
University of Notre Dame
Bioengineering Ph.D. Program

Graduate Studies Handbook

2021 – 2022 Academic Year

Table of Contents

| | |
|--|-----------|
| I. INTRODUCTION | 3 |
| II. BASIC RESPONSIBILITIES OF STUDENTS..... | 4 |
| A. REGISTRATION | 4 |
| B. ENROLLMENT | 4 |
| C. SATISFACTORY DEGREE PROGRESS | 4 |
| <i>Grades</i> | 4 |
| <i>Milestones</i> | 4 |
| D. TEACHING AND RESEARCH RESPONSIBILITIES | 4 |
| E. BREAKS AND HOLIDAYS..... | 4 |
| F. OFFICE AND LABORATORY FACILITIES..... | 5 |
| G. SAFETY..... | 5 |
| H. LEAVES OR STUDY AT OTHER SITES..... | 6 |
| III. PROGRAM STRUCTURE..... | 7 |
| A. ADMINISTRATION | 7 |
| B. HOME DEPARTMENT..... | 7 |
| C. FINANCIAL SUPPORT..... | 7 |
| IV. ADVISING | 7 |
| A. EXAMINATION COMMITTEE | 7 |
| B. PROFESSIONAL DEVELOPMENT AND CAREER PLANNING..... | 8 |
| V. DEGREE REQUIREMENTS | 9 |
| A. COURSE REQUIREMENTS | 9 |
| <i>Degree Program</i> | 9 |
| <i>First year courses</i> | 9 |
| <i>General Course Guidelines</i> | 10 |
| B. THE QUALIFYING EXAMINATION..... | 10 |
| <i>Coursework</i> | 10 |
| <i>Written component</i> | 10 |
| <i>Oral Component</i> | 10 |
| <i>Admission to the Doctoral Program</i> | 11 |
| C. CANDIDACY EXAMINATION | 11 |
| <i>Written Candidacy Examination</i> | 11 |
| <i>Oral Candidacy Examination</i> | 12 |
| <i>Advancement to Candidacy</i> | 12 |
| <i>Master's Degree Option</i> | 12 |
| <i>Students entering with an M.S. Degree</i> | 12 |
| D. THE DISSERTATION AND DEFENSE..... | 12 |
| <i>Written dissertation</i> | 12 |
| <i>Defense of Dissertation</i> | 13 |
| <i>Publication of the Dissertation</i> | 13 |
| VI. MASTER'S DEGREE IN BIOENGINEERING..... | 14 |
| VII. FACILITIES AND SERVICES | 15 |

| | | |
|--|--|-----------|
| A. | LIBRARY..... | 15 |
| B. | COMPUTING FACILITIES..... | 15 |
| C. | LABORATORY FACILITIES | 15 |
| D. | OFFICE FACILITIES..... | 15 |
| E. | COPYING FACILITIES..... | 15 |
| F. | STUDENT GOVERNMENT SERVICE | 15 |
| G. | HEALTH AND COUNSELING..... | 15 |
| H. | CAREER AND PLACEMENT | 16 |
| I. | INTERNATIONAL, AND RELIGIOUS SERVICES | 16 |
| J. | GRADUATE STUDENT LIFE | 16 |
| APPENDIX A: ACADEMIC INTEGRITY..... | | 17 |
| APPENDIX B: FACULTY | | 18 |
| APPENDIX C: MEDICAL SEPARATION FROM ACADEMIC DUTIES..... | | 19 |
| APPENDIX D: DEGREE PROGRAM FORM | | 20 |
| APPENDIX E: CANDIDACY EXAMINATION REPORT | | 22 |
| | <i>Scoring Criteria for the written candidacy examination:</i> | <i>25</i> |
| APPENDIX F: IMPORTANT DATES FOR THE 2020-2021 ACADEMIC YEAR | | 26 |

I. INTRODUCTION

This handbook describes the policies and procedures for the Bioengineering Ph.D. program at the University of Notre Dame. Its focus is on the unique degree requirements of this interdisciplinary program. In addition to the requirements in this handbook, students should be familiar with graduate school policies regarding their degree progress, and requirements to maintain eligibility for financial support and health care subsidies. Additional sources of student guideline and policies are Du Lac, the University's student policy and procedure manual, and the Graduate and Professional Student Handbook. All students were provided a copy of this Handbook upon admission.

These policies apply to all students enrolled during the 2020-2021 academic year. They are subject to change and may be different from policies published in previous years. More general information on the program can also be found at <http://bme.nd.edu>. Nothing herein, in previous handbooks or on-line is to be interpreted as contrary to the regulations of the Graduate School.

Topics covered in this handbook include the basic responsibilities of graduate students, requirements for the Ph.D. program, and items related to selected facilities and services available. A number of other important documents and directives are listed in the Table of Contents in the form of URL's and each student is encouraged to review these documents. Often answers to questions regarding the graduate program can be found by contacting Ms. Carly Reynolds. Her office is Rm. 153 Multidisciplinary Engineering Hall of Engineering and her e-mail address is cgriffi2@nd.edu. You may also contact the program director, Professor Glen Niebur, 147 Multidisciplinary Engineering Research, gniebur@nd.edu.

This handbook provides the official policies of the degree program. If under any circumstances a student wishes to deviate from these policies, they should secure prior written approval from the program director and make sure that this approval is recorded in their permanent file. Do not assume that approval will be granted for any deviations from the policies based on previous precedents.

II. BASIC RESPONSIBILITIES OF STUDENTS

A. Registration

A full-time graduate student is required to take nine credit hours during the fall and spring semesters during each semester in residence. These credits will be a mix of course work and research credits. The Graduate School allows a maximum of nine hours of course work per semester for students who are receiving stipend support. During the summer session, all students are required to enroll and register for zero credit hours of the course numbered 67890 in their home department. If they intend to graduate during the summer, they should also register for zero credits of research under their advisor. If they wish to take a course for credit offered during the summer session, they will need to apply for a tuition scholarship before the first day of classes.

B. Enrollment

All graduate students must both register and enroll before each spring and fall semester and the summer session to maintain student status. Enrollment is different from registration, and you must do both. If you fail to enroll during the semester, you may have to apply for re-admission. The only exception is for officially approved leaves of absence.

C. Satisfactory Degree Progress

Each year your degree progress will be reviewed by your advisor, the Program Committee, and the Graduate School. Each of these levels may have differing standards and criteria for evaluation. Continued financial support, both stipend and tuition, are dependent upon successful performance in research, course work, assistance in teaching as well as the availability of funds.

Grades

The most readily used means for assessment of the student's academic progress is through grades assigned in course work. The Graduate School grading system is on a four-point basis. Grades recorded for graduate courses are: A (4.0), A- (3.667), B+ (3.333), B (3.0), B- (2.667), C+ (2.333) and C (2.0). In the bioengineering program, the

grade of B- is considered the lowest acceptable grade in any graduate course. A student whose cumulative GPA is below 3.0 or whose GPA in any given semester is below 2.5 may be subject to loss of financial support and/or dismissal.

Milestones

You must meet certain milestones in order to remain in good standing with the program and the Graduate School. You must:

1. Complete your qualifying examination before starting your third semester.
2. Pass your candidacy examination before beginning your ninth semester
3. Complete your dissertation defense within seven years

Failure to achieve these milestones will result in your ineligibility for further financial aid, including tuition and fees.

D. Teaching and research responsibilities

Most graduate students are supported by research grants and contracts. You are responsible for meeting the requirements of your research position, which should be considered a full-time position. Students should be on campus and meet with their research supervisor regularly.

Most departments in the College of Engineering require affiliated graduate students to assist with teaching. The director of graduate studies in your home department may assign you teaching assistant duties according to the policies of the department.

E. Breaks and Holidays

It is expected that full-time students receiving financial support from the University devote their entire professional efforts to research, teaching, and course work within the University. Students may not engage in outside employment of any kind without permission of the program director.

Students receiving stipends should note that normal academic breaks do not apply to graduate students. In particular, you are expected to be present during spring and fall break, and in the interterm periods following finals.

Graduate students on stipend should observe the following holidays: Thanksgiving and the following Friday, Christmas Eve through New Year's Day, Good Friday and Easter Monday, Memorial Day, and Independence Day.

Vacation time during periods that you are receiving financial support must be approved by your advisor. There is no official University policy on vacation time for graduate students, and the amount of time you receive is solely at the discretion of your advisor. Note that spring break and fall break are not vacation periods for graduate students.

Students who are paid as Teaching Assistants (TA) must be available throughout the semester, through the end of final exams, to support the courses for which they have responsibility. This includes fall and spring breaks, when you may need to assist with grading or course preparation. Any absence from campus by a TA during the semester must be approved in writing by the student's research advisor, the instructor in the course for which the student is serving as a TA and the program director.

F. Office and Laboratory Facilities

Your home department supports office space and individual research laboratories. Students are responsible for acquainting themselves with and following the proper safety procedures for the laboratories they use. Because the offices and laboratories are diverse in their purposes, procedures, and equipment, specific safety procedures are not listed here. However, all users of these offices and laboratories are to observe the following general safety and security procedures:

1. You may be issued keys or electronic access to university building. Keys may not be traded among, loaned to, or passed on to other students and must be returned as soon as the need for regular access has passed.
2. Laboratory users share in maintaining its security and cleanliness. Laboratory doors are not to be propped open or left unlocked when the laboratory is unattended, and must be locked at the end of the working day.

3. Unauthorized users are not allowed into a laboratory.
4. Guests may be invited into a laboratory, but may not be left unsupervised. The host is responsible for the guests' safety.

G. Safety

Your office facilities and laboratory spaces have an integrated safety plan. You should be familiar with it, and your advisor or their designee should instruct you in laboratory safety. You should bring to the attention of your laboratory supervisor or advisor any unsafe laboratory situations they encounter. If you do not feel that your concern has been adequately addressed, you should contact the program director. The following general rules apply to all laboratories:

1. Students must complete assigned training through ComplyND before working in laboratory facilities.
2. Each student using a laboratory must be acquainted with all the particular safety procedures and safety equipment in the laboratory. These include the locations of emergency controls and the locations and use of all safety equipment and first aid supplies.
3. Students should contact their advisor or other laboratory management if they see an unsafe situation, or feel the need for additional or different personal protective equipment.
4. Graduate students who supervise undergraduate laboratories assume primary responsibility for safety procedures. If additional safety supplies (such as hard hats or safety glasses) are required, the course instructor should be notified.
5. Any graduate student developing a new experiment or acquiring new equipment will also be responsible for developing and recording the proper safety procedures associated with the new equipment.
6. Observed inadequacy of laboratory safety procedures or equipment must be reported immediately to a faculty member so that the situation may be corrected.
7. Violations of safety procedures or the creation of unsafe or unhealthy conditions

must be reported to the responsible faculty. Failure to work safely or to maintain orderly, professional working environments will result in the forfeiture of all office or laboratory privileges.

H. Leaves or Study at Other Sites

On occasion students spend part of their graduate program in a non-resident status. A

student should carefully discuss all aspects of such an arrangement with their research advisor prior to departure. Students who leave prior to completing their degree program and graduating must realize that in order to eventually receive their degree they must be registered as a student in the semester prior to the graduation. If they are in a non-resident status and wish to complete their program and graduate, they will be responsible for the tuition costs associated with that registration.

III. PROGRAM STRUCTURE

The Bioengineering program is administered by the college of engineering and is housed across the various departments. The program is strictly a Ph.D program, and the Graduate School does not grant an M.S. degree in Bioengineering.

A. Administration

All policy-making and administrative authority in the Bioengineering degree program resides with the Faculty program committee and the program director. Any policy question or administrative matter should be referred in writing to the program committee via Ms. Carly Reynolds, 153 Multidisciplinary Engineering Hall of Engineering. Matters that cannot be resolved satisfactorily can be appealed to the Graduate School, via the Dean of the Graduate School. The program director is Professor Glen L. Niebur, 147 Multidisciplinary Engineering (gniebur@nd.edu).

B. Home Department

Each student in the program is assigned to a home department. The home department is the department where the student's faculty advisor has their primary appointment. The home department in conjunction with the advisor will provide office and laboratory facilities for the student. The student is required to fulfill any teaching assistant, service, and professional development requirements as other Ph.D. students in the home department.

While the home department administrative personnel may provide certain support for students, such as ordering supplies or arranging office space, all academic records are maintained in the Bioengineering Program office (153 Multidisciplinary Engineering), and the student should ensure that all examination records and scheduling are reported to the program rather than your home department.

C. Financial Support

Most full-time students receive a stipend. Funds for these stipends typically come from the externally funded grants and contracts of the student's advisor. The bioengineering program has minimal resources to provide stipend or benefit

support to students. Such resources will be allocated at the discretion of the program committee. Students should communicate with their advisors to determine their status for ongoing financial support.

IV. ADVISING

One of the most important matters for graduate students is the choice of a faculty advisor. This choice can have a great effect on your time in graduate school and long-term career path. Upon entry, you will be temporarily advised by a faculty member assigned by your home department. Your permanent research advisor will be a faculty member in your home department.

Your advisor will be assigned to you based on your input, the current faculty needs, and available resources. In most cases individual students and faculty members make this arrangement without external intervention.

You should immediately begin speaking with faculty members in your area of interest upon arrival at Notre Dame. After your first semester you, will be asked to submit a ranked list of preferences for potential advisors to the program director. Some home departments may ask that you make this declaration earlier in your program.

If you do not have a research advisor by the end of the second semester in the program, you may be subject to dismissal from the program. If a student is dismissed by an advisor at any time during their studies and cannot secure the support of a new advisor within 6 weeks, they may be dismissed from the program at the end of the current semester.

A. Examination Committee

Within your first year of residence, you will establish your Examination Committee. This committee should be chosen carefully in consultation with your advisor, as they will also be involved in specifying the required coursework for your degree program. The committee must consist of:

1. Your research advisor
2. A faculty member of your home department

3. A faculty member from outside your home department

All students must have an advisor from their home department who is an active member of the Bioengineering program. Any faculty member in the College of Engineering or the College of Science may be part of your examination committee.

You may have one member who is not on the Notre Dame faculty. In general, individuals from outside the University should be tenured faculty at another university, or otherwise have a record of scholarly activity. An outside member must be formally requested to and approved by the Program Committee.

Note that all three members of the committee are voting members on your examination and dissertation, and should be able to understand and

judge the suitability of your coursework and research for your degree.

B. Professional Development and Career Planning

The Graduate Career Center resources are focused on graduate student success—helping you to be the best prepared in order to obtain strong career outcomes after your time at Notre Dame. All first-year Bioengineering PhD students are required to schedule a one-on-one sit down session with a Graduate Career counselor during their first year of study, preferably in the spring semester, and again sometime within their third year of the program. The purpose of the requirement is to assist you in understanding and navigating your career options while taking the steps necessary to achieve your goals. The Center is located in the Graduate School, 110 Bond Hall, and online at <http://gradcareers.nd.edu/>.

V. DEGREE REQUIREMENTS

A. Course Requirements

The Ph.D. degree requires a *minimum* of 27 credits (usually nine courses) of coursework credit. Your advisor or your examination committee(s) may specifically require you to take additional courses based on their judgment of your preparation for research and scholarship. You may take courses beyond the minimum, with the approval of your research advisor, and to the extent that they do not interfere with your teaching and research responsibilities.

It is the policy of the University that students receiving stipends take no more than three courses per semester, so as not to interfere with your research and teaching responsibilities associated with the stipend.

Degree Program

At the end of the first year, you should complete the degree plan form (Appendix D) to indicate the courses you have taken and plan to take to meet the degree requirements.

Your signed degree program will be sent to the Graduate School, and represents the expected course sequence that you will complete for your degree. Changes to your degree plan may be necessary due to changes in course availability or your research program. Changes to your degree program will normally be approved by your committee and the program director at the time of your qualifying examination. You should discuss potential changes with your advisor and your committee to ensure that they are acceptable. If any courses listed on your signed degree program form are not completed, your degree will not be awarded.

You must complete at least nine courses for the degree. Graduate school regulations require that at least seven of the nine courses are at a level of 6XXXX and above. The following course distribution requirements must be satisfied by your degree program:

1. ENGINEERING SCIENCE: Nine credits (three courses) of traditional engineering

courses at the level of 5XXXX and above. These courses must incorporate significant applications of engineering mathematics, and should generally be from the student's home department. The final determination of whether a course is appropriate to fulfill the engineering science requirement will be made by the Faculty Program Committee.

2. BIOLOGICAL SCIENCE: Nine credits (three courses) of biosciences courses such as biology, physiology, anatomy, or biochemistry. Courses at the 3XXXX-level may be taken as remedial courses, but cannot be used to fulfill the bioscience requirements. The biosciences coursework is intended to provide the student with depth of knowledge in the biological sciences, and should include at least one course at the graduate (6XXXX or greater) level.
3. BIOENGINEERING: A minimum of nine credits (normally three courses) of engineering, bioengineering, and biology electives at the graduate level (6XXXX and above). These courses are intended to develop the student's ability to synthesize knowledge in engineering and biology, and to develop the necessary background to complete their dissertation research.

The courses that fit in each category is not fixed. The final determination of the appropriateness of any course to fulfill the requirements is determined by your advisor and examination committee, and approved by the Program Committee.

A minimum of 72 semester credit hours (including both course credits and research credits) are required for the Ph.D. degree based on the requirements **to register for nine credit hours each semester**, you should complete this within six semesters.

First year courses

Eighteen credit hours of course work (6 courses), excluding research credits, are typically taken in the first year. A minimum of four courses must be taken to prepare for the qualifying examination.

Students should meet with their admission advisor at the beginning of their first semester to prepare an individual course of study for the first semester. A permanent research advisor is normally assigned during the first semester. The research advisor will then work with the student to plan the remainder of their program.

General Course Guidelines

Only courses offered by departments in the Colleges of Engineering or Science can be applied to degree requirements. Introductory graduate-level courses are numbered 6XXXX, special graduate courses are numbered 7XXXX, and advanced graduate courses are 9XXXX.

Credit can be received for up to six credits of undergraduate courses offered in the Colleges of Engineering and Science. Credit will not be given for work that is considered remedial.

If you completed your undergraduate degrees at Notre Dame, and took graduate level (60000 level or higher) courses that were not used to satisfy undergraduate degree requirements, you can request to use up to 6 credit hours of qualified courses to satisfy graduate degree requirements.

B. The Qualifying Examination

Passing the qualifying examination is your official acceptance into the Ph.D. program, and advances you to the level of doctoral student.

The purpose of the Comprehensive Evaluation is to determine whether a student is prepared to perform research at a level consistent with his or her degree objective. The evaluation is normally after the first academic year, typically at the start of the third semester in residence. The evaluation includes a review, based on the student's course work, of his or her knowledge of bioengineering fundamentals, results of the written and oral components of a research examination and an evaluation by the research advisor of the student's performance in research.

Coursework

To pass the coursework portion of the exam, students must have completed at least three engineering courses and at least four courses total while maintaining a grade point average of 3.3 or

higher in their first year. Any courses in which the student earned a grade of B- or lower cannot be counted towards satisfying degree requirements, regardless of overall GPA.

If deficiencies should appear in the course work evaluation while the other evaluation components appear satisfactory, specific remedies may be identified on an individual basis at the discretion of the faculty.

Written component

By the end of the summer session following your first year in residence, you must complete a research paper (5-7 pages) describing and analyzing a problem that includes both engineering and biological components. It should formulate a unique problem, explain the motivation for the problem, review the relevant literature, and provide a description of the topic based on principles of engineering analysis. Ordinarily these papers will be based on your research, so that a description of the relevant experimental, theoretical, and computational techniques should be included along with preliminary results and a description of the next steps in the work. It is *not* a research proposal.

Your examination committee, approved by the Program Director, will evaluate the written component and hold an oral examination session to further evaluate your ability to continue for a Ph.D. You must distribute copies of your paper to the examination committee at least one week (5 business days) prior to the date of your oral examination.

Oral Component

You are responsible for scheduling the oral component of the examination. Carly Reynolds in 153 Multidisciplinary Engineering Hall of Engineering or your home department administrative assistant can help you to locate and schedule an appropriate room.

You will make an oral presentation, no more than 20 minutes in length, describing the key content of your written examination. Of particular interest are a description of the research problem formulated in your document, a review of current research in the field, preliminary results from your

own work, and a discussion of important research directions. This is followed by a period of questions from the faculty, which will focus on your ability to interpret and explain the presented research. Questioning is not confined to topics within the scope of the research, but this should be the majority of interrogation as the coursework component is intended to address fundamentals. The oral examination is typically 45 minutes in length.

Following the examination, the committee will discuss and vote to either pass or fail, which your advisor will communicate to the program administrator and program director. If you pass, you should complete the degree plan in appendix D, and have it signed by your committee. If you deviate from this course plan, you will need to gain approval of your committee and the program director.

The oral qualifying examination is not public. However, you are encouraged to present the examination material in alternate public settings such as a laboratory or group seminar.

Admission to the Doctoral Program

The Program Committee will make the decision to accept the student into the doctoral program after reviewing the student's academic record and the Qualifying examination results. Admission to the degree program does not constitute admission to degree candidacy, for which additional requirements are described below.

C. Candidacy Examination

All Ph.D. students at Notre Dame must take and pass a candidacy examination. Passing the candidacy examination will advance you to the level of Ph.D. candidate.

You should plan to take and pass your candidacy examination by the end of your third year in the program. You must pass your candidacy examination before you start your ninth semester. The examination consists of both written and oral components, and will be administered by the appointed Examination Committee. The written and oral parts are considered separately and you must pass both.

It is normally expected that you will have submitted at least one paper to an appropriate peer-reviewed journal in your field prior to your oral candidacy examination. Your committee may accept a conference paper, or a paper that is nearly ready for submission.

You must have completed at least six courses or 18 course credits before completing your candidacy. At least 15 credits must be in engineering courses.

Written Candidacy Examination

The written candidacy examination is a research proposal. The formatting should follow guidelines for an NSF research proposal (see <http://nsf.gov>) including page limitations. You should not include personnel, facilities, and budget justification sections. Your proposal should include a CV that includes your relevant publications and presentations. Your CV need not follow NSF guidelines. It should include all publications, including conference presentations, and any other relevant research accomplishments or awards. Your advisor can provide you with examples of typical research proposals and CVs, which may vary slightly between subdisciplines.

The proposal should introduce the theme of your research project and develop two to four specific aims within the first one to two pages of the proposal. Following the aims, the background and significance, including relevant literature and any preliminary results should be presented. Your specific research plan to address the aims, objective or hypotheses of your work should be presented. Specific methods should be provided as necessary to demonstrate your knowledge of how the research can be carried out.

You must distribute the written component of your examination to the committee **at least 10 business days prior to officially scheduling the examination with the bioengineering graduate program** (15 business days prior to your proposed examination date). Each committee member must sign the examination report (Appendix E) and return it to Carly Reynolds in 153 Multidisciplinary Engineering Hall or Professor Glen Niebur in 147 Multidisciplinary Engineering Research **at least**

five business days prior to your proposed examination date to allow your oral examination to be officially scheduled. Your oral examination cannot be officially scheduled through the graduate school until the signed report is completed.

The written component of the examination requires *unanimous committee approval*.

Oral Candidacy Examination

The oral candidacy examination will conform to Graduate School guidelines.

The examination will include a presentation of completed research, and proposed research to complete your dissertation. It should specifically address how your research applies to the field of bioengineering, how it integrates knowledge of both biology and engineering, and how it will advance the state of knowledge in the field. The initial presentation is open to the public. You must accept and answer questions from the public audience at the completion of the presentation.

Following the public presentation, the examination committee will question you in depth on your completed research and your research plans. The committee may also ask fundamental questions about your field(s) of research and study. You may wish to confer with your examination committee members prior to the examination to determine the expected scope of their questions.

Following questioning, your Examination Committee will deliberate in private.

Passing the oral candidacy examination requires a *majority vote* of the committee.

Advancement to Candidacy

Upon passing both the written and oral candidacy examinations, you will be advanced to candidacy, which signifies your ability and responsibility to conduct independent research.

Master's Degree Option

A student who has successfully completed all parts of the doctoral Candidacy Examination, and has completed at least 15 credits in engineering courses, 18 total course credits, and 24 total credits (research and coursework), may receive a Master's degree in Bioengineering on the recommendation

of the candidacy committee, and approval by the program director. Note that it is the policy of the University to not award duplicate degrees. A student who has a Master's degree in bioengineering or biomedical engineering will not be awarded a Master's degree on completion of the Candidacy examination.

Students entering with an M.S. Degree

There are some modifications to the program if you had an M.S. degree upon entering the Bioengineering Ph.D. program. A request to the program committee for transfer of up to nine credits from a master's degree obtained within the previous five years may be made. To receive credit for a graduate course taken elsewhere, the course will need to be a graded, graduate-level, academic course, of the type that would normally be considered as part of our graduate academic course requirements and the student achieved a grade of a B+ or better. You cannot transfer pass/fail courses, research credits, thesis credits or other non-classroom credits. Your examination committee, advisor, and the program committee will assess whether these courses fulfill the category requirements of your degree plan. In any case, you will still need to complete at least 72 total credits, including research credits, *at Notre Dame*.

D. The Dissertation and Defense

After the completion of research and all course work, you will prepare and defend a written dissertation. The dissertation is the traditional form of documenting your ability to perform, write, and present scholarly research. The contents of the dissertation should be deemed suitable for publication in the peer-reviewed literature.

Written dissertation

This is a thorough compendium of your research and scholarship at Notre Dame. The contents of the dissertation vary between subfields, and you should consult with your advisor regarding the overall format and style. In addition, the graduate school has specific formatting and style requirements that you must meet.

When your dissertation advisor(s) is/are satisfied that the dissertation is in suitable form,

and has the appropriate content, they will sign a distribution form, releasing it for distribution to the examination committee. You must deliver the signed form to the programs' graduate administrative assistant, who will then issue the Ph.D. reader's card. It is your responsibility to deliver the required copies of the dissertation along with the appropriate reader's card to their readers, and to collect and return the signed readers cards to the administrative assistant.

The dissertation defense may not be scheduled sooner than four weeks from the date the graduate studies administrative assistant receives the dissertation distribution form. It is expected that during this time each reader will carefully read the dissertation and meet with the candidate to discuss suggested or necessary changes to be made before the oral defense. The oral examination will not be scheduled until all the Ph.D. reader's cards have been signed and returned to the graduate studies administrative assistant. Only a dissertation unanimously and unconditionally approved by the readers may be defended.

Defense of Dissertation

The purpose of the Ph.D. Dissertation Defense is to explore the originality and significance of the candidate's dissertation. It is your responsibility to determine a mutually agreeable time for the defense. The scheduled date and time, accompanied with the readers' cards, are returned to the Graduate School at least 10 business days, excluding holidays, prior to the defense of the dissertation.

You are responsible for reserving a room for the defense and ensuring that the necessary audio-visual equipment is available. Assistance in scheduling and locating equipment can be obtained from administrative staff.

The final dissertation defense is public. The candidate should post the time and place one week in advance of the defense. Your research advisor will act as the chair and moderator.

The examination begins with a summary presentation of thirty to forty minutes. You will be expected to present your research and place it in the context of the existing literature in the field,

including the relevance of the work to a specific problem in bioengineering. After the presentation, the public audience may ask questions.

The presentation is followed by the closed oral examination. The committee members will question you in private, for a period of up to 120 minutes. If questioning exceeds 90 minutes, you should be offered, or may request a short break.

Following questioning, you will be excused, and your committee members will deliberate and cast official votes. The majority of members of the committee must vote pass in order for you to pass the examination. The individual votes will be recorded on the examination report form. You must return the voting form to the graduate school.

Failure of the defense does not necessarily require rewriting the dissertation. In the case of a failure, the student may be allowed a second opportunity to present a defense of their work based upon the recommendation of a majority of the candidacy examination committee members, the department chair and the approval of the Graduate School. Failure in the second defense terminates the candidate's eligibility for a doctorate at the University.

Publication of the Dissertation

The dissertation serves as the scholarly record of the student's doctoral research, and should be published and disseminated. In addition to publications in the peer-reviewed literature, the graduate school publishes your dissertation in its entirety. The final version of the dissertation must conform to the requirements as outlined on the Graduate School's webpage: <http://graduateschool.nd.edu/resources-for-current-students/dt/>

Your dissertation *must* be checked for format conformity by the Graduate School before its final submission.

After the oral defense and approval by the Graduate School, you must upload a clear, print-quality PDF version of the complete dissertation to the Library's electronic submission website at <http://etd.nd.edu>. Note that the PDF upload requires the advisor-signed title page. The Library system allows students to have control over the

electronic release of their dissertation so as to protect their intellectual property where appropriate.

It is the responsibility of the individual advisors and graduate students to support the cost, produce, and distribute any bound copies of the student's dissertation. Any questions regarding Graduate School dissertation rules should be submitted the Graduate School.

VI. MASTER'S DEGREE IN BIOENGINEERING

The program does not normally admit students to pursue Master's degrees. However, your plans to pursue a Ph.D. may be affected by changes in career plans, life circumstances, or other events.

You may, with the approval of your advisor and the program director, obtain a terminal Master's degree in Bioengineering. The requirements for the Master's degree are: at least 15 credits in engineering courses, 18 total course credits, and 24 total credits (research and coursework).

You must complete a project report on the research you completed during your tenure at Notre Dame. This written report should be assessed by a committee of three faculty members. The written report should be distributed to the faculty committee at least 10 business days prior to the oral examination.

The oral examination is the final comprehensive examination for the Master's degree. A majority vote of the committee is required to pass the oral comprehensive examination.

VII. FACILITIES AND SERVICES

A. Library

The University Library system consists of a number of libraries. Circulation policies and operating hours are available at each of the libraries. Students should make themselves aware of the resources the libraries provide and become more familiar with them by visiting the University library web site, <http://library.nd.edu/>.

B. Computing Facilities

The Office of Information Technologies (OIT) oversees an extensive variety of computers, workstation clusters, and personal computer facilities throughout campus. Many are open year-round, twenty-four hours a day. The University has a wide range of software and printing services available for the use of all students. For a complete current listing of University facilities, which change often, students should visit <http://oit.nd.edu>.

C. Laboratory Facilities

You may work in a wide variety of laboratories across the University campus. These may be specific laboratories to your research group, or shared facilities that are supported by user fees.

D. Office Facilities

All full-time graduate students have access to personal office space. Offices are typically shared with other students. Each student will also have a mailbox located in or near the main administrative office in the building to which you have been assigned. Students are expected to maintain professional office environments, to maintain a neat office, and to be respectful and courteous to their officemates and others in their office environment.

E. Copying Facilities

There are a number of copying facilities on campus, with services available at a charge. Many small machines are located in Hesburgh Library and each branch library. Your home department or your research group may maintain a copier for student use. Check with the administrative staff or your advisor to determine if you are allowed to use these resources.

F. Student Government Service

Graduate students are responsible for the activities of the Graduate Student Union (GSU). Through a council of elected officers, appointed officers, and representatives from the departments of its constituent colleges, the GSU provides a variety of services and represents its membership on various University councils and committees. It publishes the bimonthly GSU newsletter, conducts a graduate orientation program, and sponsors workshops, travel grants, and various social and cultural activities. The GSU is the graduate students' official liaison with University administration, the Office of Student Activities, and the Library Administration. The GSU finances operations through a yearly fee assessed on all graduate students. The GSU maintains offices in 219 LaFortune Student Center, 631-6963; their website URL is: <http://www.gsu.nd.edu/>.

G. Health and Counseling

There are many additional services available to graduate students. Most are described in detail in the *Bulletin of Information* or on the web at: <http://graduateschool.nd.edu/resources-for-current-students/>.

University Health Services, located in the University Health Center, 631-7497, provides immediate, follow-up, and ongoing health care. The services provided include outpatient clinics, dispensing medication, administering allergy injections, laboratory and x-ray facilities, and a twenty-five-bed inpatient unit. Health insurance is required of all international and full-time students. The University offers a plan for all students. The student's spouse and children have the option of purchasing health insurance through this plan. More information can be obtained by calling 631-6114. The University Counseling Center, located in the University Health Center, 631-7336, offers professional services to all graduate students and their families.

The University has several excellent athletic and exercise facilities, most of which are available free of charge.

H. Career and Placement

The University's Graduate Career Services provides assistance with post-graduate placement and professional development. (See Section IV. Advising, page 8, for additional information.)

I. International, and Religious Services

The University supports an International Student Affairs Office, 205 LaFortune, 631-5243, which aids in immigration matters, serves as liaison with sponsoring agencies and governments, and promotes interaction within the University. The International Student Organization (ISO), 204 LaFortune, is a club for interested students.

Campus Ministry, 103 Hesburgh Library, 631-7800, offers programs and organizations to serve

students' spiritual needs across a full range of faith traditions.

J. Graduate Student Life

A unit within the Division of Student Affairs and in cooperation with the Graduate School, Graduate Student life (<http://gradlife.nd.edu/>) is committed to enhancing the educational experience and quality of life for Notre Dame students pursuing advanced degrees. The Graduate Student Life website contains reference links for special events and programs, family resources and information regarding campus life in general. A helpful Q&A weblog to answer your questions is also featured.

APPENDIX A: ACADEMIC INTEGRITY

In questions involving academic integrity the student is referred to the general policy found in the Graduate School *Bulletin of Information*.

The department expects all students to maintain and promote the highest standards of personal honesty and professional integrity. These standards apply to examinations, assigned papers, projects and preparation of the thesis or dissertation. Violation of these standards, which includes, but is not limited to cheating in examinations, plagiarism and fraudulent practices in conducting research or reporting the results of

such research, may result in suspension or dismissal.

Within the department, primary authority for judgment and decision on matters of academic integrity lies with the course instructor for issues, which arise in the classroom, or the faculty research advisor for issues that arise in research. Unsettled disputes should be referred first to the director of graduate studies and next to the department chair each of whom can serve as arbiters at the department level. Any further appeal should be directed to the Graduate School.

APPENDIX B: FACULTY

| Faculty Name | Department | Office Location |
|---------------------|--|---------------------------------|
| Basar Bilgicer | Chemical and Biomolecular Engineering | 205C McCourtney |
| Edgar Bolivar-Nieto | Aerospace and Mechanical Engineering | |
| Hsueh-Chia Chang | Chemical and Biomolecular Engineering | 118B Cushing |
| Meenal Datta | Aerospace and Mechanical Engineering | 145 Multidisciplinary Eng. Res. |
| Donny Hanjaya-Putra | Aerospace and Mechanical Engineering | 141 Multidisciplinary Eng. Res. |
| Maria Holland | Aerospace and Mechanical Engineering | 142 Multidisciplinary Eng. Res. |
| Scott Howard | Electrical Engineering | 262 Fitzpatrick |
| Tijana Milenkovic | Computer Science and Engineering | 381 Fitzpatrick |
| Nosang Myung | Chemical and Biomolecular Engineering | 105E McCourtney |
| Robert Nerenberg | Civil and Environmental Engineering | 163 Fitzpatrick |
| Glen Niebur | Aerospace and Mechanical Engineering | 147 Multidisciplinary Eng. Res. |
| Thomas O'Sullivan | Electrical Engineering | 227B Cushing |
| Matt Ravosa | Biological Science/Aero. and Mech. Engr. | 221 Galvin |
| Ryan Roeder | Aerospace and Mechanical Engineering | 148 Multidisciplinary Eng. Res. |
| James Schmiedeler | Aerospace and Mechanical Engineering | 373 Fitzpatrick Hall |
| Joshua Shrout | Civil Engineering/Biological Sciences | 156 Fitzpatrick |
| Yichun Wang | Chemical and Biomolecular Engineering | 240C McCourtney |
| Matthew Webber | Chemical and Biomolecular Engineering | 205B McCourtney |
| Patrick Wensing | Aerospace and Mechanical Engineering | 375 Fitzpatrick |
| Sangpil Yoon | Aerospace and Mechanical Engineering | 151 Multidisciplinary Eng. Res. |
| Jeremiah Zartman | Chemical and Biomolecular Engineering | 205D McCourtney |
| Pinar Zorlutuna | Aerospace and Mechanical Engineering | 143 Multidisciplinary Eng. Res. |

APPENDIX C: MEDICAL SEPARATION FROM ACADEMIC DUTIES

Students enrolled in the Notre Dame Graduate School who wish to temporarily interrupt their programs for medical reasons must apply to the Graduate School. Information can be found in the Forms, Policies, and Handbooks section in the

Academic Code of the Graduate School:
<https://graduateschool.nd.edu/resources-for-current-students/>

APPENDIX D: DEGREE PROGRAM FORM

Complete the following form and have it signed by your committee when you complete your *qualifying examination*. Your committee signatures indicate passing of the qualifying examination, and the signed form should reflect course work that they expect you to complete for your degree. Any changes to your degree program following that time must be approved by the program director.

Proposed Program of Study for: _____ NDID: _____

Admission (Semester/Year): _____ QE _____ CE _____

Engineering Science

| Course Number | Title | Semester/Year | Grade |
|---------------|-------|---------------|-------|
| | | | |
| | | | |
| | | | |

Biological Sciences

| Course Number | Title | Semester/Year | Grade |
|---------------|-------|---------------|-------|
| | | | |
| | | | |
| | | | |

Bioengineering

| Course Number | Title | Semester/Year | Grade |
|---------------|-------|---------------|-------|
| | | | |
| | | | |
| | | | |

Additional Coursework

| Course Number | Title | Semester/Year | Grade |
|---------------|-------|---------------|-------|
| | | | |
| | | | |
| | | | |

Committee Members:

Name Signature Date

Name Signature Date

Name Signature Date

Name Signature Date

Program Director:

Name Signature Date

APPENDIX E: CANDIDACY EXAMINATION PROCEDURES

A student may take the Candidacy Exam at any time *after* completing the Qualifying Exam, but *must complete it prior to* completion of their 8th semester. If the student does not complete the Candidacy Exam prior to the completion of their 8th semester, they will be placed on probation by the Graduate School, resulting in loss of financial support or a financial penalty.

The Candidacy Exam can be scheduled at any time but specific deadlines are defined by the Graduate School so that the exam counts as being completed in that semester. These deadlines can be found at:

<https://graduateschool.nd.edu/policies-forms/academic-year-deadlines/>

Committee Makeup

The Candidacy Exam is administered by committee of *at least* three members that consists of:

- the student's advisor
- a tenure track or research faculty member *within* their home department
- a tenure track or research faculty member *outside* their home department

The faculty members serve the role of *readers* of the student's dissertation. If a student wishes to include someone from outside of the University on their committee, they should see the graduate program administrative assistant as it requires approval of the DGS in consultation with the Graduate Studies Committee. In general, individuals from outside the University should be on the faculty at another university or otherwise have a record of scholarly activity. A committee member who does not have an appointment at Notre Dame cannot generally replace one of the three members listed above, but can serve as an additional member of the committee.

To initiate the Candidacy Exam process, the student should consult with their advisor(s) to identify potential members of their committee. The student should then reach out to the potential faculty directly and confirm their willingness to serve on the committee. Students' should not assume that any faculty member will agree to be on their committee without contacting them.

Timeline and Procedures

- *Initiate the process:* Complete the Course Checklist and Formation of the Doctoral Committee form, which includes completed and projected courses to fulfill course requirements. The form needs to be approved by the student's advisor, committee members, and the DGS.
- Preliminarily identify a potential exam date with committee members.
- *Three weeks (at least) prior to intended exam date:* Send the written dissertation proposal to committee members.
- *One week (at least) prior to intended exam date:* Complete the Written Ph.D. Candidacy Examination Form (below) with signatures from all committee members that have read the written dissertation proposal along with their evaluation.
- *One week prior to intended exam date:* Send all completed forms to the Program Administrator along with the following information
 - Completed/updated Degree Program form (see appendix D).
 - Date, time, and place of the exam (the Program Administrator can assist with room scheduling)
 - Advisor(s) name
 - All committee members and their affiliations

During the scheduled exam time, the student will present the content of their dissertation proposal to the committee (~30-40 minutes) followed by audience questions and then an oral exam with the committee. After the examination, the student's advisor will excuse the student and call for discussion followed by a vote of committee members. The results are recorded on a Reporting Form that must be returned to the Program Administrator. Official notification of the results of the examination will be sent to the student and their advisor(s) from the Graduate School. **The first portion of the exam – presentation and audience questions – is open to the public; the examination by the committee is closed to the public.**

UNIVERSITY OF NOTRE DAME
Bioengineering Graduate Program

Written Ph.D. Candidacy Examination

PLEASE PRINT:

Student: _____ ND ID#: _____

Advisor: _____ Date: _____

Co-Advisor (if applicable): _____

Committee Member: _____ Dept.: _____

Committee Member: _____ Dept.: _____

Committee Member: _____ Dept.: _____

All committee members must indicate scores in the passing range for the written proposal before scheduling the oral examination. See the following page for scoring criteria.

Note that this score is only for the written examination. The student must also take and pass the oral examination before advancement to candidacy.

FACULTY SIGNATURES

Pass

Fail

Committee Member

Ex VG G

F P

Committee Member

Ex VG G

F P

Committee Member

Ex VG G

F P

Coursework Completed?: YES NO (At least six courses should be completed)

Advisor Approval

Date

Scoring Criteria for the written candidacy examination:

Excellent (EX)

The proposal is exceptional in all respects. Specifically:

- The proposal demonstrates an independent research plan, sufficient in scope for a doctoral degree.
- The research direction is supported by a clear explanation of its significance.
- Sound critical thinking is applied in relationship to the existing state of knowledge and the proposed research.
- The hypotheses or objectives are supported by the literature or preliminary results, and the specific aims address these hypotheses or objectives.
- Appropriate experimental, analytical, and computational methods are defined to complete each aim.
- The writing and style are clear and concise.

Very Good (VG)

The proposal is of high quality. It meets the expectations of an excellent proposal, but may have slight deficiencies in some areas. The research can likely be completed, and the hypotheses and aims will be suitable as a basis for peer-reviewed publications. *The candidate should be provided with an explanation of the deficiencies in writing or in person, for example during the oral examination.*

Good (G)

The proposal is deficient in several areas, but it is likely that the research can be completed. Methodological errors are present that are easily correctable, the hypotheses/objectives may need refinement to be suitable as the basis for publication, or the overall scope is modest. *The candidate should be provided with an explanation of the deficiencies in writing or in person during the oral examination.*

Fair (F)

The proposal has significant flaws that the committee member believes can be repaired by thorough editing. For example, the hypotheses are not specific, the connection between the hypotheses, aims and research questions are ambiguous, or it is not clear that the methods can address the research questions. *The candidate should be provided with an explanation of the deficiencies in writing or in person. The oral examination will not proceed until the candidate sufficiently modifies the proposal to achieve a score of GOOD or higher.*

Poor (P)

The proposal lacks direction, the problem is not compelling, or the work is not considered to be of sufficient scope for a doctoral dissertation. It is unlikely that the proposal can be modified to meet the expectations of the committee member, and the committee member will not consider a revision of the proposal.

APPENDIX F: DISSERTATION AND DEFENSE PROCEDURES

A student may complete and defend their dissertation *after* completing two semesters following the successful completion of the Qualifying Exam. Students must complete and defend their dissertation *prior to* completion of their student's 16th semester. If the student does not complete their dissertation and defense prior to the completion of the student's 8th year, they are subject to dismissal by the Graduate School.

The Dissertation Defense can be scheduled at any time but specific deadlines are defined by the Graduate School so that the dissertation counts as being completed in that semester. These deadlines can be found at: <https://graduateschool.nd.edu/policies-forms/academic-year-deadlines/>

Committee Makeup

The Dissertation Defense is administered by committee of *at least* three members that consists of:

- the student's advisor
- three additional faculty members *or* two faculty additional faculty members and co-advisor (if applicable)

The three additional faculty members serve the role of *readers* of the student's dissertation. In nearly all cases, the dissertation committee is the same as the committee for the qualifying exam. If the student wishes to change their committee, they should contact the DGS in advance.

The makeup of the committee is described in Appendix E.2 but also repeated here. Unless special circumstances warrant, at least two of the three readers on the candidacy committee should be members of the AME Graduate Faculty (see Appendix B). In some cases, students have a committee of 5 or more faculty members. If a student wishes to include someone from outside of the University on their committee, they should see the graduate program administrative assistant as it requires approval of the DGS in consultation with the Graduate Studies Committee. In general, individuals from outside the University should be on the faculty at another university or otherwise have a record of scholarly activity. Company/corporate individuals involved in a student's research may be added as additional committee members, but only after approval from the DGS.

Timeline and Procedures

- *Initiate the process:* Complete the Release of Ph.D. Dissertation for Distribution to the Doctoral Committee form with the signatures of the student's advisor(s). Completion of this form acknowledges that the dissertation is complete, preliminarily approved by the advisor, and ready to be distributed to the committee. Send completed form to the Program Administrator.
- *Four weeks (at least) prior to intended defense date:* Send written dissertation to committee members for them to read. Email the Program Administrator so they may complete the Ph.D. Dissertation Reader report forms for all committee members to read and approve the dissertation.
- *One week prior to intended exam date:* Confirm with the Program Administrator all Reader report forms have been submitted to the Graduate School along with the following information:
 - Name and ID number (#900)
 - Date, time, and place of the defense (the Program Administrator can assist with room scheduling)
 - Advisor(s) name
 - All committee members and their affiliations

During the scheduled defense time, the student will present the content of their dissertation to the committee (~40-60 minutes) followed by audience questions and then an oral defense with the committee. After

the defense, the student's advisor will excuse the student and call for discussion followed by a vote of committee members. The results are recorded on a Reporting Form that must be returned to the Program Administrator. **The first portion of the defense – presentation and audience questions – is open to the public; the defense with the committee is closed to the public.**

APPENDIX G: IMPORTANT DATES FOR THE 2020-2021 ACADEMIC YEAR

The Graduate School SCHEDULE OF DEADLINES Academic Year 2020-2021 & Summer 2021

The following are deadlines for class changes, examinations, and submission of various applications, lists, and materials required by the Graduate School for: Fall 2021 (January graduation), Spring 2022 (May graduation), and Summer 2022 (August graduation).

| | Fall 2021 | Spring 2022 | Sum 2022 |
|---|-----------|-------------|----------|
| First class day | Aug. 23 | Jan 10 | TBD |
| All course changes | Aug. 30 | Jan 18 | — |
| Course discontinuance | Oct. 29 | Mar 18 | — |
| Deadline to submit dissertations to readers*** | Oct. 26 | Mar 7 | TBD |
| Preliminary theses/dissertations submitted for formatting check* | Nov. 8 | Mar 14 | TBD |
| Master's comprehensive examinations & PhD dissertation defenses** | Nov. 23 | Apr 4 | TBD |
| Last class day | Dec. 7 | Apr 26 | TBD |
| Final theses/dissertations submitted to Graduate School | Dec. 6 | Apr 11 | TBD |
| Final exams begin | Dec. 10 | May 2 | — |
| Graduation date (official degree conferral) | Jan. 2 | May 14 | TBD |

**Formatting checks should be submitted to the Graduate School when the document is given to readers, at least two to four weeks prior to the defense.*

***Reader's reports must be submitted to the Graduate School before the defense takes place.*

*** *The dissertation defense may not be scheduled sooner than four weeks from the date the graduate studies administrative assistant receives the dissertation distribution form.*

These dates may change! For the most up-to-date deadlines, please see:
<https://graduateschool.nd.edu/policies-forms/academic-year-deadlines/>