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Table of Contents

1. General Information 6
   1.1 Graduate Programs and Degrees 6
   1.2 Department Safety Training 6
   1.3 Forms for Graduate Studies 6

2. Bioengineering Master of Science – Overview and Program Concentrations 6
   2.1 Concentrations 7
   2.2 Detailed MS Program Course Requirements 8
       MS Concentration 1 – Medical Devices and Bioimaging (28 SH) 8
       MS Concentration 2 - Cell and Tissue Engineering (28 SH) 9
       MS Concentration 3 – Biomechanics (28 SH) 9
       MS Concentration 4 - Systems, Synthetic, and Computational Bioengineering (28 SH) 10
   2.3 MS Program Thesis Option Requirements 11
   2.4 MS Program Project-Option Requirements 12
   2.5 Graduate Certificate Options 12

3. Bioengineering PhD – Overview and Research Areas 13
   PhD Research Area 1: Imaging, Instrumentation, and Signal Processing 13
   PhD Research Area 2: Biomechanics, Biotransport and MechanoBiology 13
   PhD Research Area 3: Molecular, Cell, and Tissue Engineering 13
   PhD Research Area 4: Systems, Synthetic, and Computational Bioengineering 13

3.1 PhD Course Requirements 14
   3.1.1 Students Entering with BS Degree 14
       I. Required Core Courses (12 SH): 14
       II. Restricted Technical Electives (8 SH): 14
       III. Unrestricted Technical Electives (12 SH): 15
       IV. Professional Development Courses (0 SH): 15
       V. Dissertation (0 SH): 15
   3.1.2 Advanced Entry Students 16
   3.1.3 Professional Development Course Requirements 16

3.2 PhD Research Requirements 17
   3.2.1 PhD Laboratory Rotation 17
   3.2.2 Finding and Declaring a Research Advisor 18
   3.2.3 Annual Individual Development Plan (AIDP) Student Review 20
   3.2.4 Qualifying Exam (written and oral) 20
   3.2.5 PhD Dissertation Committee 21
   3.2.6 Annual Committee Meetings and Dissertation Proposals 21
   3.2.7 PhD Dissertation Defense 21

3.3 Example PhD Timeline – Research Milestones 22
Appendix

Appendix A. Bioengineering Department Safety Training 42
Appendix B. Suggested PhD Electives by Research Area and Master Electives List 42
  Area 1 – Imaging, Instrumentation, and Signal Processing 42
  Area 2 – Biomechanics, Biotransport and MechanoBiology 42
  Area 3 – Molecular, Cell, and Tissue Engineering 43
  Area 4 – Computational and Systems Biology 43
  All areas – Master List of Approved BioE PhD Electives 44
Appendix C. Laboratory Rotation Form 46
Appendix D. PhD Advisor Declaration Form 48
Appendix E. Bioengineering Qualifying Exam, Structure and Criteria 50
  I. Timing and Organization 50
  II. Exam Structure and Requirements 50
Appendix F. PhD Dissertation Committee & Proposal Defense Form 54
Appendix G. Industrial PhD - Best Practices and Recommendations 55
  Coursework Requirements 55
  Research Requirements 55

Version: 2022.5
1. General Information

Welcome to the Department of Bioengineering (“BioE”) at Northeastern University! This document provides information for current and prospective students about graduate programs in the Department of Bioengineering, College of Engineering, Northeastern University. Graduate students are expected to read this document, be familiar with the rules and procedures, follow them, and refer to this guide when they have questions. Please reach out to relevant department faculty or staff with any questions, comments or concerns. You may also e-mail listen2bioestudents@coe.neu.edu with program feedback.

1.1 Graduate Programs and Degrees

The BioE Department offers two main graduate programs, a Master of Science (MS) in Bioengineering and Doctor of Philosophy (PhD) in Bioengineering. MS and PhD degree programs are only offered as full-time programs (for guidelines regarding Industrial PhD, please see Appendix G). Qualified applicants with a BS or MS degree in bioengineering or related field can apply to our graduate programs.

1.2 Department Safety Training

All PhD and MS students who plan to perform laboratory research are required to complete the basic Department of Bioengineering laboratory safety training program, in addition to any lab-specific safety training. To avoid delays in performing research, new students are strongly advised to complete this training in the first month following matriculation. The list of required online and in-class courses is provided in Appendix A of this handbook. For more information, please contact the department Safety Officer Kathryn Lasseter (k.lasseter@northeastern.edu).

1.3 Forms for Graduate Studies

Please use this link to access the following forms: PhD Advisor Declaration Form, PhD Lab Rotation Form, Dissertation Committee and Proposal Defense Form. These forms can also be found in the Handbook Appendix.

Please use this link for Graduate School of Engineering Forms, including course petition forms, registration override forms, and academic probation forms.

2. Bioengineering Master of Science – Overview and Program Concentrations

Students accepted to the Master of Science in Bioengineering program have three concentrations from which to choose:

- Concentration 1: Medical Devices and Bioimaging
- Concentration 2: Cell and Tissue Engineering
- Concentration 3: Biomechanics
- Concentration 4: Systems, Synthetic, and Computational Bioengineering
A study concentration is required for every MS student. Each concentration has required courses and a list of technical electives. Students should select two to five courses, depending on the concentration, and whether he or she selects the thesis option, project option, or course-only option (please consult the detailed requirements for each concentration).

2.1 MS Concentrations

Biomedical Devices and Bioimaging

The biomedical devices and bioimaging concentration is appropriate for students interested in the design of biomedical devices, as well as biomedical imaging and signal processing. Three courses are required for all students in this concentration, Design of Biomedical Instrumentation (BIOE 5810), Design, Manufacture, and Evaluation of Medical Devices (BIOE 5250), and Biomedical Imaging (BIOE 5235).

Cell and Tissue Engineering

The cell and tissue engineering concentration is appropriate for students interested in molecular, cell, and tissue engineering. Two courses are required for all cell and tissue engineering students, Molecular Bioengineering (BIOE 5410) and Cellular Engineering (BIOE 5420). There is an extensive list of approved technical electives to choose from to complete the degree.

Biomechanics

Students who join the biomechanics concentration will cover multiscale mechanics, including whole-body movement, mechanical properties of biomaterials, and fluid mechanics of physiological fluids. All biomechanics concentration students must complete two of the following courses: Multiscale Biomechanics (BIOE 5650), Musculoskeletal Biomechanics (ME 5665), Physiological Fluid Mechanics (BIOE 5630), and Computational Biomechanics (BIOE 5640).

Systems, Synthetic, and Computational Bioengineering

This concentration covers topics including statistical physics, statistical inference, dynamical and stochastic modeling, execution and analysis of quantitative experimentation, machine learning, and control and information theory. These techniques are taught in the context of biological applications, such as gene regulation, differentiation and cancer, epigenetics, the microbiome, memory and learning, and synthetic genetic circuits. The concentration includes a lab course, BIOE 5710. Required courses are BIOE 5710 and BIOE 5720, and one of BIOE 5115 or BIOE 5750.
2.2 Detailed MS Program Course Requirements

The following sections explain the course requirements for students entering the bioengineering Master Program. A total of 32 semester hours (SH, 1 SH is roughly equivalent to 45 hours of learning) and a minimum 3.0 GPA are required to complete the MS degree. In addition to the core courses for each MS student, each concentration has its own course requirements (see below).

**Required Core Courses (All Concentrations)**

<table>
<thead>
<tr>
<th>Course</th>
<th>SH</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOE 7390 Seminar</td>
<td>0</td>
</tr>
<tr>
<td>BIOE 6100 Medical Physiology</td>
<td>4</td>
</tr>
<tr>
<td>BIOE 6000 Principles of Bioengineering</td>
<td>1</td>
</tr>
</tbody>
</table>

**Concentration Specific Requirements**

Complete requirements for one of the four MS concentrations as follows:

**MS Concentration 1 – Biomedical Devices and Bioimaging (28 SH)**

**Required Course Work (12 SH)**

- A grade of C or higher is required.
- BIOE 5235 Biomedical Imaging
- or BIOE 5648 Biomedical Optics
- BIOE 5250 Design, Manufacture, and Evaluation of Medical Devices
- BIOE 5810 Design of Biomedical Instrumentation

*And one of the following:*

i) **Coursework Option (16 SH)**

   Complete 16 SH from the course list (see below).

ii) **Project Option (16 SH)**

   - BIOE 7890 Master’s Project 4 SH
   - + Complete 12 semester hours from the course list. 12 SH

iii) **Thesis Option (16 SH)**

   - Complete the following (repeatable) course twice:
   - BIOE 7990 Thesis 8 SH
   - + Complete 8 SH course works from the elective course list. 8 SH

**Concentration 1 Electives Course List:**

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOE 5115</td>
<td>Dynamical Systems in Biological Engineering</td>
</tr>
<tr>
<td>BIOE 5820</td>
<td>Biomaterials</td>
</tr>
<tr>
<td>BIOE 5850</td>
<td>Design of Implants</td>
</tr>
<tr>
<td>BIOE 5648</td>
<td>Biomedical Optics</td>
</tr>
<tr>
<td>EECE 5606</td>
<td>Micro- and Nanofabrication</td>
</tr>
<tr>
<td>EECE 7105</td>
<td>Optics for Engineers</td>
</tr>
<tr>
<td>EECE 7200</td>
<td>Linear Systems Analysis</td>
</tr>
<tr>
<td>EECE 7203</td>
<td>Complex Variable Theory and Differential Equations</td>
</tr>
</tbody>
</table>
MS Concentration 2 - Cell and Tissue Engineering (28 SH)

*Required Course Work (8 SH)*

A grade of C or higher is required.

- BIOE 5410 Molecular Bioengineering
- BIOE 5420 Cellular Engineering

*And one of the following:*

i) **Coursework Option (20 SH)**
   - Complete 19-20 SH from the course list (see below).

ii) **Project Option**
   - BIOE 7890 Master’s Project  4 SH
   - Complete 15-16 SH from the course list.  15-16 SH

iii) **Thesis Option**
   - Complete the following (repeatable) course twice:
     - BIOE 7990 Thesis  8 SH
     - Complete 11-12 SH from the course list.  11-12 SH

*Concentration 2 Electives Course List:*

- BIOE 5115 Dynamical Systems in Biological Engineering
- BIOE 5250 Design, Manufacture, and Evaluation of Medical Devices
- BIOE 5430 Principles and Applications of Tissue Engineering
- BIOE 5440 The Cell as a Machine
- BIOE 5450 Stem Cell Engineering
- BIOE 5820 Biomaterials
- BIOL 5543 Stem Cells and Regeneration
- BIOL 6301 Molecular Cell Biology
- ME 5667 Solid Mechanics of Cells and Tissues
- NNMD 5370 Nanomedicine Research Techniques
- NNMD 5470 Nano/Biomedical Commercialization: Concept to Market

MS Concentration 3 – Biomechanics (28 SH)

*Required Course Work (8 SH)*

A grade of C or higher is required.

Complete two of the following courses:

- BIOE 5630 Physiological Fluid Mechanics
- BIOE 5640 Computational Biomechanics
- ME 5665 Musculoskeletal Biomechanics
- BIOE 5650 Multiscale Biomechanics
And one of the following:

i) Coursework Option (20 SH)
Complete 20 SH from the course list (see below).

ii) Project Option (20 SH)
BIOE 7890  Master’s Project  4 SH
Complete 16 SH from the course list.  16 SH

iii) Thesis Option (20 SH)
Complete the following (repeatable) course twice:
BIOE 7990  Thesis  8 SH
Complete 12 SH from the course list.  12 SH

Concentration 3 Electives Course List:
- BIOE 5115  Dynamical Systems in Biological Engineering
- BIOE 5440  The Cell as a Machine
- BIOE 5630  Physiological Fluid Mechanics
- BIOE 5640  Computational Biomechanics
- BIOE 5650  Multiscale Biomechanics
- BIOE 5820  Biomaterials
- BIOL 5601  Multidisciplinary Approaches in Motor Control
- EECE 7200  Linear Systems Analysis
- EECE 7203  Complex Variable Theory and Differential Equations
- ME 5665  Musculoskeletal Biomechanics
- ME 5650  Advanced Mechanics of Materials
- ME 5655  Dynamics and Mechanical Vibration
- ME 5657  Finite Element Method
- ME 5659  Control Systems Engineering
- ME 5654  Elasticity and Plasticity
- ME 7238  Advanced Finite Element Method
- ME 7245  Fracture Mechanics and Failure Analysis
- ME 5658  Continuum Mechanics

MS Concentration 4 – Systems, Synthetic, and Computational Bioengineering (28 SH)

Required Course Work (12 SH)
A grade of C or higher is required (Note: students attaining lower than a C grade in a core course will need to retake the course).
Complete the following courses (8 SH)
BIOE 5710  Experimental Systems and Synthetic Bioengineering
BIOE 5720  Physical Bioengineering

Complete one of the following courses (4 SH)
BIOE 5115  Dynamical Systems in Biological Engineering
BIOE 5750  Modeling and Inference in Bioengineering
And one of the following:
   i) Coursework Option **(16 SH)**
      Complete 16 SH from the course list (see below).

   ii) Project Option **(16 SH)**
      BIOE 7890  Master’s Project  4 SH
      + Complete 12 SH from the course list.  12 SH

   iii) Thesis Option **(16 SH)**
      Complete the following (repeatable) course twice:
      BIOE 7990  Thesis  8 SH
      + Complete 8 SH from the course list.  8 SH

Concentration 4 Electives Course List:
- BINF 6400  Genomics in Bioinformatics
- BINF 6410  Proteomics in Bioinformatics
- BIOE 5115  Dynamical Systems in Biological Engineering
- BIOE 5440  The Cell as a Machine
- BIOE 5510  Bioengineering Products/Technology Commercialization
- BIOE 5640  Computational Biomechanics
- BIOE 5750  Modeling and Inference in Bioengineering
- BIOE 5760  Method and Logic in Systems Biology and Bioengineering
- BIOE 5860  Engineering Approaches to Precision Medicine I
- BIOE 5870  Engineering Approaches to Precision Medicine II
- BIOL 6299  Molecular Cell Biology for Biotechnology
- CHEM 5638  Molecular Modeling
- CHME 5630  Biochemical Engineering
- DS 5110  Introduction to Data Management and Processing
- DS 5220  Supervised Machine Learning and Learning Theory
- DS 5230  Unsupervised Machine Learning and Data Mining
- HINF 5101  Introduction to Health Informatics and Health Information Systems
- PHSC 6290  Biophysical Methods in Drug Discovery
- PHTH 5202  Introduction to Epidemiology
- PHYS 5116  Complex Networks and Applications

2.3 **MS Program Thesis Option Requirements**
For MS students choosing the Thesis Option, he/she must find a thesis advisor and complete 8 SH of BIOE 7990 (Thesis). This is usually done in two semesters, with each semester 4 SH, but can also be done in one semester for 8 SH. If a student has completed 8 SH of BIOE 7990, but has not yet defended their thesis, he/she must enroll in BIOE 7996 (Master’s Thesis Continuation, 0 SH) until they successfully defend their thesis.

When a student is ready to defend their thesis, they must form a “Thesis committee” in consultation with their advisor. The Committee must have at least three members, and at least two of whom must be tenured or tenure-track BIOE faculty. After successful defense of one’s thesis, a letter grade will be assigned to BIOE 7990 (Master’s Thesis) by the student’s advisor. Students should adhere to Graduate School of Engineering deadlines and after defending, initiate the MS Thesis signature page. Deadlines and the Thesis Signature Form can be found here.
The date and location of an MS thesis defense must be announced at least one week before the date of the defense - please reach out to the BioE Academic Coordinator, Caroline Pridmore c.pridmore@northeastern.edu, to arrange this. Please provide the following details:

- Date, start time, finish time
- Location or, if you would like department assistance with booking, preferred location and expected capacity
- Zoom link if planning a hybrid or virtual presentation
- Title and Abstract, and confirmation of committee members

An MS student taking the thesis option may graduate once he/she has successfully defended their MS thesis, and fulfilled all course requirements. To graduate, a student must attain a cumulative grade-point average (GPA) of 3.0 or higher in all courses. A student must also earn a grade of “C” or higher in all required core courses.

2.4 MS Program Project-Option Requirements

For MS students choosing the Project Option, he/she must find a project advisor and complete 4 SH of BIOE 7890 (MS Project).

When an MS student has completed the MS project, they must write a Project Report. A template for writing the Project Report can be obtained from Graduate Student Services. The report must be submitted to the student’s project advisor and obtain their approval. The approved Project Report will be archived by both the BIOE Department as well as the project advisor.

An MS student taking the project option can graduate once he/she has obtained their Project advisor’s approval of the Project report and fulfilled all course requirements. To graduate, one must have a cumulative GPA of at least 3.00 with a grade of “C” or higher in all required core courses.

2.5 Graduate Certificate Options

Students enrolled in an MS degree have the opportunity to also pursue one of the many engineering graduate certificate options in addition to or in combination with the MS degree. Students should consult their faculty advisor regarding these options.

Gordon Institute of Engineering Leadership

Master's Degree in Bioengineering with Graduate Certificate in Engineering Leadership

Students may complete an MS in Bioengineering in addition to earning a Graduate Certificate in Engineering Leadership. Students must apply and be admitted to the Gordon Engineering Leadership Program in order to pursue this option. The program requires fulfillment of the 16-semester-hour-curriculum required to earn the Graduate Certificate in Engineering Leadership, which includes an industry-based challenge project with multiple mentors. The integrated 33-SH degree and certificate will require 17 hours of advisor-approved bioengineering technical courses.
3. Bioengineering PhD – Overview and Research Areas

Students pursuing a PhD degree through the Department of Bioengineering are expected to complete required coursework (Section 3.1) and perform cutting-edge research (Section 3.2) under the guidance of a primary advisor, and sometimes additional co-advisors, identified from our core and affiliated faculty. The Department features four research areas as listed below. Students should consult the Bioengineering Research Map for more information about BioE faculty conducting research in these areas.

**PhD Research Area 1: Imaging, Instrumentation, and Signal Processing (IISP)**

The Imaging, Instrumentation and Signal Processing track reflects Northeastern University’s outstanding research profile in developing innovative medical imaging and instrumentation technologies for detecting and understanding complex biological processes and diseases. Our department has active federally funded research spanning across a broad spectrum of relevant areas in instrument design, contrast agent development, advanced computational modeling and image reconstruction methods. Example research centers include the Chemical Imaging of Living Systems Institute (CILS), and the Translational Biophotonics (TBP) Cluster.

**PhD Research Area 2: Biomechanics, Biotransport and MechanoBiology (BBM)**

Motion, deformation, and flow of biological systems in response to applied loads elicit biological responses at the molecular and cellular levels that support the physiological functions of tissues and organs and drive their adaptation and remodeling. To study these complex interactions, principles of solid, fluid, and transport mechanics must be combined with measures of biological functions. The Biomechanics, Biotransport, & Mechanobiology track embraces this approach and leverages the strong expertise of Northeastern faculty attempting to tie applied loads to biological responses at multiple length and time scales.

**PhD Research Area 3: Molecular, Cell, and Tissue Engineering (MCTE)**

Principles for engineering living cells and tissues are essential to address many of the most significant biomedical challenges facing our society today. These application areas include engineering biomaterials to coax and enable stem cells to form functional tissue or to heal damaged tissue; designing vehicles for delivering genes and therapeutics to reach specific target cells to treat a disease; and, uncovering therapeutic strategies to curb pathological cell behaviors and tissue phenotypes. At a more fundamental level, the field is at the nascent stages of understanding how cells make decisions in complex microenvironments and how cells interact with each other and their surrounding environment to organize into complex three-dimensional tissues. Advances will require combinations of multiscale experimental, computational and theoretical approaches spanning across molecular-cellular-tissue levels and integration of molecular and physical mechanisms, including the role of mechanical forces.

**PhD Research Area 4: Systems, Synthetic, and Computational Bioengineering (SSCB)**

The research in the System, Synthetic, and Computational Bioengineering concentration aims to understand the rules governing emergent systems-level behavior and to use these rules to rationally engineer biological systems. We make quantitative measurements, increasingly at the single cell level, to test different conceptual frameworks and discriminate amongst different classes of models. Our faculty are leaders in developing and applying both theoretical methods,
e.g., control theory, and experimental methods, e.g., single-cell proteomics by mass-spec, to biological systems. At the organ and tissue levels, 3D scans acquired through medical imaging methods (e.g. ultrasound/US, computed tomography/CT, magnetic resonance imaging/MRI,) may be used to reconstruct virtual models of targeted systems. Non-invasive measures of the physiological function can then inform numerical simulations to predict the behavior of biological systems over time, with the goal of estimating the progression towards pathological endpoints or to test the efficacy of targeted surgical procedures and pharmaceutical treatments (e.g., drug delivery).

3.1 PhD Course Requirements

The following sections explain the course requirements for students entering the Bioengineering PhD program with a BS degree as well as students entering with a Master’s degree (“Advanced Entry”). The normal course-load for PhD students is 8-9 semester hours (SH) per semester (roughly 2 regular courses). In addition to coursework, students must complete the qualifying, proposal, and PhD defense exam sequence described in detail in Section 3. All PhD students are expected to maintain regular research progress alfor timely completion of their PhD, verified by satisfactory reviews in their annual individual development plans (AIDP).

A student must attain a cumulative grade-point average (GPA) of 3.0 or higher in all courses applied toward that degree and exclusive of any prerequisite courses required of students admitted provisionally to their program. A student must also earn a grade of “C” or higher in all required core courses (courses must be retaken in the event of attainment below a “C”).

3.1.1 Students Entering with BS Degrees

Students entering the Bioengineering PhD program with a BS will take a total of 8 courses (32 SH): three core bioengineering courses (12 SH), two restricted bioengineering technical electives (8 SH), and three unrestricted technical electives (12 SH). Those courses choices are outlined below:

I. Required Core Courses (12 SH):
   - BIOE 6100 Medical Physiology
   - BIOE 7000 Principles of Bioengineering
   - BIOE 6200 Mathematical Methods in Bioengineering

II. Restricted Technical Electives (8 SH):
   - BIOE 5235 Biomedical Imaging
   - BIOE 5410 Molecular Bioengineering
   - BIOE 5420 Cellular Engineering
   - BIOE 5430 Principles and Applications of Tissue Engineering
   - BIOE 5440 The Cell as a Machine
   - BIOE 5630 Physiological Fluid Mechanics
   - BIOE 5640 Biomedical Optics
   - BIOE 5650 Multiscale Biomechanics
   - BIOE 5656 Fields, Forces, and Flows in Biological Systems
   - BIOE 5810 Design of Biomedical Instrumentation
BIOE 5820  Biomaterials
ME 5665  Musculoskeletal Biomechanics

The list below are approved electives that can be petitioned to count as Restricted Technical Electives for the Systems, Synthetic, and Computational Bioengineering concentration:

BIOE 5115  Dynamical Systems in Biological Engineering
BIOE 5710  Experimental Systems and Synthetic Bioengineering
BIOE 5720  Physical Bioengineering
BIOE 5750  Modeling and Inference in Bioengineering

III. Unrestricted Technical Electives (12 SH):
Any 3 courses on our master list of approved technical electives. This list is included in Appendix B. A list of suggested courses by research area is also included. Some unrestricted BIOE electives may be petitioned to count as a restricted elective. Other courses may be taken by petition and with approval of PhD Advisor and PhD director.

IV. Professional Development Courses (0 SH):
Complete the following (repeatable) courses, 2 semesters each.
- BIOE 7390  Seminar (enrolled in at least two semesters)
- BIOE 7391  Student Seminar (2nd and 4th years)

V. Dissertation (0 SH):
Complete the following two courses:
- BIOE 9900  Dissertation Term 1
- BIOE 9991  Dissertation Term 2

After achieving PhD candidacy by passing the qualifying exam, the doctoral candidate, in consultation with his or her research advisor, must register in two consecutive semesters (may include full summer term) for Dissertation Term 1 (BIOE 9990) and Dissertation Term 2 (BIOE 9991). Upon completion of this sequence, the student must then register for Dissertation Continuation (BIOE 9996) in every semester they are receiving funding until the dissertation is completed. Students may not register for Dissertation Continuation (BIOE 9996) until they fulfill the two-semester sequence of Dissertation Term 1 (BIOE 9990) and Dissertation Term 2 (BIOE 9991).

For PhD students who have completed the majority of their course work but not yet reached PhD candidacy, a zero-credit course, Exam Preparation—Doctoral (BIOE 8960), can be taken if needed to fulfill the full-time course registration requirement. Exam Preparation—Doctoral (BIOE 8960) is an individual instruction course, billed at 1 SH, and graded S or U. Exam Preparation—Doctoral (BIOE 8960) does not have any course content, and students must register in a section for which their research advisor is listed as the “instructor.” If your instructor’ section
does not exist, you will need to submit an Individual Instruction Registration form. Please note that Exam Preparation can not be taken more than two times; otherwise, students can take Research (BIOE 9986) to maintain full time enrollment prior to achieving candidacy.

3.1.2 Advanced Entry Students

The curriculum for PhD students with advanced standing will be selected from the available core and elective courses under the guidance of the student's primary advisor, the Associate Chair for Graduate Studies (PhD Program Director) and Academic Coordinator. The advanced standing PhD degree requires a minimum of 16 semester hours (SH) of course work to be approved by the graduate director and a completed PhD dissertation. Advanced standing constitutes receipt of a relevant and accepted master's degree at a qualified institution. Examples of “relevant degrees” include MS degrees in various Engineering domains, including, but not limited to, Mechanical, Chemical, Biomedical, Electrical and Computer Engineering; examples of MS degrees that are not considered relevant include prior MS degrees in art, history, literature, finance, etc.

<table>
<thead>
<tr>
<th>Requirements</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Advisor-approved coursework made up of a combination of the following:</td>
<td>16 SH</td>
</tr>
<tr>
<td>● BIOE 7000</td>
<td></td>
</tr>
<tr>
<td>● BIOE 6200</td>
<td></td>
</tr>
<tr>
<td>● Electives</td>
<td></td>
</tr>
<tr>
<td>● Independent Study</td>
<td></td>
</tr>
<tr>
<td>Seminar (register and complete two semesters)</td>
<td>0 SH</td>
</tr>
<tr>
<td>Student Seminar (register and complete two semesters)</td>
<td>0 SH</td>
</tr>
<tr>
<td>Dissertation (register and complete two semesters)</td>
<td>0 SH</td>
</tr>
<tr>
<td>Minimum semester hours required</td>
<td>16 SH</td>
</tr>
</tbody>
</table>

The Master List of approved technical electives is included in Appendix B. A list of suggested courses by research area is also included. Electives for Advanced Entry students may be replaced with up to 12 SH of relevant independent studies courses - Independent Study (BIOE 7978) - by petition.

3.1.3 Professional Development Course Requirements

The Bioengineering department holds weekly PhD student work-in-progress (WIP) seminars to give students opportunities to present their research to the department. Students are required to minimally present twice throughout the PhD program. The recommended timing of these WIP presentations is to present once in the second year, and another one in the fourth year. Each seminar consists of a 25-minute presentation with 5 minutes for questions from the audience.

Students should enroll in a dedicated course “Student Seminar” (BIOE 7391) only in the semesters they are expected to present, i.e. in their second and fourth years. The department academic coordinator will contact students when they are due to present. A grade of S or U will be assigned by the PhD Program Director at the end of the semester.

We want to highlight that the primary goal of the PhD student seminars is to give students practice in clear and concise oral communication of research to an audience of educated non-specialists.
This is an essential skill for anyone seeking a career in scientific research and beyond. This differs from that of a group meeting or a conference presentation, which are given to audiences of fellow specialists who are already familiar with the field and its specialized terminology. Rather, students will be presenting to a diverse, interdisciplinary group of peers (i.e. the Bioengineering Department and other members of the Northeastern community). A prior familiarity with the area of research therefore cannot be assumed.

By nature, students in their 2nd year will focus on reviewing their area of research and discussing their planned research directions (as opposed to presenting original research). In contrast, students in their 4th year will focus on presenting their dissertation work.

Students should also make every effort to present their research in a way that is accessible to people who are listening rather than viewing. For example, instead of telling the audience "as you can see on this graph”, one should describe clearly what the graph shows.

A secondary goal of the seminar series is to enrich the intellectual environment of the Department of Bioengineering. Students should take the opportunity to attend all seminars and to develop familiarity with research outside of their own groups and research areas.

Some text adapted from: [https://medbio.utoronto.ca/graduate-student-seminars](https://medbio.utoronto.ca/graduate-student-seminars)

### 3.2 PhD Research Requirements

In addition to coursework ([Section 3.1](#)), completion of the PhD degree requires students to successfully complete all the research related requirements listed below. An example timeline for a PhD student entering with a BS degree is listed in [Section 3.3](#).

#### 3.2.1 PhD Laboratory Rotation

All PhD students who are funded by Bioengineering (Dean’s) Fellowship or Teaching Assistant (TA) at the time of entry into the program are required to complete a rotation in a *minimum of two* department research laboratories. At least one of the two rotations must be performed in the laboratory of a core Bioengineering faculty member. It is recommended that your *first rotation is with a core Bioengineering faculty member*.

Students should make an appointment to speak with potential research advisors and confirm their willingness to advise and potentially provide financial support to a student via research assistantship (RA) following the rotation. Potential advisors may be found through the Department website, through the [Bioengineering Research Map](#), through the Department Research Fair in September, and by meeting with the PhD Program Director.

Students should complete the [PhD Laboratory Rotation Form](#Appendix C) and return it to the Academic Coordinator ([c.pridmore@northeastern.edu](mailto:c.pridmore@northeastern.edu)) of the department prior to each lab rotation.

The rotation timeline is as follows (for students with a September/Fall matriculation):

<table>
<thead>
<tr>
<th>時期</th>
<th>活動描述及目標</th>
<th>附註</th>
</tr>
</thead>
<tbody>
<tr>
<td>九月</td>
<td>完成部門安全訓練 (<a href="#">Section 1.2, Appendix A</a>)</td>
<td></td>
</tr>
<tr>
<td>十月至十二月</td>
<td>第一次實習</td>
<td></td>
</tr>
<tr>
<td>一月至三月</td>
<td>第二次實習</td>
<td></td>
</tr>
</tbody>
</table>
3.2.2 Finding and Declaring a Research Advisor

Completion of the research dissertation component of the PhD degree requires that a student selects and formally declares a research advisor. To do this, the PhD Research Advisor Declaration Form (Appendix D) is completed, signed by the student and the advisor, and filed with the Academic Coordinator of the Bioengineering Department. The research advisor can be any tenured, tenure-track, or affiliated Bioengineering faculty. All PhD students must have a research advisor within one calendar year after their matriculation at NU; otherwise, their status changes to MS course-only track. If, after a change of status, these students can find a research advisor, their status will be reset to PhD.

Choosing a research advisor that is a mutually “good match” is perhaps one of the most important decisions a PhD student will make. This is typically done on the student’s initiative, before or within the first semester of joining the PhD program. Students should plan to meet with prospective advisors, determine their willingness to take on new students, and ask about research in their labs. Example questions a student might ask in this meeting to determine the potential fit are:

- Are you taking on new students in your group?
- Do you have a specific project in mind? If so, is that project currently funded by a research grant?
- What other projects are going on in this group? Are all the students in your group funded?
- What are the most important skills to be successful in your group?
- Would you be able to support me on a research assistantship?
- How often do you meet with your students 1-on-1?
- Do you have regular lab meetings? Journal club?
- Do you normally pair a student up with a senior student?
- How big is your group? How many MS, PhD, Postdocs?
- Are you a ‘hands on’ advisor? If not, who would I go to for help?
- Can I meet with one of your current grad students?
- What journals does your group normally publish in?
- What conference does your group regularly attend?
- What is your policy on sending students to conferences?
- What are your expectations for graduation for a PhD in terms of research output?

A PhD student should have a primary advisor, either at the time of entry to the program (as a research assistant) or shortly after completion of lab rotations. Except for lab rotations, any period of time that a PhD student does not have a primary advisor is referred to as the "transition period". In unfortunate cases, a student may experience more than 1 transition period throughout their study, however, the maximum duration for each transition period should not exceed six months and multiple transition periods must have a minimum spacing of no less than 6 months. If a student fails to re-declare a new advisor six month into the transition period, their status automatically changes to MS course-only track.

If a student is experiencing difficulties in their current lab, they are strongly encouraged to reach out to the Bioengineering PhD Director or Academic Coordinator for support and to discuss options before making a firm decision.
The start of the transition period may be triggered by one of the 3 below events:

1. a PhD student may elect to change research advisors partway through their PhD studies,
2. an advisor may initiate a probation due to unsatisfactory performance and the student under probation failed to complete the mutually agreed action plan, and
3. a student completed the maximum number of allowed rotations and failed to be accepted by a lab.

In the first scenario, if a student decides to leave a lab, before doing so, the student must speak with the Bioengineering PhD Director or Academic Coordinator. A formal written communication must be sent by the student or PhD Director to the student's advisor to inform the decision. The student must identify and re-declare a research advisor within six calendar months of this meeting, or within six calendar months of leaving their previous lab (whichever comes sooner).

In rare cases, the PhD advisor may also elect to terminate the advisee relationship partway through their PhD studies due to unsatisfactory performance. The advisor must first provide detailed written warning to the student to start a “performance probation” period, with a minimum length of 4 months. This written warning (either by email or AIDP review) must, i) explain the nature of the deficiency, ii) define a 4 month “action plan” by which the student may demonstrate acceptable progress to continue mentorship. The action plan is effective when approved by the Bioengineering PhD Director. During the probation period, the primary advisor of the student remains unchanged (thus probation period and transition period are not overlapping), therefore, the primary advisor is still responsible for mentoring and supporting the student. However, if the student fails to make sufficient progress to address the communicated deficiencies within the probation period, then the student loses their primary advisor and enters the transition period. In some cases, a student may elect to leave the lab, as in scenario 1 above, during the probation period. This also triggers the start of the transition period. The student should provide written notice of this decision to both the advisor and the Bioengineering PhD Director.

Similarly, for any student entered the program without an advisor, including Bioengineering Fellows and Teaching Assistants, the student is required to complete lab rotations in the first two semesters of their study, and identify/declare a research advisor by the end of their second semester. When necessary, a 3rd rotation is permitted to allow a student to explore additional options. If a rotation student fails to be accepted by any lab by the end of the second semester after matriculation, the student also enters the transition period.

Any student in a transition period should discuss the forms of possible financial support with the Graduate Chair and the Department Business Manager. In principle, funding support is not guaranteed. In certain extraneous situations, our department has limited TA slots that may be allocated to support some of these students, but such funding is not guaranteed and a student must have sufficient technical background to be considered for a TA position for a course that is available at that time.
3.2.3 Annual Individual Development Plan (AIDP) Student Review

In accordance with College of Engineering rules, the department of Bioengineering conducts yearly student evaluations in the form of Annual Individual Development Plan (AIDP) review, usually performed in the Spring semester of each year. The purposes of the AIDP are to: i) summarize student academic achievements in the prior calendar year, ii) outline student goals for the present calendar year, and iii) obtain formal written feedback and evaluation from their advisory committee. The AIDP must be discussed with a student’s advisor prior to submission. All PhD students are required to complete the AIDP reporting process with their advisor by the specified deadline. Specific instructions and deadlines will be provided by the department annually. Our department is obligated to report the annual review decisions to the College.

If a student fails to submit the AIDP report before the reporting deadline for the College, an automatic “unsatisfactory” decision may be assigned by the department. An unsatisfactory AIDP review, either concluded by the student’s advisor and Dissertation committee, or by the Department results in a “performance probation”. An official probation letter will be sent by the College to notify the respective student. In addition, failing to provide sufficient detail on the AIDP can lead to an unsatisfactory review, therefore leading to a probation period.

3.2.4 Qualifying Exam (written and oral)

In order to continue the PhD Program, students must pass a comprehensive qualifying examination in one of the four Department research areas. The qualifying exam is normally taken in the first semester of the student’s second year. In addition to satisfactory research progress and satisfactory academic standing, students will prepare a 6-page written document (with format detailed in Appendix E). This document needs to demonstrate independent, creative thinking and represent a clear conceptual departure from the student’s PhD thesis and the work of their thesis laboratory. The document should be distributed to the student’s qualifying exam committee no later than 7 calendar days before the oral examination.

Plagiarism, i.e. including verbatim copies or slightly modified text from written materials published by others without appropriate citation, is considered severe academic misconduct and is strictly forbidden in all academic works at Northeastern, including qualifying exam reports. The exam committee actively performs plagiarism checks to verify the originality of the report. Any verified plagiarism activities discovered in the written report may automatically result in a failure of the exam, or, in severe cases, discharge from the PhD program.

Students who fail their qualifying exam on the first attempt may have maximum one additional opportunity to retake the exam in the following semester. Students may not take the qualifying exam more than twice. In rare cases, a student may receive a “conditional pass”, with clear criteria for passing from the Qualifying Exam committee. More detailed description of the qualifying exam structure and criteria are provided in Appendix E.

Qualifying Exam Committee: The qualifying examination committee is composed of three members of the Department of Bioengineering faculty, assigned by the Graduate Development Committee and/or PhD Program Director. At least two of the three committee members will be from the student’s research area. Because the qualifying exam aims to serve as an independent and
departmental evaluation of the student’s basic research capabilities, the student's primary research advisor may not sit on the qualifying exam committee or help the student in completing the exam.

3.2.5 PhD Dissertation Committee

Within two years of joining the Bioengineering PhD program, students shall form their Dissertation committee. The committee should be composed of at least three Northeastern University members. The chair of the committee should be the student’s primary advisor or a member of the Bioengineering core faculty. Two members of the committee must be core faculty from the Bioengineering Department. It is highly recommended to have an External Faculty member from another university or institute to serve as a member of the committee. Once students have formed their committees, they should complete the PhD Dissertation Committee Form Appendix F and file it with the Academic Coordinator of the department. Students will be required to meet with their PhD Dissertation Committee at least annually to document sufficient research progress. A more frequent meeting schedule and active interactions with the Dissertation Committee members is highly recommended.

3.2.6 First Committee Meetings and Dissertation Proposals

A PhD student’s first committee meeting also serves as the Dissertation Proposal at Bioengineering Department. Prior to a student’s first committee meeting, they are required to write a research plan, outlining aims and objectives for their research in the form of an NIH-style R21 research plan, to be distributed to all committee members no later than 1 week prior to the meeting. Research progress update meetings must be held annually after the proposal. At the second to last meeting, held at least four months before the Dissertation Defense, the student must prepare and present a final dissertation proposal document. The student will be allowed to progress to the PhD Dissertation Defense upon successful defense of this proposal. Students must hold their first Dissertation Committee meeting no later than their third year.

3.2.7 PhD Dissertation Defense

All PhD candidates must complete and defend a dissertation of original research in Bioengineering. The dissertation examination committee is composed of the same faculty of the PhD Dissertation Committee. In addition, it is highly recommended to have an External Faculty member from another University serve as an ad-hoc member of the committee for the defense.

Please contact BioE Academic Coordinator, Caroline Pridmore (c.pridmore@northeastern.edu) no later than four weeks prior to the Dissertation Defense date to coordinate room reservation and advertisement of the defense across the University. Please provide the following details:

- Date, start time, finish time
- Expected capacity
- Zoom link if planning a hybrid or virtual presentation
- Title and Abstract, and confirmation of committee members

It is the student’s responsibility to schedule a date and time of the final oral examination with all Dissertation Defense Committee members.
Students must send a complete version of their PhD dissertation to their examination committee no later than two weeks prior to the Defense date. Although students will have an opportunity to make final revisions to the dissertation and abstract after their Final Oral Examination (Dissertation Defense), the Final Dissertation version should be a complete high-quality document that follows COE formatting guidelines.

The format of the defense will be that of an open presentation to the Northeastern Bioengineering faculty, students and staff, followed by a closed meeting with their dissertation committee in which candidates are expected to answer all relevant questions regarding their work, its significance and its relationship to ongoing work across the broader research community. The dissertation defense exam is expected to last approximately 2 hours in total.

Important deadlines, instructions, and the PhD Dissertation Signature page can be found on the COE webpage.

Students are required to initiate the submission process after they have successfully defended their PhD Dissertation, within 24 hours of the defense. If the examination committee deems that a “conditional pass” is appropriate, the student’s advisor must convey the specific conditions and proposed timeline in writing to the Academic Coordinator and Bioengineering PhD Director within 48 hours of the defense. In certain cases, this action may require additional review by the Bioengineering Graduate Development Committee (GDC).

3.3 Example PhD Timeline – Research Milestones

<table>
<thead>
<tr>
<th>Year</th>
<th>Fall</th>
<th>Spring</th>
<th>Summer</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Find Research Advisor</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Spring</td>
<td></td>
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<td></td>
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<tr>
<td>2</td>
<td>Qualifying Exam</td>
<td>Makeup Qualifying Exam (or Qualifying Exam for students who started the previous Spring semester)</td>
<td>Form PhD Committee</td>
</tr>
<tr>
<td></td>
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<tr>
<td>3</td>
<td>First Committee Meeting, aka. Thesis Proposal; Dissertation Research Plan in R21 format</td>
<td>Spring</td>
<td></td>
</tr>
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<td></td>
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<tr>
<td>4</td>
<td>Second Committee Meeting</td>
<td>Spring</td>
<td></td>
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<tr>
<td>5</td>
<td>Third Committee Meeting</td>
<td>Spring</td>
<td></td>
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<td></td>
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<tr>
<td></td>
<td>PhD Dissertation Defense</td>
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</tbody>
</table>
3.4 PhD Funding
It is the intent and track record of the Department of Bioengineering to ensure continuous funding to all PhD students throughout the tenure of their studies. Most students take about 5 years to complete a PhD degree and may be funded through a variety of mechanisms, including RA and TA awards and external fellowships.

3.4.1 Teaching Assistantships
Teaching assistantships (TAs) are administered by the Department of Bioengineering under the direction of the Business Manager (Esther Cohen). TAs are allocated to a mixture of incoming PhD and senior students advised by tenured and tenure-track Bioengineering faculty. TAs assist Bioengineering instructors in various aspects of teaching including running laboratories and grading assignments, and therefore requires matching of skills with course needs. Students who are funded by TA on entry are required to perform a laboratory rotation (Section 3.2.1) TA funding requests should be made by a student’s research advisor directly to the Business Manager.

3.4.2 Research Assistantships
Research assistantships (RAs) are paid by research advisors to students, normally from research grants to support their dissertation research. RAs are renewable on a semester basis, pending satisfactory research progress and availability of funding. Students should discuss expectations for satisfactory progress with their advisor but can expect a minimum of 20 hours per week spent on research.

3.4.3 Receiving Stipend
Please follow the following steps to complete necessary paperwork in order to receive a stipend.

Step 1: If you are an international student and you do not have a Social Security Number, the Graduate School of Engineering will produce an “Engagement Form” for you. This form must be filed to the Office of Global Services (OGS) on campus so that they can process a Social Security Number for you. If you are a newly admitted student, the “Engagement Form” will be provided to the Office of Global Services for your arrival check-in. Otherwise, please request the Engagement Form from the Graduate School of Engineering.

Step 2: All students: please visit the Student Employment Office at 101 Curry Student Center and complete a Direct Deposit Authorization Form and a Form W-4 for tax purposes.

Step 3: All students: Your stipend will be paid directly into your bank account on the 15th and the 30th or 31st of each month during which you hold your assistantship. If your Direct Deposit has not yet been set up, you will collect your paper paycheck at the Human Resources office at 716 Columbus Avenue.
4. Statement on Academic and Scholarly Integrity

Throughout one’s MS and PhD education, a student will be required to write frequently - this includes assignments, essays, tests, and written exams for your courses, and journal papers, texts, conference abstracts and papers related to your research. Please note that plagiarism is considered a form of severe academic/scholarly misconduct and is strictly prohibited at Northeastern and the Department. This means that **under absolutely no circumstance a student is it permitted to present another student's or scholar's work without appropriate citation or attribution of credits. Verbatim copies of text, including text with minor modifications, without citing the source are considered unacceptable for any academic or scholarly works at Northeastern, if detected, can result in severe penalties including failure of courses or exams, loss of funding, or discharge from the degree program.**

The prohibition of plagiarism also applies to computer codes. For all copyrighted computer programs and codes, one must carefully read and understand the respective software licenses declared by the upstream authors or copyright owners in order to determine whether it is appropriate to be used in your coursework or research. All included software codes, including those with open-source licenses, must be appropriately acknowledged according to the upstream license requirements in your reports or publications (including papers or software releases). In the end you are responsible for any work you hand in and may be asked to explain it to the instructor, so do not hand in anything you do not understand! In the case of improper collaboration, penalties may be assessed to all students involved. Please note that copying code snippets posted on forums or websites (such as StackOverflow) is highly problematic and shall not be used beyond the scope of “fair use” defined by copyright laws.

Similarly, plagiarism from journals, texts or websites are also considered unacceptable; they will be dealt with under the discretion of the course instructor and the Graduate Director. Also please note that assignments and written exams may be tested by the instructor or examination committees using plagiarism detection apps such as Turnitin.

If one has any doubt in a specific situation about what level of collaboration is acceptable, one should ask your instructor or advisor!

5. Petition and Registration Override Procedures

Please note the following:

1. Petitions/overrides for taking courses must be filed and approved **BEFORE** registration in the course.
2. Filing a petition/override does not mean that it will be approved, you need to receive the approval to go ahead.
3. Please file your petitions/overrides well in advance. Processing a petition/override takes at least 7 business days.
4. When submitting your petition/override make sure it is completed and signed by you. If you have a research advisor, the form must be signed by him/her as well. If the signature of the instructor is needed (for override forms), please make sure that you obtain the signature.
5. All petitions/overrides must be submitted with a copy of your current transcripts. Unofficial transcripts are acceptable for this purpose.

Here are the steps for filing petitions/overrides:
1. To file a petition:
   (a) Complete the petition form from [here](#).
   (b) Complete the form; this will then automatically be sent to the appropriate contacts for their approval

2. To file a registration override form (these forms are used to register in courses that have restrictions):
   (a) Completed the override form from [here](#); this will then automatically be sent to the appropriate contacts for their approval

6. Probation Policies and Procedures

To maintain good academic standing, students must maintain an overall 3.0 GPA and attain a C grade or higher in all of their core courses. So, if a student attains a “C-” grade or below in a core course but has a 3.0 overall, they will need to retake that class to meet the graduating requirements.

If a student’s GPA falls below 3.0, they will be placed on an academic probation. Please refer to sections 3.2.2 and 3.2.3 for information on performance probations.

**One academic term with cumulative GPA below 3.000:** Students with a cumulative GPA below 3.000 for one term are required to complete an Academic Probation Action Plan to be signed and approved by their academic advisor and submitted to the Graduate School within 7 business days from the start of the next academic term.

**Two consecutive terms with cumulative GPA below 3.000:** Students with a cumulative GPA below 3.000 for two consecutive terms will be dismissed from their degree program at the end of the second term. Students in this situation may submit an Academic Dismissal Appeal Form to the Graduate School to request a final one-term extension. The appeal will be reviewed by the student’s department.

**Three consecutive terms with cumulative GPA below 3.000:** Students with a cumulative GPA below 3.000 for three consecutive terms will automatically be dismissed from their degree program. In this case, the student may submit an appeal to the Associate Dean of the Graduate School per the University appeals process.

For more information, please refer to the College of Engineering [website](#).
7. Policies and Procedures for Course Transfer
Graduate students can transfer a maximum of 9 SH (or equivalent) course work from other institutions. 4 SH of course work is defined as 45 hours of lecture. For credit transfer from other institutions, the following conditions must be satisfied:
1. Students should have a grade of at least B (or equivalent) in the course.
2. The course must be passed during the past seven years.
3. The course should not be part of the requirements of a degree received by the student in the past.
4. The course will be reviewed by the Graduate Affairs Committee and should be approved as equivalent to a graduate-level Northeastern course that students can take as part of their degree program.

The process for transfer credit requires filing a Petition to Transfer Credit form. The petition should be accompanied by the detailed syllabus of the course (including textbook information) and the equivalent NU course as well as sufficient evidence that the course has not been part of the requirements of a degree received by the student. Evidence should be noted on the transcripts or be sent in a letter/formal email from the Student Service Coordinator (or equivalent) confirming credits were not used towards a degree in the former institution.

The full policy for transferring credits can be found here.

8. Policies and Procedures for Requesting Changes in the Graduate Program
In general, changes to the graduate program are possible after completing at least one semester at Northeastern. This gives the students an opportunity to get accurate information about each program in order to make an informed decision. The only request for change in the program that is accepted during the first semester is change from full-time to part-time or from part-time to full-time. This change does not apply to those who hold an F-1 student visa.

1. **Change from FT to PT or PT to FT.** This is the only change that can be petitioned during the first semester. To request this change you need to file a petition as explained in Section 4. FT PhD students cannot change to PT before having a research advisor. Change from FT to PT for international students is only possible if it complies with the Office of Global Services rules.

   For International Students Only: An approved change of program requires that a new I-20 be issued. It is the student's responsibility to initiate the I-20 process. Instructions are provided on the official admission acceptance letter. Questions should be directed to the International Student and Scholar Institute on campus.

2. **Change from PhD to MS, or MS to PhD:** Students need to file a Change in Degree Level form.

9. Annual Individual Development Plan Guidelines
All BioE PhD students are required to complete an Individual Development Plan annually. An Annual Individual Development Plan (AIDP) is a planning tool designed to help PhD students identify annual progress, professional development needs, and career objectives. It also serves as a valuable communication tool between PhD students and their research advisor.
Students will receive a link to the submission portal and will have 30 days to complete the submission. Once the submission has been submitted it will go to the students’ faculty advisor for review. Students will need to register for a COE account before logging in. To create a COE account you will need to email help@coe.neu.edu Please note: COE account registration can take up to five days since it is done manually by the COE IT Department.

Students that were on any type of leave for the entire year are not required to complete the IDP. If you were on leave for part of the year, you still need to submit an IDP to be reviewed.

Students that receive an overall merit review that does not meet expectations will be subject to review by the Graduate Studies Committee.

10. Co-op & Experiential Learning
Co-op and internship are forms of CPT (Curricular Practical Training) that allow full-time students to integrate a practical learning experience into their graduate program. With full approval and ongoing discussion with their PI, internship is an option for PhD students only to provide them with work experience that is integral to the student’s education, i.e., required for their dissertation research. Internship provides the opportunity to further the students’ training and knowledge in an area central to the advancement of their research. It does not refer to an “internship” as used by companies, agencies and other institutions. Examples include students working at a company, government lab or other entity whereby the tasks, data, protocols, etc. will be brought back to NU and used in an integral way in the advisor’s lab and the student’s research. Coop is available to all graduate students and its goal is to provide students with actual work experience in their field of study and need not be research oriented (though it often is).

Professional courtesy should be used when deciding whether to pursue a co-op or internship, and you should coordinate all aspects with your PI to ensure your PhD research and milestones are prioritized. The PI should also be involved in all stages of co-op planning. Your PI will need to approve the timeline with you and the co-op team prior to moving forward with the process. If no effort is made to coordinate with your PI ahead of time, funding may not be guaranteed following your co-op or internship.

10.1 Eligibility
To start the co-op search process, College of Engineering graduate students must:
1. Be enrolled full-time at Northeastern University.
2. Meet all English-language requirements described in the table below.
3. Meet the minimum GPA for their program.
4. Have no disciplinary or standing academic probation issues and no incomplete courses (i.e., no I grade in their records).
5. Have at least one term left in their program after completing co-op (i.e., students must return to Northeastern to take courses (including Dissertation Series), for at least one term prior to graduating).
6. Have a valid I-20 (for international students).
7. Have completed their first full time semester with a minimum of 8SH completed.
8. Be enrolled in or have completed the Career Management for Engineers (ENCP 6000) or Introduction to Cooperative Education (ENCP 6100) course (depending on their major).
9. Complete a COE Co-op Application and receive Co-op Coordinator approval to initiate a co-op job search.

To participate in Co-op, College of Engineering graduate students must:
1. Meet the minimum semester-hour requirements of 16SH completed as described in the table below.
2. Successfully complete the Career Management for Engineers (ENCP 6000) or Introduction to Cooperative Education (ENCP 6100) (depending on their major).
3. Receive Co-op Coordinator approval prior to accepting a co-op job offer.
4. Meet all the additional requirements as listed above for starting the co-op search process.

10.2 Applying for Co-op
For full details and instructions on the co-op process, please visit the Graduate Co-op Page, or contact Senior Co-op Coordinator Karen Kelly at k.kelly@northeastern.edu

11. Vacation Policy

All full-time Bioengineering PhD students are entitled to two weeks (10 working days) of vacation a year. This vacation time is in addition to the standard Northeastern University holidays. Vacation time may not be rolled over to subsequent years. Planned vacation must be approved at least one month in advance by the Faculty Research Advisor for RAs, and by the Faculty Research Advisor and Graduate Chair for TAs.

PhD students must coordinate with their PI/research advisor in a timely way about their requested vacation time, and the time off must be approved before time off is taken. Students who receive funding cannot take time off that interferes with teaching or research obligations, and must discuss time off in advance. This also applies to Northeastern University holidays - some research may require members of the lab to be present due to live experiments or lab commitments that cannot be rearranged.

Extended periods of time away from campus, including extended delays with international travel, must be approved by the student’s PI/research advisor, the Bioengineering PhD Director, and the Graduate School of Engineering to ensure funding is unaffected. Please refer to the University’s Attendance Policies for details on Leaves of Absence and other absences.
**Key Bioengineering Buildings**

**The Interdisciplinary Science & Engineering Complex (ISEC)**
Many of the labs and most of our Bioengineering faculty have offices on the second and third floors. The Bioengineering department administrative offices are in 206 ISEC.

**Snell Engineering Center**
The College of Engineering Graduate Student Services Office is located at 130 Snell.

**Mugar Life Sciences Building**
Several Bioengineering labs are in Mugar.

**Egan Research center**
Raytheon Amphitheater is a popular spot for events. The building houses many other events and seminar rooms.

**Curry Student Center**
Shop in the Northeastern bookstore for textbooks and school supplies, and clothing adorned with the Northeastern logo. There is also the largest food court on campus and a Starbucks.

**Labs: Faculty members have lab spaces in the following areas:**

<table>
<thead>
<tr>
<th>Faculty</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prof. Amini</td>
<td>456 Snell</td>
</tr>
<tr>
<td>Prof. Asthagiri</td>
<td>260-272 ISEC</td>
</tr>
<tr>
<td>Prof. Bajpayee</td>
<td>260B, 262C ISEC</td>
</tr>
<tr>
<td>Prof. Bellini</td>
<td>260-272 ISEC</td>
</tr>
<tr>
<td>Prof. Chung</td>
<td>020 ISEC</td>
</tr>
<tr>
<td>Prof. Dai</td>
<td>260-272 ISEC</td>
</tr>
<tr>
<td>Prof. Ebong</td>
<td>275 ISEC</td>
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<td>Prof. Fang</td>
<td>020 ISEC</td>
</tr>
<tr>
<td>Prof. E. Levine</td>
<td>Mugar 415</td>
</tr>
<tr>
<td>Prof. H. Levine</td>
<td>177 Huntington Ave.</td>
</tr>
<tr>
<td>Prof. Li</td>
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<td>Prof. Libby</td>
<td>260-272 ISEC</td>
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<tr>
<td>Prof. Loth</td>
<td>Forsyth Building</td>
</tr>
<tr>
<td>Prof. Lu</td>
<td>1319 177 Huntington</td>
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<tr>
<td>Prof. Makowski</td>
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<td>Prof. Minkara</td>
<td>306 ISEC</td>
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<tr>
<td>Prof. Niedre</td>
<td>020 ISEC</td>
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<td>Prof. Oakes</td>
<td>260-272 ISEC</td>
</tr>
<tr>
<td>Prof. Parameswaran</td>
<td>260-272 ISEC</td>
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<tr>
<td>Prof. Rouhanifard</td>
<td>378 ISEC</td>
</tr>
<tr>
<td>Prof. Ruberti</td>
<td>260-272 ISEC</td>
</tr>
<tr>
<td>Prof. Shefelbine</td>
<td>260-272 ISEC</td>
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<tr>
<td>Prof. Slavov</td>
<td>Mugar 111 &amp; 119</td>
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<tr>
<td>Prof. Sontag</td>
<td>355 ISEC</td>
</tr>
<tr>
<td>Prof. Yaseen</td>
<td>045 ISEC</td>
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</table>
Popular Coffee Spots
Cafe Strega – ISEC Lobby
Dunkin Donuts - Hayden Hall, Shillman Hall
Starbucks Coffee – Curry Student Center
Pavement Coffeehouse - 44 Gainsborough St
Render Coffee - 563 Columbus Ave
Thinking Cup - 165 Tremont
Tatte Bakery and Cafè - 369 Huntington Ave
Oakleaf Cakes Bake Shop - 12 Westland Ave
Caffe Nero - 114 New Edgerly Rd

13. Other Useful links
   ● Academic Integrity
   ● Code of Student Conduct
   ● BioE Department Website
   ● BioE Facebook
   ● BioE Twitter
   ● BioE Instagram
   ● BioE LinkedIn
   ● Graduate School of Engineering
   ● Official University Calendars
   ● Registrar’s Office
   ● University Health and Counseling Services
   ● General Graduate Forms
   ● NU Graduate Catalog
   ● NU Health and Wellness On-Campus Resources
14. Bioengineering Faculty and Staff

**Rouzbeh Amini** (he/him)
Associate Professor, Bioengineering
Jointly appointed in Mechanical & Industrial Engineering
Biomechanics, mechanobiology, and biotransport with applications in the eye, heart, and brain.
508 ISEC, r.amini@northeastern.edu

**Anand Asthagiri** (he/him)
Associate Professor, Bioengineering
Cell engineering, cancer cell biology. The Asthagiri lab investigates how cancer cells migrate and invade their surroundings during metastasis. We apply quantitative experimental analysis of live-cell imaging and mathematical modeling to gain an understanding of single-cell behaviors and cell-cell interactions during cancer progression.
226 ISEC, a.asthagiri@northeastern.edu
Lab website: [www.cell-engineering.org](http://www.cell-engineering.org)

**Ambika Bajpayee** (she/her)
Associate Professor, Bioengineering
Targeted drug delivery to connective and charged tissues. Her lab utilizes concepts of nanomedicine and bio-electrostatics to design polypeptides and protein-based carriers for targeted and sustained delivery of small molecule drugs, protein growth factors, antibodies and genetic materials to specific intra-tissue and intra-cellular target sites inside connective tissues.
216 ISEC, a.bajpayee@northeastern.edu

**Chiara Bellini** (she/her)
Associate Professor, Bioengineering
Diseases of the cardiovascular system; effects of cell mediated growth and remodeling processes on tissue and organ mechanics
228 ISEC, c.bellini@northeastern.edu
Samuel Chung (he/him)
Assistant Professor, Bioengineering
Researches central nervous system regeneration model in C. elegans, femtosecond laser surgery; user-friendly and low-cost fluorescence microscopy.
218 ISEC, s.chung@northeastern.edu
Lab website: https://sites.google.com/view/wormneurolab/

Guohao Dai (he/him)
Associate Professor, Bioengineering
Researches 3-D bioprinting technology, stem cells technology and vascular bioengineering.
224 ISEC, g.dai@northeastern.edu

Eno Ebong (she/her)
Associate Professor, Bioengineering
Jointly appointed in Bioengineering & Chemical Engineering.
Researches the means by which endothelial cell mechanotransduction occurs in order to prevent or promote diseases related to blood vessel dysfunction.
221 ISEC, e.ebong@northeastern.edu
Lab website: Ebong Laboratory

Qianqian Fang (he/him)
Associate Professor and Associate Chair for Research and Graduate Affairs, Bioengineering
Researches innovations in translational medical imaging devices to better diagnose cancers, neuroinformatics, and high-performance computing tools to facilitate the development of the next-generation imaging methods.
223 ISEC, q.fang@northeastern.edu
Twitter: @FangQ
Marc Fuller (he/him)
Adjunct Teaching Professor, Bioengineering
After receiving a PhD with an emphasis on bioelectricity at the University of Michigan, he spent his career equally divided between academia and industry. He has worked for Bell Laboratories, Siemens Medical, Draeger Medical, and Philips Health Care. His interests have spanned a wide range of physiological subjects from neural coding to resuscitation.

m.fuller@northeastern.edu

Michael Jaeggli (he/him)
Associate Teaching Professor, Associate Chair for Undergraduate Studies, Bioengineering
Focuses on curricular development and program delivery in bioengineering. During graduate school he specialized in heart valve tissue engineering and the use of 3D printing technologies for surgical planning. He is currently partnering with the Roux Institute to research and develop interdisciplinary programs to address rural health disparities in Maine.
206D ISEC, m.jaeggli@northeastern.edu

Miten Jain (he/him)
Assistant Professor, Bioengineering
Jointly appointed in Bioengineering & Physics

Timothy Lannin (he/him)
Associate Teaching Professor, Bioengineering
Previous research includes work on automating image analysis of cancer cells, measuring the electrical properties of cancer cells to use electric fields to separate them from blood cells, and measuring the electrical properties of algae cells to optimize their output for biofuels.
206A ISEC, t.lannin@northeastern.edu
**Erel Levine (he/him)**
Associate Professor, Bioengineering
Researches the analysis of big biological data by developing statistical physics approaches to deep learning; statistical learning approaches to the dynamics, plasticity and evolvability of small regulatory RNA; host-pathogen interaction: in-host dynamics and inter-species systems biology.
[e.levine@northeastern.edu](mailto:e.levine@northeastern.edu)
Lab website: [https://web.northeastern.edu/sysbioeng/](https://web.northeastern.edu/sysbioeng/)

**Herbert Levine (he/him)**
University Distinguished Professor, Bioengineering
Jointly appointed in Bioengineering & Physics
Studies mechanics of motility at both single cell and multicellular levels, genetic and metabolic networks underlying phenotypic changes en route to cancer metastasis, effective detection by and activation of the adaptive immune system. See my entry at ctbp.northeastern.edu for more info.
1308, 177 Huntington Ave; [h.levine@northeastern.edu](mailto:h.levine@northeastern.edu)

**Jiahe Li (he/him)**
Assistant Professor, Bioengineering
Researches synthetic biology, microbiome, drug delivery, polymeric materials and vaccines.
225 ISEC, [jiah.li@northeastern.edu](mailto:jiah.li@northeastern.edu)
Lab website: [The Advanced Therapeutics Lab](http://www.boitb.org)

**Elizabeth Libby (she/her)**
Assistant Professor, Bioengineering
Researches synthetic biology to build predictably performing biological systems for applications such as biosensor development and quantitative microbiology.
323 ISEC, [e.libby@northeastern.edu](mailto:e.libby@northeastern.edu)
Lab website: [https://libbylab.sites.northeastern.edu/](https://libbylab.sites.northeastern.edu/)

Francis Loth (he/him)
Professor, Bioengineering
Jointly appointed in Bioengineering & Mechanical and Industrial Engineering; Researches biological flows, experimental fluid mechanics, computational fluid mechanics, blood flow simulation, cerebrospinal fluid simulation, Chiari malformation, syringomyelia, medical image processing, magnetic resonance imaging
f.loth@northeastern.edu

Mingyang Lu (he/him)
Assistant Professor, Bioengineering
Uses systems biology approaches to uncover the underlying principles governing the operation of genetic networks. Integrates computational modeling and data analysis to elucidate the relationship among robustness of network dynamics, stochasticity in gene expression and heterogeneity in cancer evolution.
1319, 177 Huntington, m.lu@northeastern.edu
Lab websites: lusystemsbio.northeastern.edu; geneex.jax.org

Lee Makowski (he/him)
Professor and Chair, Bioengineering
Jointly appointed in Bioengineering & Chemistry and Chemical Biology. Research focus is on the molecular basis of Alzheimer's disease and other neurodegenerative disorders and the linkage between the structure of pathological fibrillar aggregates and disease progression. The work involves collaboration with neuropathologists in the use of scanning x-ray microdiffraction for study of fibrillar structures within human brain tissue.
206B ISEC, l.makowski@northeastern.edu

Helen Markewich (she/her)
Assistant Teaching Professor, Bioengineering
Specialty in lab-based and hands-on learning. She received her PhD from Cornell University and her BS from Georgia Tech. She also worked in biotech and in the water industry.
254B Richards Hall, h.markewich@northeastern.edu
Mona Minkara (she/her)
Assistant Professor, Bioengineering
Using computational methods, such as Monte Carlo and molecular dynamics simulations, to obtain a fundamental understanding of molecular interactions that occur at biological interfaces, such as the pulmonary surfactant system
325 ISEC, m.minkara@northeastern.edu
Lab website: https://www.monaminkara.com

Mark Niedre (he/him)
Professor, Bioengineering
Prof. Niedre researches and finds interest in biomedical optics and non-invasive imaging, rare cell detection and tracking in the body, image reconstruction and biomedical signal processing.
Office 217 ISEC, Lab 020 ISEC
m.niedre@northeastern.edu
Lab website: https://sites.google.com/site/niedrelab/home

Jessica Oakes (she/her)
Assistant Professor, Bioengineering
Researches pulmonary physiology, biofluids and transport phenomenon, computational biomechanics, magnetic resonance imaging, and multi-scale modeling. She is interested in applications pertaining to wildland fire smoke inhalation, e-cigs, and asthma.
229 ISEC, j.oakes@northeastern.edu
Lab website: https://www.northeastern.edu/biofluids/

Harikrishnan Parameswaran (he/him)
Assistant Professor, Bioengineering
Researches the mechanobiology of smooth muscle contractions to understand the fundamental mechanisms regulating airway caliber and why they fail in diseases like asthma.
219 ISEC, h.parameswaran@northeastern.edu
Lab website: https://web.northeastern.edu/breathe/
Sara Rouhanifard (she/her)
Assistant Professor, Bioengineering
Developing chemical approaches to track and quantify RNA modifications in cells; understanding differences in RNA expression and the impacts on disease and development. Single-molecule fluorescent imaging of RNA. Nucleic acid technologies.
220 ISEC, s.rouhanifard@northeastern.edu
Lab website: https://rouhanifardlab.com/
Twitter: @SRouhanifard

Jeffrey W. Ruberti (he/him)
Professor, Bioengineering
Researches tissue engineering of load-bearing matrix (bone, cornea), bioreactor design, multi-scale mechanobiomechanics, statistical mechanics, energetics microscopy, high-resolution imaging; and biopolymer self-assembly.
215 ISEC, j.ruberti@northeastern.edu

Sandra Shefelbine (she/her)
Associate Dean for Space and Special Initiatives, Office of the Dean
Professor, Bioengineering
Jointly appointed with Bioengineering & Mechanical and Industrial Engineering
Researches multi-scale bone biomechanics – how the structure and composition of bone influences its mechanical properties; mechano-adaptation of bone and joint – how tissue responds to mechanical signals.
222 ISEC, s.shefelbine@northeastern.edu
Lab website: www.shefelbine.org

Shiaoming Shi (he/him)
Associate Teaching Professor, Bioengineering
Researches cancer detection and drug discovery technologies.
230 ISEC, s.shi@northeastern.edu
**Nikolai Slavov** (he/him)
Associate Professor, Bioengineering, Allen Distinguished Investigator
Researches single-cell proteomics, Ribosome-mediated translational regulation, and quantitative systems biology. Most recently Slavov lab developed a high-throughput method for single cell proteomics by mass spectrometry and used it to quantify proteome heterogeneity during cell differentiation.
334 MU, n.slavov@northeastern.edu

**Eduardo Sontag** (he/him)
University Distinguished Professor, Bioengineering
Jointly appointed in Bioengineering & Electrical and Computer Engineering.
Researches feedback control theory, systems biology, cancer, and biomedicine.
326 ISEC, e.sontag@northeastern.edu

**Esin Sozer** (she/her)
Assistant Teaching Professor, Bioengineering

**Tao Sun** (he/him)
Assistant Professor, Bioengineering
Mohammad Abbas Yaseen (he/him)
Assistant Professor, Bioengineering
Research Focus: Advanced microscopy for minimally invasive, in vivo characterization of brain function
Research Projects: Relating neuroimmune and neurovascular alterations during Alzheimer’s Disease progression Principal Investigator, National Institute of Health
Near Infrared Fluorescence Imaging of Reactive Oxygen Species in Alzheimer’s Disease Co-Investigator, National Institute of Health
318 ISEC, m.yaseen@northeastern.edu
Lab website: https://www.yaseen-omnilab.org/

STAFF

Esther Cohen
Business Manager
e.cohen@northeastern.edu
206C ISEC
(she/her)

Elizabeth Chesley
Program Coordinator
e.chesley@northeastern.edu
206 ISEC
(she/her)

Noah Joseph
Senior Engineering Lab Technician
n.joseph@northeastern.edu
057 Richards Hall
(he/him)
Kathryn Lasseter  
Lab Ops & Safety Manager  
k.lasseter@northeastern.edu  
234 ISEC  
(they/them)

Caroline Pridmore  
Academic Coordinator  
c.pridmore@northeastern.edu  
206 ISEC  
(she/her)

Prachi Shah  
Financial Operations Coordinator  
pr.shah@northeastern.edu  
206 ISEC  
(she/her)
Appendix A. Bioengineering Department Safety Training
All PhD students and MS students who plan to perform laboratory research are required to complete the basic Department of Bioengineering laboratory safety program, plus any additional lab-specific safety training. Students are strongly advised to complete this training in the first month following matriculation. For more information please contact the Lab Operations and Safety Manager Kathryn Lasseter (k.lasseter@northeastern.edu)

Appendix B. Suggested PhD Electives by Research Area and Master Electives List

please file a petition form for any courses not currently listed on the catalog

Area 1 – Imaging, Instrumentation, and Signal Processing
BIOE 5235 Biomedical Imaging
BIOE 5810 Design of Biomedical Instrumentation
EECE 5606 Micro- and Nanofabrication
EECE 5639 Computer Vision
EECE 5642 Data Visualization
EECE 5644 Machine Learning
EECE 5648 Biomedical Optics
EECE 5664 Biomedical Signal Processing
EECE 5666 Digital Signal Processing
EECE 7105 Optics for Engineers
EECE 7200 Linear Systems Analysis
EECE 7202 Electromagnetic Theory 1
EECE 7203 Complex Variable Theory and Differential Equations
EECE 7204 Applied Probability and Stochastic Processes
EECE 7211 Nonlinear Control
EECE 7271 Computational Methods in Electromagnetics

Area 2 - Biomechanics, Biotransport and MechanoBiology
BIOE 5650 Multiscale Biomechanics
BIOE 5656 Fields, Forces, and Flows in Biological Systems
BIOE 5820 Biomaterials
BIOL 5601 Multidisciplinary Approaches to Motor Control
BIOL 5587 Comparative Neurobiology
IE 7280 Statistical Methods in Engineering
IE 7315 Human Factors
ME 5250 Robot Mechanics and Control
ME 5650 Advanced Mechanics of Material
ME 5655 Dynamics and Mechanical Vibration
ME 5657 Finite Element Method
ME 5659 Control Systems Engineering
ME 5665 Musculoskeletal Biomechanics
ME 5654 Elasticity and Plasticity
ME 7238 Advanced Finite Element Method
ME 5658 Continuum Mechanics
+ PT 5139 Lab
PT 5150 Motor Control, Development and Learning
Area 3 – Molecular, Cell, and Tissue Engineering
BIOE 5410 Molecular Bioengineering
BIOE 5430 Principles and Applications of Tissue Engineering
BIOL 5543 Stem Cells and Regeneration
BIOE 5650 Multiscale Biomechanics
BIOE 5820 Biomaterials
BIOL 6401 Research Methods and Critical Analysis in Molecular Cell Biology
CHEM 5612 Principles of Mass Spectrometry
CHME 5699 Nanomaterials
CHME 5699 Advanced topics in Biomaterials
CHME 5630 Biochemical Engineering
CHME 5699 Bioanalytical Sensors
PMST 6254 Advanced Drug Delivery System
PHSC 6214 Experimental Design and Biostatics

Area 4 – Systems, Synthetic, and Computational Bioengineering
* *please file a petition form for any courses not currently listed on the catalog website
Restricted
Electives
BIOE 5115 Dynamical Systems in Biological Engineering
BIOE 5710 Experimental Systems and Synthetic Bioengineering
BIOE 5720 Physical Bioengineering
BIOE 5750 Modeling and Inference in Bioengineering

Elective List
BINF 6400 Genomics in Bioinformatics
BINF 6410 Proteomics in Bioinformatics
BIOE 5440 The Cell as a Machine
BIOE 5510 Bioengineering Products/Technology Commercialization
BIOE 5640 Computational Biomechanics
BIOE 5760 Method and Logic in Systems Biology and Bioengineering
BIOE 5860 Engineering Approaches to Precision Medicine I
BIOE 5870 Engineering Approaches to Precision Medicine II
BIOE 5880 Computational Methods in Systems Bioengineering
BIOL 6299 Molecular Cell Biology for Biotechnology
CHEM 5638 Molecular Modeling
CHME 5630 Biochemical Engineering
DS 5220 Supervised Machine Learning and Learning Theory
DS 5230 Unsupervised Machine Learning and Learning Theory
HINF 5101 Introduction to Health Informatics and Health Information Systems
PHSC 6290 Biophysical Methods in Drug Discovery
PHTH 5202 Introduction to Epidemiology
PHYS 5116 Network Science I
### All areas: Master List of Approved BioE PhD Electives - No petition form required

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<tr>
<th>Course Code</th>
<th>Course Title</th>
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<tr>
<td>BIOE 5235</td>
<td>Biomedical Imaging</td>
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<tr>
<td>BIOE 5250</td>
<td>Design, Manufacture, and Evaluation of Medical Devices</td>
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<tr>
<td>BIOE 5410</td>
<td>Molecular Bioengineering</td>
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<tr>
<td>BIOE 5420</td>
<td>Cellular Engineering</td>
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<tr>
<td>BIOE 5430</td>
<td>Principles and Applications of Tissue Engineering</td>
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<td>BIOE 5440</td>
<td>The Cell as a Machine</td>
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<td>BIOE 5450</td>
<td>Stem Cell Engineering</td>
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<td>BIOE 5630</td>
<td>Physiological Fluid Mechanics</td>
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<td>BIOE 5650</td>
<td>Multiscale Biomechanics</td>
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<td>BIOE 5656</td>
<td>Fields, Forces, and Flows in Biological Systems</td>
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<td>BIOE 5710</td>
<td>Experimental Systems and Synthetic Bioengineering</td>
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<td>Method and Logic in Systems Biology and Bioengineering</td>
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<td>BIOE 5800</td>
<td>Systems, Signals, and Controls for Bioengineers</td>
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<td>BIOE 5810</td>
<td>Design of Biomedical Instrumentation</td>
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<td>BIOL 5307</td>
<td>Biological Electron Microscopy</td>
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<td>BIOL 5543</td>
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<td>BIOL 6300</td>
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<td>Research Methods and Critical Analysis in Molecular Cell Biology</td>
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<td>CAEP 6202</td>
<td>Research, Evaluation, and Data Analysis</td>
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<td>CHEM 5620</td>
<td>Protein Chemistry</td>
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<td>CHEM 5621</td>
<td>Principles of Chemical Biology for Chemists</td>
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<td>CHEM 5638</td>
<td>Molecular Modeling</td>
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<td>CHEM 5660</td>
<td>Analytical Biochemistry</td>
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<td>CHEM 7247</td>
<td>Advances in Nanomaterials</td>
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<td>CHME 5630</td>
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<td>CS 5100</td>
<td>Foundations of Artificial Intelligence</td>
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<td>Database Management Systems</td>
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<td>CS 5335</td>
<td>Robotic Science and Systems</td>
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<td>Principles of Programming Language</td>
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<td>EECE 5606</td>
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<td>Data Visualization (new)</td>
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<td>Fundamentals of Computer Engineering</td>
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<td>Nonlinear Control</td>
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<td>System Identification and Adaptive Control</td>
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<td>EECE 7214</td>
<td>Optimal and Robust Control</td>
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<td>Computational Methods in Electromagnetics</td>
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<td>Modern Signal Processing</td>
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<td>EECE 7364</td>
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<td>High-Level Design of Hardware-Software Systems</td>
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Appendix C. Laboratory Rotation Form

Graduate Student Lab Rotation Allocation Form

Rotation mentors must be a Core Faculty or Affiliated Faculty of the Bioengineering Department. The rotation is an opportunity to determine if the lab is a good ‘fit’ for both mentor and the student. Students are expected to do 2 rotations and should choose a mentor and program by the beginning of Spring Term.

➢ MENTOR

Name: __________________________
Primary Admin Dept.: __________________________
Phone: __________________________ Email: __________________________

Graduate Program Affiliation (mark all that apply)
☐ Imaging
☐ Biomechanics
☐ Cell & Tissue
☐ Systems, Synthetic, Comp. BioE.

➢ FUNDING (check one)

☐ I have funding to support this student if he/she joins my lab.
   ○ Grant number: __________________________ Expiration date: __________________________
☐ Grant application is submitted/scored. I expect to have funding to support this student.
☐ I will not have funding, but my department has agreed to support this student for years.
☐ I will not have funding to support this student joining my lab.

If you will not have funding, you and the student should discuss, and explain below, why you think this rotation is justified (e.g., the student wishes to learn a specific technique)

☐ 1st rotation
☐ 2nd rotation
☐ Additional

➢ PROJECT

Please provide a brief description of the project the student will be working on during their rotation.


➢ SIGNATURES

Mentor __________________________ Date __________________________

Graduate Student Advisor __________________________ Date __________________________

Student __________________________ Date __________________________
Graduate Student Post-Lab Evaluation Form

This form is to be filled out by lab rotation advisors after rotation students have completed each rotation. Please return to the Bioengineering Academic Coordinator (Caroline Pridmore, c.pridmore@northeastern.edu) upon completion and prior to starting the next rotation/declaring a lab.

To be completed by the student:

Rotation advisor’s name:

Student name: ____________________________________________

Rotation number:

Brief summary of what was accomplished during the rotation (1-3 sentences):

To be completed by the rotation advisor (PI):

Ratings (1 to 5, with 1 being need further development and 5 being best)
- Responsible, shows up to lab: __________
- Works hard when in lab: __________
- Understands what they are doing and can summarize: __________
- Can execute experiments / analyze data / develop methods with minimal guidance: __________
- Critical thinker: __________
- Independently reads the relevant background literature: __________

Strengths of this student in the lab:

Please discuss what this student should work on to be successful in the PhD program:

Signature of rotation advisor (PI): ____________________________

Signature of student: _____________________________________
Appendix D. **PhD Advisor Declaration Form**

Department of Bioengineering

PhD Advisor Declaration/Advisor Change Request Form

Student Name: ________________________________________________

NUID#: ____________________ E-mail Address: ______________________

Advisor Declaration

Advisor Name (print): ___________________________________________

Department: __________________________________________________

Semester/Year Advisor’s RA Support to Begin: ______________________

*Advisor’s Index Number(s) for first two semesters of RA Support:

Advisor’s Signature: _______________________________ Date: ____________

Advisor Change Request

Current Advisor Name (print): ____________________________________

Department: __________________________________________________

Current Advisor’s Signature: _______________________________ Date: ____________

Proposed New Advisor’s Name (print): ____________________________

Department: __________________________________________________
Semester/Year New Advisor’s RA Support to Begin:
_____________________________________________________

*New Advisor’s Index Number(s) for first two semesters of RA Support:
_____________________________________

Proposed New Advisor’s Signature: ________________________ Date: ____________________

Student Signature: __________________________________ Date: ______________________

Approved by Bioengineering Graduate Director: ____________________ Date: ______________

*Note to Advisor: Index numbers for advisor’s support of subsequent semesters will be required at the time of SGA appointment requests.

After completing this form, submit it to the Academic Coordinator, Caroline Pridmore (c.pridmore@northeastern.edu) Bioengineering Office, ISEC 206, and save a copy for your records.
Appendix E. Bioengineering Qualifying Exam, Structure and Criteria

I. Timing and Organization
i) To be taken in Fall of 2nd year (typical)
ii) In one of 4 subject areas
   1) Imaging, Instrumentation, and Signal Processing
   2) Biomechanics, Biotransport and MechanoBiology
   3) Molecular, Cell, and Tissue Engineering
   4) Computational and Systems Biology
iii) Exam committee will be composed of three faculty, at least one of whom must be core Bioengineering faculty
iv) Evaluation process:
   1) There will be a tentative evaluation during the exam (BioE Grading Rubric below).
   2) At the end of ‘exam period’ the committee meets and decides on pass/fail for each student
   3) The advisor may attend the meeting and provide input on the student’s research progress. The advisor may also provide their input in writing before the meeting.
v) There will be a makeup exam in the Spring semester.
vi) Students may take the exam only twice.

II. Exam Structure and Requirements
i) The qualifying exam committee will provide a list of 6 papers in the students’ subject area
ii) Students will submit their top 3 choices based on their interest and knowledge. They will be assigned 1 paper (best match) approximately 4 weeks before the exam.
iii) Students will prepare a 6-page (maximum) written document 1 week before the oral exam
iv) The written document will be in two parts:
   1) Summary, review and critique of the paper* (3 pages)
   2) A short research proposal (1-2 Aims) that builds on the selected paper (3 pages)
v) The oral exam will be a maximum 2-hour in length. The student will present and be questioned on their written document.
vi) Immediately following the exam, the committee will complete the preliminary evaluation form. The evaluation rubric for the exam is included on the next pages for the student’s reference.
vii) Students will not be informed of the result of the exam until after the final meeting. Advisors have the opportunity to provide input at or before the final review meeting.
Northeastern Bioengineering Grading Rubric for PhD Qualifying Exam
**To be filled out by the Exam committee chair in consultation with the exam committee**

Student Name:

Date:

Examiners present:

General Instructions:

- This assessment should be completed by the exam committee immediately after the oral qualification exam without the student present.

- Oral exam will be conducted in two parts,

b. comprehension of the selected paper, and,

c. the proposal.

- Students will be assigned a score from 1 to 9 for each section,
  1 = “outstanding”, 9 = “unacceptable”, 5 = “average”

- Students will not be informed of the exam result on the day of the exam.

1. **Exam Part I: Journal paper**

1a) Did the student demonstrate understanding the underlying scientific premise of the paper?

1 2 3 4 5 6 7 8 9

1b) Did the student understand the relevant methods, assays, imaging modalities etc. involved in the experiments?

1 2 3 4 5 6 7 8 9

1c) Did the student understand the key results and their scientific significance?

1 2 3 4 5 6 7 8 9

1d) Did the student critically examine the conclusions of the study?

1 2 3 4 5 6 7 8 9
1e) Overall, what was the students' level of comprehension of their selected paper?
1 2 3 4 5 6 7 8 9

1f) Other comments for Part 1:

2. Presentation section:

Exam Part 2 – Proposal:

This proposal represents a conceptual departure from the thesis lab work-- TRUE
FALSE

FALSE selection results in an automatic fail. Example of proposals that are not acceptable:

1. The proposal mirrors thesis work with a different model system
2. The proposal applies the core technology of thesis laboratory to the analyzed paper

2a) Is the proposed work a rational extension or application of the paper presented?
1 2 3 4 5 6 7 8 9

2b) Significance: Did the proposal clearly address the significance of their proposal, and explain how the proposed project will improve scientific knowledge and/or technical capability?
1 2 3 4 5 6 7 8 9
2c) Scientific approach and rigor: Was the overall strategy, methodology, and analyses well-reasoned and appropriate to accomplish the specific aims of the project? Are potential problems, alternative strategies, and benchmarks for success presented?

1 2 3 4 5 6 7 8 9

2d) Quality of oral presentation: Clarity, quality of presentation materials etc.

1 2 3 4 5 6 7 8 9

2e) Quality of written proposal: Proper references, grammar, structure, adherence to page limits:

1 2 3 4 5 6 7 8 9

2f) Overall proposal assessment:

1 2 3 4 5 6 7 8 9

2g) Other comments for part 2:

Preliminary Exam Result: Fail  Pass
Appendix F. PhD Dissertation Committee & Proposal Defense Form
Northeastern University Department of Bioengineering Doctoral Degree in Bioengineering PhD Dissertation Committee & Proposal Defense Form

Name: _____________________    Date: __________
NUID: ___________________

**Dissertation Committee Composition:**
The Dissertation Committee composition should adhere to the following guidelines: The Dissertation Committee must be composed of a minimum of three members, at least one of whom must be core Bioengineering faculty. In addition, at least two of the Committee members must be either core or affiliated Bioengineering faculty.

**Dissertation Proposal Defense:**
The Dissertation Proposal should adhere to the following guidelines: The Dissertation Proposal must be in the form of an NIH-style R21 proposal. The PhD Candidate must defend their Dissertation Proposal before the Dissertation Committee. Committee Members must receive the Proposal no later than 1 week prior to the meeting.

Proposal Title: ____________________________________________________________

Approved for Proposal Defense Requirement for the Doctor of Philosophy Degree

Dissertation Advisor Name (print): ___________    Department: ___________
Signature: ____________________________

Committee Member Name (print): ___________    Department: ___________
Signature: ____________________________

Committee Member Name (print): ___________    Department: ___________
Signature: ____________________________

Committee Member Name (print): ___________    Department: ___________
Signature: ____________________________

Student’s Signature: ___________    Date: ___________

Approved by BioE Graduate Director: ___________    Date: ___________

After completing this form please submit it to the BioE Academic Coordinator, Caroline Pridmore (c.pridmore@northeastern.edu) and save a copy for your records.

Last Updated June, 2022
Appendix G. Industrial PhD - Best Practices and Recommendations

Coursework Requirements

The coursework requirements for Industrial PhD students follow the normal degree requirements (Bioengineering Graduate Handbook Section 3.1).

**Advanced Entry Students:** Most Industrial PhD students have ‘advanced entry’ (AE) status, meaning that they have an MS in a related field, which significantly reduces course requirements (16 Semester Hours or 4 Courses). Some AE Industrial PhD students are unable to be physically on campus where most of our department courses are offered. In these cases, we recommend that AE Industrial PhD students take 3 courses (12 SH) in Independent Study (BIOE 7978) with non-dissertation advisor faculty in different areas of research in our department. These can be literature reviews that can be done off site on the students’ own time and will allow breadth and depth for the course requirements. Please note that the Independent Study course may be taken at most 3 times. It is recommended that AE students take Principles of Bioengineering (BIOE 7000) as the remaining 4 SH. There are also a small number of online courses that can be taken.

**Regular-Entry Students:** Industrial PhD students entering with BS only (non-AE) are required to take a 32 Semester Hour course-load as specified in the Graduate Student Handbook. To meet this, students typically must be on campus about 20 hours per week for at least the first two years of their PhD. PhD students are also required to take the Advanced Seminar Course (BIOE 7390) four semesters. We intend to record and stream department seminars through the Blackboard/Tegrity system beginning Fall 2019. Offsite students may choose to register for the course and view the seminars online.

Research Requirements

The core of the PhD program is research and scholarship. Qualifying exams, committee meetings, annual reviews and defenses must be performed “as normal” as described in the Graduate Handbook Section 3.2.

Research performed by PhDs who are employed at an outside company may present a number of unique challenges with respect to publication, conference presentations, and intellectual property. It is critical that students and potential PhD advisors discuss these issues at the beginning of the PhD. As a general rule, the PhD research should be research performed beyond the student’s job-related research so that it may be freely publicly discussed.

This discussion should be documented in a letter, which will be signed by the student and PI, and reviewed by the Bioengineering Graduate Study Committee. Some considerations include:

- *Where will the research be performed?*
- *What are the expectations for journal and conference publications?*
- *Will the student be able to present the research at internal seminars and meetings, as well as at academic conferences?*

Northeastern University has an Industrial PhD Agreement template which can be obtained from the department of Bioengineering office or the Graduate Director. This should be completed and signed before beginning the PhD. Northeastern University has existing policies on IP and licensing with which both the student and advisor should be aware.

Further questions should be addressed to the Department of Bioengineering Graduate Director: Qianqian Fang, Chair for Graduate Studies, q.fang@northeastern.edu.

*Last Updated June, 2022*