C. 20210
www.dol.gov
(800) 397-6251

2. PERSONNEL

The current list of personnel can be found on the “People” section of the **Northwestern Biomedical Engineering website**. The names of the current department chair and the director of graduate studies (DGS) can be found on the faculty page. The names of the current financial assistant and student services team can be found on the staff page.

3. ACADEMIC INFORMATION

3.1. Overall Learning Goals and Assessment Strategies for the Program

The purpose of Northwestern University's doctoral degree program in Biomedical Engineering (BME) is to produce graduates who are qualified to fill research positions at the highest levels in private industry and in government laboratories, to teach in this field at universities, and to perform original research on the staffs of universities, hospitals, and companies. Students entering the program with a degree in a field other than BME (e.g., traditional areas of biology, civil engineering, etc.) are expected to concentrate their elective course work to gain expertise in the areas of BME that are new to them.

Students in the BME doctoral program study approximately equal portions of engineering, life sciences, and mathematics. Biomedical Engineering is a diverse field, and thus breadth is required. At the same time, students are expected to develop depth and understanding in one particular area of engineering and one of the life sciences. The areas of mathematical and computational development are also somewhat flexible, with some breadth expected, but should be appropriate for the student's area of study. The relative effort devoted to engineering, life sciences, and mathematics will depend on the student's previous background.

Students in the PhD program enter into one of several “tracks” representing the broad research areas in our department. The purpose of these tracks is to guide students in their course selection, providing depth in areas relevant to their selected research area. Track listings and specific course requirements for each track can be found on the BME PhD Communications Canvas site.

Graduate students are admitted to The Graduate School (TGS), not the Engineering School. At Northwestern University, almost all advanced degrees are conferred via TGS. Thus, students must meet degree requirements as stipulated on [The Graduate School](#) website. All courses taken for graduate credit must be listed as graduate-level on CAESAR (e.g., BME 395 does not qualify for graduate credit).

Learning objective(s) Students should be able to...	Milestone or Requirement	Assessment Strategies and Criteria. How do we know this objective has been achieved? What criteria determine success?
Demonstrate a basic knowledge of responsible conduct in research	Y1: Complete responsible conduct in research training	Student must complete responsible conduct in research training
Demonstrate basic knowledge within the field of BME and within a chosen BME specialization	Y2: Complete qualifying coursework (Nine courses before qualifying exams)	Student must meet TGS minimum grade requirement each quarter, as well as minimum grade requirement for department track courses
Design a research project.	Y2: qualifying research proposal and oral exam	Student submits a research proposal and answers related questions asked by a faculty committee.
Communicate research progress in presentation form	Y2 and onwards: Annual committee meetings	Student shares plan annually with advisor and thesis committee; Student seeks appropriate resources in response to advisor and committee feedback.

Begin to communicate research progress in writing to the scientific community	Y3: complete MS degree	Student must submit a 1 st author manuscript to a peer reviewed journal, OR submit an MS thesis, OR have the MS degree waived.
Develop classroom activities for a specific discussion section.	Y3: Teaching Experience	Teaching assistant (TA) collaborates with professor and fellow TAs.
Independently conceptualize and complete a significant, cohesive, doctoral-level research project in the field of BME	Y4: Prospectus	Student must pass written and oral components of the prospectus
Communicate research progress in writing to the relevant scientific community	Prior to graduation	Student must have a 1 st author manuscript accepted to a peer -reviewed journal. Detailed requirements are provided in this handbook under the heading “publication requirement”

3.2. Documenting Academic Progress

Academic progress is documented through Northwestern’s Graduate Student Progress tracker (GSP). Detailed instructions for documenting progress and uploading forms to GSP can be found on the BME PhD Communications Canvas site. Throughout their time in the PhD program, students are responsible for regularly checking this Canvas site for the requirements for their year and for ensuring that they meet the milestones and deadlines described there.

During their time in the PhD program, students must maintain satisfactory academic standing both in TGS and within the BME program. Failure to maintain satisfactory academic standing either in TGS or within the BME PhD program, or failure to document academic progress on GSP (including the annual report), will result in the student being placed on probation.

Criteria for maintaining satisfactory academic standing within The Graduate School are listed at **this website**.

Criteria for maintaining satisfactory academic standing within BME department includes the following:

(1) meeting all department milestones by the specified deadlines including:

- Choose an advisor and document on GSP – end of February Y1
- Begin a research project in preparation for qualifying exams – spring Y1
- Choose a committee and document on GSP – end of August Y1
- First committee meeting – end of winter quarter, Y2
- Complete all courses required for qualifying exams, end of spring quarter, Y2
- Obtain a minimum grade of “B+” in the courses required for the student’s chosen “track.”
- Complete oral exams – end of spring quarter, Y2
- Complete MS degree – end of August, Y3
- Complete all courses required for PhD, end of Y3
- Complete TA requirement – end of Y3
- Complete prospectus – end of August, Y4

(2) making satisfactory research progress, as evaluated by PhD research advisor and committee

If an advisor or committee has concerns that a student is not making satisfactory research progress, a meeting with the BME DGS and/or an appropriate delegate should be arranged. At the meeting, the parties will discuss both the reasons for the concerns (why is the progress unsatisfactory?) and create a written document that outlines specific requirements for the student to demonstrate that they are resuming satisfactory academic progress. A student may not be placed on probation for unsatisfactory research progress without first meeting

with DGS and without developing a written remediation plan.

Students placed on department probation for any reason will typically have one quarter to address the issue that is causing them to be on probation. Under some circumstances, DGS and/or the graduate committee may allow a more extended probation period. When a decision to place a student on probation is made by the program, the student and The Graduate School must be notified in writing.

Students not removed from department probation by the end of the probationary period will no longer be considered in good standing and will be excluded from the PhD program, subject to review by the graduate committee. The decision to exclude is made by the program faculty or a subset of faculty which includes the Director of Graduate Studies. No individual faculty member may exclude a student.

A student who fails to resume satisfactory academic standing during the probationary period after being notified of placement on probation by The Graduate School will be excluded (dismissed) from The Graduate School.

A student who fails to resume satisfactory academic standing during the probationary period after being notified of placement on probation by the department will be excluded (dismissed) from the Biomedical Engineering Department.

Funding will cease on the effective date of the exclusion unless other arrangements are made. When a student is excluded (dismissed) by the program, the student has an opportunity to appeal the exclusion decision to The Graduate School. When a student appeals the program's exclusion decision, the student remains an active student while the appeal is under review. In the event the appeal is denied, the exclusion takes effect after the appeal process has concluded.

3.3. Coursework requirements

Overview: This section first describes coursework requirements for students entering with a BS degree. The requirements for students entering with an MS degree and for students in the MSTP or PhD/DPT programs are identical to those for students entering with a BS, with some exceptions listed at the end of this section. Detailed course requirements generally change slightly each academic year. To meet coursework milestones, students should carefully follow the Plans of Study posted on the Canvas website for their year of admission. In general, students must meet the following coursework requirements:

Students entering with a BS degree: Students entering with a BS degree must complete a minimum of 12 graduate-level, letter-graded credits at Northwestern University. All courses must be in Engineering, Science, or Mathematics on topics related to the general field of biomedical engineering. They may not be writing, communications, entrepreneurship, or business-related classes. They must be full (1 credit) classes. A student may choose to take some classes that are only 0.5 or 0.34 credits, however, the total sum of fractional credits must equal or exceed 1-credit in order to count as a 1-credit course. In other words, to achieve 1 credit, a student may take two 0.5-credit classes, or one 0.5-credit class and two 0.34-credit classes, or three 0.34-credit classes).

Students are to work with their primary BME advisor to ensure that the Plan of Study is sufficient for meeting all requirements. All courses taken to meet these minimum requirements must be for a letter grade (i.e., P/N courses are not accepted), with the exception of classes taken in the spring of 2020. None can be a 499 (research credit).

All first-year students are required to complete BMD_ENG 512 (seminar) in the fall, winter, and spring quarters. Upon petition to the Graduate Program Chair, a student may delay completion of BMD_ENG 512 until a subsequent time if the student is enrolled in a class that meets in conflict with BMD_ENG 512. All first-year students are required to complete mandatory training in Responsible Conduct of Research (including GEN_ENG 519). Although they are both required courses, both BMD_ENG 512 nor GEN_ENG 519 are zero credits, and do not count towards the minimum 12-credit requirement.

The following professional skills classes (also zero credits) are recommended for all students, but not required: Public speaking: TGS offers public speaking workshops throughout the year. Students are strongly encouraged

to participate prior to taking the oral Qualifying Exam. Grant writing: TGS offers grant writing workshops throughout the year. Students are strongly encouraged to participate prior to taking the oral Qualifying Exam. Workshops relevant to NIH funding are most relevant to this particular exam.

The 12 credits include some classes required of all students as well as courses specific to the student's selected course track. Course requirements include classes with a quantitative focus, a life sciences focus, and a track-specialization focus. Details of course requirements are specific to the year the student joined the PhD program and can be found on the student's Plan of Study form.

Students are required to complete an initial Plan of Study form by the end of the winter quarter of the first year. This plan must be approved by the primary research advisor or rotation advisor and the Director of Graduate Studies (DGS). Note that this is just an initial plan and is likely to change depending on course offerings and the student's developing research interests. Appropriate changes can be made with approval of the primary advisor.

Students entering with an MS degree and students in the MSTP or PhD/DPT programs: Requirements for these students are identical to those for students entering with a BS, with the following exceptions.

Students entering with an MS or in the PhD/DPT programs: A minimum of nine 300 or 400-level graduate courses must be taken for a letter grade (i.e., P/N courses are not accepted). One of these may be a 499 (research credit).

Students in the MSTP program: A total of at least six 300 or 400-level graduate courses for a letter grade (i.e., P/N courses are not accepted). None of these may be a 499 (research credit).

Grades: Credit for the MS or PhD degree will be given only for courses in which a grade above a C- has been received. No P/N registration will be accepted. A GPA greater than 3.0 is required for graduation with an MS or PhD. Students must obtain a grade of B+ or higher in their selected "track" courses. 499 courses do not count toward the GPA, except with approval by the Chair of the Graduate Program Committee. A student whose overall GPA is below 3.0 is not meeting academic standards and will be placed on probation by TGS. Failure to improve the GPA may lead to exclusion by TGS. Further grading details can be found on the [TGS website](#).

3.4. Research advisor, thesis committee, and annual committee meetings

3.4.1. Vocabulary Notes:

- Core and Courtesy BME faculty members are identified on the BME website.
- Your research advisor is often, but not always, the Chair of your thesis committee.
- Instructions for determining who is a member of TGS Faculty can be found on the BME PhD Communications Canvas site.

3.4.2. Steps to establishing an advisor and committee:

1. Timeline for finding an advisor:

By the end of February, all first-year students are required to choose a research advisor who agrees to support them as a research assistant. Students who choose to work with a research advisor who is not core faculty in BME must also select a BME co-advisor by this time. Advisors and co-advisors must be documented on GSP following the instructions on the BME PhD Communications Canvas site. Students who do not meet this milestone will be placed on probation for failure to make satisfactory academic progress, and removed from probation when an advisor/co-advisor is chosen and documented on GSP. If an advisor continues not to be chosen, the student may be excluded from the PhD program at the end of the fourth quarter, as this constitutes a lack of 'satisfactory academic progress,' per TGS policy. If the student has maintained an adequate GPA and is in good standing in the program, they may petition the BME graduate committee to pursue a coursework-based master's degree.

2. Details on co-advisors:

- **2A)** Students who choose to work with a research advisor who is not a core BME faculty member must select a BME co-advisor no later than the end of February of the first year. The BME co-advisor must be core BME faculty. The role of the co-advisor is to serve on the thesis committee and to provide access to a faculty member who is well-versed in the requirements of the BME department. The co-advisor's role in your PhD research is no different than any other thesis committee member.
- **2B)** Occasionally, students who choose to work with a research advisor who is a core BME faculty member might also select a co-advisor, if they anticipate that their thesis project will be joint between two laboratories. The decision to add a co-advisor should be carefully discussed with the research advisor. In this case, the co-advisor can be added at any time during the student's PhD.

3. Timeline for forming a committee and requirements for committee members

Students are required to form a thesis committee by the end of the summer quarter of their first year. The committee must be documented on GSP following the instructions on the BME PhD Communications Canvas site. Students who do not meet this milestone will be placed on probation for failure to meet satisfactory academic progress, and removed from probation when committee is established and documented on GSP.

3A) The Chair of the committee:

- Must be a core member of the BME department.
- Is typically, but not always, your advisor.
- If your advisor is not a core member of the BME department, the co-advisor can be Chair.
- Must be a member of the Graduate School Faculty. See the Canvas video for instructions on how to determine who is a member of the Graduate School Faculty.

3B) A thesis committee must consist of at least four faculty members. The Chair counts as one of these faculty members.

- At least three members must be full-time members of Northwestern University faculty.
- At least two members must be members of the Graduate School Faculty. See the Canvas video for instructions on how to determine who is a member of the Graduate School Faculty.
- At least two members must be core or courtesy members of the BME department.
- One member should be your advisor (who may or may not also be the Chair).

4. Annual committee meetings

The thesis committee must meet at least once per academic year, beginning in the second year, to review student progress. The first committee meeting should occur soon after the initial research project (see Research Component of the PhD Qualifying Exam) is completed. The occurrence of this initial meeting can be no later than March 31st of the second year. At least two committee meetings must be held before the final doctoral defense can be scheduled. The first committee meeting must be documented on GSP following the instructions on the BME PhD Communications Canvas site. Students who do not meet this milestone will be placed on probation for failure to meet satisfactory academic progress, and removed from probation when a committee meeting is held and documented on GSP.

5. Changing Advisors

If a student finds they are unable to continue working with their assigned advisor, they are first encouraged to discuss possible changes in research direction with their advisor. They are then advised to talk with the DGS or the Department Chair as soon as possible to identify possible remedies, including a change of advisor or exiting the program.

3.5. PhD qualifying exams

PhD Qualifying Exams must be completed by the end of the second year of study. Before taking these exams, students must complete at least nine courses, including the required quantitative courses, life sciences courses, and track courses, as well as BME 512 (seminar) and RCR training. MSTP students must take all six required courses before Qualifying Exams, as well as BME 512 (seminar) and RCR training. Students who do not meet this milestone will be placed on probation for failure to meet satisfactory academic progress unless a time-extension is requested and granted by the Graduate Program Committee.

There are three components to the PhD Qualifying Exam: a course-based component, a research component, and an oral exam. The requirements for each component are directly related to the student's area of research.

The course-based component of the exam ensures that the candidate has understood the basics of the chosen biomedical research area. General course requirements as well as track requirements and minimum grade requirements are found on the Plan of Study for the student's year. Plans of Study are found on the BME PhD Communications Canvas site. Students are responsible for discussing their qualifying coursework with their advisor and for ensuring that their advisor signs and returns the "Qualifying Coursework Form" to DGS and copies the student. The student must then document completion of this component of the qualifying exams on GSP following the instructions on the BME PhD Communications Canvas site.

The research component of the Qualifying Exam is to be completed under the supervision of the student's primary research advisor. The scope of the project should be equivalent to approximately 6 – 12 months of full-time research effort. Project details and specific goals are to be agreed upon by the student and the advisor prior to the start of work. The project should be started in the summer of the first year and results presented at the student's first committee meeting (no later than March 31st of the second year). The student's thesis committee will evaluate the research progress made to date and determine whether – within 15 months – the work meets quality standards for an MS thesis. Students are responsible for ensuring that their advisor signs and returns the "First Committee Meeting Form" to DGS and copies the student. The student must then document completion of this component of the qualifying exams on GSP following the instructions on the BME PhD Communications Canvas site.

For students entering with a BS, this initial research project forms the basis of the MS thesis component. The committee will assess the student's expected timeline to submit a document to meet the MS writing requirements as described in the next section of the handbook. For those entering with an MS, or for students in a program that does not require an MS to be completed (e.g., MSTP, PhD/DPT), this initial research project can be incorporated into the PhD dissertation. The committee will assess the student's expected timeline to submit a first-author manuscript to a peer-reviewed journal.

The oral component of the Qualifying Exam will take as its starting point, a written research proposal that the student submits to a committee of BME faculty, different from the student's thesis committee. The student will

defend the proposal during a one-hour oral exam before the committee. This exam emphasizes general questions related to the area of research. The goal of this exam is to evaluate the student's preparedness for independent graduate research. Details for the structure of the written proposal and a rubric for the qualifying exam are provided on the BME PhD Communications Canvas site.

The student will receive written feedback from DGS on their performance on the oral exam within one week of exam completion. If the student passes the exam, the student is responsible for documenting completion of this component of the qualifying exams on GSP.

The oral component of the Qualifying Exam must be taken in June of the second academic year. After the Oral Exam, all three components of the Qualifying Exam will be considered together by the BME faculty. Based on the student's performance on the three components, students' qualification to continue towards completion of their PhD thesis will be determined. If a student fails the oral exam but is otherwise in good standing in the program, they will be given the option to leave the program with an MS degree upon completion of all additional requirements for the MS program. Alternatively, the student may petition the Graduate Program Committee for permission to retake the oral component of the exam. Permission will be granted only in rare circumstances. If granted, the exam must be taken in June of the third year of study. If a student fails the oral exam a second time but is otherwise in good standing in the program, they will be excluded from the PhD program, but given the option to leave the program with an MS degree upon completion of all additional requirements for the MS program.

3.6. MS degree requirement for students in the PhD program

Students entering with a BS degree and not enrolled in the MSTP or PhD/DPT programs are required to complete an MS degree no later than the end of their third year of study. Ideally, the MS degree will be completed within two years. Completion of the MS degree is required for admission to PhD candidacy. Students not completing the MS by the end of the third year will be placed on department probation. The requirements for the MS degree are as follows:

Completion of all courses required for the PhD Qualifying Exams. A committee meeting in which the thesis committee agrees that the completed research is sufficient for the MS degree. An estimate of the timeline for completing research sufficient for the MS degree should be obtained at the first committee meeting in the spring of the second year.

Completion of the MS writing requirement. This requirement can be met by submitting the MS research to a peer-reviewed journal approved by the thesis committee. The student must be the first or co-first author on this publication. Conference proceedings cannot be used to meet this requirement. If the MS research is not suitable for publication in a peer-reviewed journal, this requirement can be met by submitting an MS thesis before the end of the three-year deadline. Only the primary research advisor needs to approve the MS thesis.

3.7. Teaching requirement

Whether working in academia, industry, or a research laboratory, recipients of a PhD degree are often in the position of mentoring and educating others. Teaching is not limited to academic lectures; presentations at international meetings and in corporate boardrooms are forums that require teaching skills, and patents must teach the reader the utility and novelty of the disclosed design or process. Thus, the BME department requires that all PhD students serve as teaching assistants (TA) within the first 3 years of their tenure at Northwestern University. Extensions beyond this time require prior approval of the Graduate Program Committee.

The teaching requirement is to be fulfilled by serving for at least one quarter as a full-time TA (approximate time commitment dependent on your funding: 10-20 hr/week) for a BME course. Serving as a TA in a department other than BME will not fulfill the TA requirement unless prior approval by the DGS has been granted. The responsibilities of a TA include but are not limited to: tutoring students, conducting problem solving sessions, preparing and supervising laboratory sessions, and grading. It is expected that some students will want more than this minimal teaching experience; where possible, these students will be accommodated. The teaching requirement is usually completed during a student's second or third year in the program.

3.8. Prospectus

Students must pass their prospectus no later than the end of Y4 of the PhD program. The goal of the prospectus is for the student to demonstrate that they can independently conceptualize and complete a significant, cohesive, doctoral-level research project in the field of biomedical engineering. Passing the prospectus consists of two parts: written and oral.

- Written: Students should provide their thesis committee with a written document that clearly describes the body of work they plan to complete for their PhD dissertation. The exact format of the written document is determined by the student/advisor pair; however, it must meet approval of all thesis committee members and must meet the prospectus goal stated above. Some suggested formats are available on the BME PhD Communication Website.
- Oral: Students must give a "prospectus presentation" at one of their annual thesis committee meetings. The presentation should review the written document and clearly describe the body of work that the student proposes to complete for their PhD dissertation.

Students are responsible for ensuring that their advisor completes the prospectus form (found on the BME PhD Communication Canvas site) and emails it to DGS while copying the student. The student should then document completion of the prospectus requirement on GSP following the instructions on Canvas.

Students should work with their advisor and committee as much as required to ensure that the prospectus is passed. If a student does not pass the prospectus by the end of Y4 in the program, they will be placed on probation based on unsatisfactory academic progress. They will be removed from probation once the prospectus is passed, or asked to leave the program with an MS degree, pending completion of all MS requirements.

For further instructions, if the prospectus is not passed, see "Alternative Circumstances" at the end of the handbook.

3.9. Publication Requirement

All students are required to be the first or co-first author on a peer-reviewed journal article accepted for publication prior to defending their PhD research. For students entering with a BS degree, this publication can be the same used to meet the MS degree requirements. The article cannot be a review article. The article must describe research in science or engineering. The article cannot concern biomedical engineering education or pedagogy. Conference proceedings cannot be used to meet this requirement.

3.10. Thesis/dissertation requirements

Upon written recommendation from the thesis committee and following a thesis committee meeting, a final thesis defense can be scheduled. Notification of this defense must be circulated to all faculty members of the department a minimum of three weeks before the defense and cannot be circulated prior to written approval by the thesis committee. All thesis committee members must receive a copy of the thesis after they have provided written approval of the defense date, and a minimum of two weeks prior to the defense. The thesis defense is open to all members of the Northwestern University community and their guests.

An acceptable dissertation resulting from original research must conform to [guidelines](#) set forth by TGS. Each student must submit a PDF of the completed thesis to the department office. An electronic copy also must be submitted to TGS, as described on their [website](#).

Although suggested as a possibility within the TGS guidelines, the department strongly recommends against placing a copy of your CV at the end of your dissertation. A CV is a "living document." A thesis is a completed, finalized body of work.

**3.11. Summary of milestones in the program:
typical PhD timeline**

Figure 1 summarizes the major milestones during the PhD qualifying process and the approximate expected effort during this time. The prospectus requirement must be met by the end of Year 4 (not shown in figure). Darker bars correspond to increased effort. Failure to meet the required milestones will result in the student being placed on probation by TGS or BME and may result in exclusion from the PhD program. Unless specified, the listed milestones are deadlines, not suggested completion dates. Students are encouraged to complete milestones, especially those in the first year, as soon as possible.

The target duration for completing the PhD in BME is 5-6 years, though the exact duration will depend upon the details of the selected research project and the ability of the student and advisor to work together to complete research and publications. After the Qualifying Exams of the second year, it is expected that most students will dedicate 100% of effort towards research, fulfilling their teaching requirement, and completing any remaining coursework.

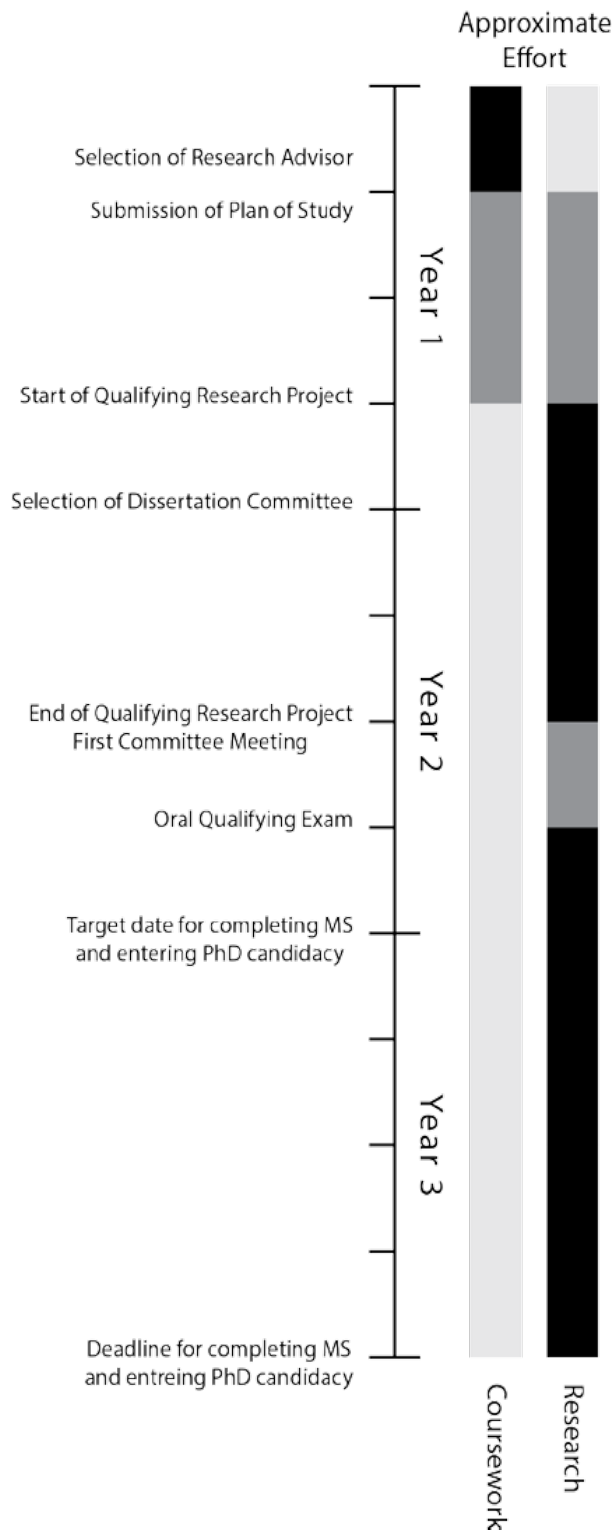


Figure 1. PhD Major Milestones

4. ADMINISTRATIVE INFORMATION

4.1. Registration

All students using departmental facilities in any quarter including summer must be registered. Registration details and recommended patterns of registration can be found on the [TGS website](#). A full-time registration of 4 units of courses and/or research (BMD_ENG 590 or TGS 500) is typical. Generally, in the first two years of PhD study, students complete courses and some units of BMD_ENG 590. Once students have completed the first eight quarters of full-time enrollment in the PhD program, passed qualifying exams, and completed all coursework, they should enroll in TGS 500 (Advanced Doctoral Study).

The maximum time allowed for completing all PhD requirements is nine years. Beyond this time period, students will not be eligible to receive federal loans or to qualify for the university health insurance subsidy, nor will they be eligible for fellowships, traineeships, teaching or research assistantships, or scholarships. Petitions based on hardship will be reviewed on a case-by-case basis by the Dean of TGS.

Per the [Continuous Registration Policy](#), all doctoral students must be registered at Northwestern University in each of the fall, winter, and spring terms until all degree requirements have been completed. To continue receiving a stipend in summer quarter, you must be registered full time. A list of available TGS general registrations is available [at this website](#).

4.2. Financial Aid

Incoming PhD students are provided with a minimum of 5 academic years and 4 summers of guaranteed funding. This funding typically comes from a combination of research assistantships in the selected laboratory, teaching assistantships, and fellowships or scholarships. Funding ends at the end of the month in which the student completes all degree requirements.

All graduate students are also strongly encouraged to seek external funding for their research. External grants perform two vital functions: first, they supplement or extend doctoral students' funding to finance research; additionally, such awards – particularly if they are highly competitive and prestigious – can enhance a student's resume.

Students who need additional funds to pay for their education may wish to apply for loans. Only U.S. citizens and permanent residents who are enrolled at least half-time are eligible for federal loans. There are alternative loan options for part-time students and for international students. To be eligible for all forms of financial aid, continuing graduate students must remain in good academic standing and demonstrate satisfactory academic progress toward their respective degrees. Further details and links to additional information can be found on [the TGS website](#).

4.3. Leaves, internships, and vacations

Students may take leaves for various issues: medical, bereavement, parental. They may also take internships. Instructions for taking a leave can be found on the BME PhD Communications Canvas site. Students should discuss remote work and vacation time with their advisor and ensure that their advisor's policies are clear.

4.4. Alternative circumstances

If an advisor leaves the university, the student should notify DGS and the department chair. Arrangements will be made to finish the degree depending on the year of the student and the individual needs/circumstances of the student.

If a student does not pass the prospectus in year 4, even after working with their advisor and committee, they should schedule a meeting with DGS, their advisor, and, if desired, the Northwestern Ombudsperson.

4.5. Conflict resolution

Students should follow the steps outlined on this TGS website:

<https://www.tgs.northwestern.edu/services-support/dealing-with-student-faculty-conflicts/index.html>