



JOHNS HOPKINS
UNIVERSITY

Department of
Mechanical
Engineering

Ph.D.
Graduate Student
Advising Manual

2018-2019

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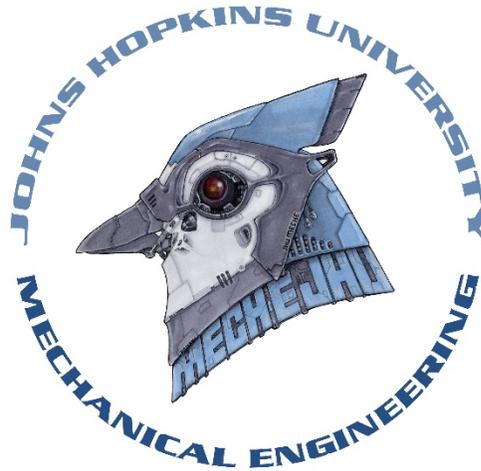


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1. Welcome!

Welcome to the Department of Mechanical Engineering! This manual is designed to serve as a guide for graduate students in the Department of Mechanical Engineering to work more effectively during the conduct of their research and to describe the basic academic requirements for both the MSE and Ph.D. degrees. The detailed planning of an academic program, such as choosing courses and the like must be done with the guidance of the faculty advisor.

This manual covers policies and procedures, and offers suggestions regarding our program. Please address issues and questions not covered in this manual with these professors and staff:

- Academic Program Manager - Mike Bernard - me-academic@jhu.edu
- Senior Academic Program Coordinator - Kevin Adams - me-academic@jhu.edu
- Your faculty advisor
- Administrator - Marty Devaney - mdevane2@jhu.edu
- Director of Graduate Studies, Professor Rajat Mittal - mittal@jhu.edu
- Diversity Champion, Professor Vicky Nguyen - vicky.nguyen@jhu.edu
- Department Head, Professor Gretar Tryggvason - gtryggv1@jhu.edu

This document is not phrased to professional legal standards. You will want to clarify any unclear issues with the department.

2. General Information

Graduate study is a joint enterprise involving faculty, fellow students, and instructors from other disciplines. Advanced degrees require advanced training through both coursework and individual faculty guidance as well as through innovative fundamental research. The results of this research should be disseminated through conference presentations, archival journals, and other appropriate publications. Our goal is to provide an environment that fosters a stimulating, rewarding, productive, and enjoyable intellectual enterprise.

2.1. Residency Requirements

Once students begin their graduate course of study toward a degree, they must complete a minimum of two consecutive semesters of registration as a full-time, resident graduate student. To qualify as a resident student, the student must be present on campus and working toward fulfilling the requirements for the degree. Information is available at <http://homewoodgrad.jhu.edu/academics/graduate-board/>.

2.2. English Language Program for International Students

International students whose native language is other than English are strongly encouraged to strengthen their English language skills, no matter how proficient they are currently. Taking the course 370.602 Accent Reduction will help.

- **All students whose TOEFL speaking scores are 27/30 or higher** are exempt from taking 370.602 Accent Reduction, but are strongly encouraged to take 370.603 Communication Strategies in the American Academia.
- **All Ph.D. students whose TOEFL speaking scores are 26/30 or lower** must register for 370.602 Accent Reduction and later strongly encouraged to take 370.603 Culture and Communication Strategies in the American Academia.

If you feel that your English-language skills are strong enough to avoid taking these remedial courses, you are welcome to participate in English-language assessments by the English Language Program for International Teaching Assistants of the Language Teaching Center (LTC)

Visit the LTC in 523 Krieger Hall to take the English-language assessment listening test and interview. Contact the [Center for Language Education](#) to arrange an appointment.

If you pass the test, you may drop the Accent Reduction course and you will be eligible to act as a Teaching Assistant right away. If the examiner “recommends” or “requires” taking 370.602 Accent Reduction, then our department requires you to take the course.

If you must take 370.602 Accent Reduction but there is a conflict with another course on your schedule, you may delay taking the course but you cannot be hired as a Teaching Assistant until you take and pass the remedial course.

2.3. Required Introductory Courses and Tutorials

There are three introductory courses and tutorials that most or all graduate students must take.

2.3.1. Responsible Conduct of Research

Many M.S.E. and all Ph.D. graduate students will be required to take the “Responsible Conduct of Research” course.

Each Ph.D. student must complete the in-person training course (AS.360.625) before the start of his or her fourth semester of the program. Failure to complete the course could result in the loss of funding.

Information is available at <http://engineering.jhu.edu/wse-research/resources-policies-forms/responsible-conduct-of-research/>.

2.3.2. Academic Ethics

Graduate students are automatically enrolled in the online tutorial EN.500.603 Academic Ethics, which teaches academic and ethical responsibilities. This 20-minute tutorial must be completed in the first eight weeks of the student’s first semester. The Whiting School of Engineering will notify new students when the course is available.

2.3.3. Research Laboratory Safety

All students working in a research laboratories should take the Research Laboratory Safety course modules: an introduction to laboratory safety, including chemical, biological, radiation, and physical hazards. Students learn hazard assessment techniques, laboratory emergencies, and general lab standards for Whiting School of Engineering.

See Section 11.1 of this manual for details on the modules and lectures.

These should be taken before beginning work in a research laboratory.

COMING SOON: New training on Opioid Dangers and Title IX will be introduced. Details will be provided when they are available.

2.4. Advisors

In most cases, a graduate student's academic and research advisor will be a full-time professor in the Department of Mechanical Engineering.

An advisor is best defined as a departmentally approved faculty member under whose guidance a student is conducting research and in whose lab the student is associated and expected to participate. All students must have an advisor.

Occasionally, a Ph.D. or M.S.E. student may partake in specialized research where he or she will work with a professor in another department. If this is the case, the student will have two advisors:

- A research advisor, whose primary appointment is in an outside department and may or may not have a secondary appointment in Mechanical Engineering
- An academic advisor whose primary appointment is in Mechanical Engineering.

2.5. Course Registration and Credits

2.5.1. Credits and Full-Time Status

All Whiting School of Engineering graduate students will register for courses with credits.

- The Mechanical Engineering degree requirements do not change for the number or types of courses.
- All Whiting School of Engineering (WSE) graduate-level courses (EN.600-level or higher) have credits assigned to them.
- To maintain full-time status, all WSE graduate students must be enrolled in at least 9 credits. Students enrolled in fewer than 9 credits per semester will not meet the full-time enrollment requirement, which may affect residency requirements for all and visa concerns for international students.

- PhD students must enroll in in at least 20 credits per semester. Students can achieve full-time status by registering for any combination of courses and seminars, as approved by one’s advisor.
 - Seminars – 1 credit
 - WSE courses, both undergraduate and graduate – 3 or 4 credits
 - EN.530.801/EN.530.802 PhD Graduate Research – 3-20 credits
 - NOTE:
 - Audited courses do not count toward a full-time credit load.
 - Krieger School of Arts and Sciences’ graduate-level courses will not have credits listed in ISIS, but will be recognized as 3-4 credits toward one’s full-time credit load.
 - The maximum per-semester enrollment limit is 25 credits. If there is a need to register for more than 25 credits, please contact Academic Program Manager Mike Bernard. The Whiting School will consider exceptions.
- Visit the Whiting School’s Frequently Asked Questions page at <http://homewoodgrad.jhu.edu/academics/wse-graduate-credit-hours/> for more information.

2.5.2. Interdivisional Course Registration

Students may need to register in another division, like the Engineering for Professionals program or in any of Hopkins’s eight other schools. Registration for courses in these areas must be done in person at the Registrar’s office in Garland Hall. Visit <https://studentaffairs.jhu.edu/registrar/students/interdivisional-registration/> for information.

2.6. Frequency of Course Offerings

Graduate courses are offered in specific semesters, and sometimes in alternating years. Below is a timeframe of elective course offerings listed in the anticipated order of next offering.

These offerings are subject to change due to instructor sabbaticals or unusual situations. Please confirm these offerings when planning your course schedule.

(See next page...)

MECHANICAL ENGINEERING - COURSES - ANTICIPATED OFFERINGS

| Semester | Math/ Computational / Design | Robotics, Systems and Controls | Fluid Mechanics / Energy | Mechanics and Materials | Biomechanics |
|------------------------------------|---|---|---|--|--|
| Spring 2019 (confirmed) | <ul style="list-style-type: none"> - EN.530.480 Image Processing and Data Visualization - EN.530.614 Master's Design Project II | <ul style="list-style-type: none"> - EN.530.421 Mechatronics - EN.530.470 Space Vehicle Dynamics and Control - EN.530.475 / 675 Locomotion I: Mechanics - EN.530.616 Intro to Linear Systems Theory - EN.530.645 Kinematics - EN.530.646 Robot Devices, Kinematics, Dynamics and Control - EN.530.663 Robot Motion Planning - EN.530.678 Nonlinear Control and Planning in Robotics - EN.530.707 Robot Systems Programming | <ul style="list-style-type: none"> - EN.530.427/627 Intermediate Fluid Mechanics - 530.608 Experimental Fluid Dynamics - EN.530.622 Fluid Dynamics II - EN.530.632 Convection - EN.530.726 Hydrodynamic Stability - EN.530.767 Computational Fluid Dynamics | <ul style="list-style-type: none"> - EN.530.606 Mechanics of Solids and Materials II - EN.530.618 Fabricatology - EN.530.642 Plasticity - EN.530.655 Additive Manufacturing - EN.530.732 Fracture Mechanics | <ul style="list-style-type: none"> - EN.530.441 Intro to Biophotonics - EN.530.475 / 675 Locomotion I: Mechanics - EN.530.480 Image Processing and Data Visualization |
| Fall 2019 (confirmed) | <ul style="list-style-type: none"> - EN.530.414 Computer Aided Design - EN.530.430 Applied Finite Element Analysis - EN.530.613 Master's Design Project I - EN.530.761 Math Methods for Engineers - EN.530.766 Numerical Methods | <ul style="list-style-type: none"> - EN.530.420 Robot Sensors and Actuators - EN.530.424 / 624 Dynamics of Robots and Spacecraft - EN.530.475 / 675 Locomotion I – Mechanics - EN.530.603 Applied Optimal Control - EN.530.646 Robot Devices, Kinematics, Dynamics, and Control - EN.530.691 Haptic Interface Design for Human-Robot Interaction | <ul style="list-style-type: none"> - EN.530.418 / 619 Aerospace Structures and Materials - EN.530.425 Mechanics of Flight - EN.530.443 / 643 Fundamentals, Design Principles, and Applications of Microfluidic Systems - EN.530.621 Fluid Dynamics I - EN.530.625 Turbulence - EN.530.629 Simulation and Analysis of Ocean Wave Energy Systems - EN.533.710 Optical Measurement Techniques | <ul style="list-style-type: none"> - EN.530.418 / 619 Aerospace Structures and Materials - EN.530.455/655 Additive Manufacturing - EN.530.605 Mechanics of Solids and Materials I | <ul style="list-style-type: none"> - EN.530.436/636 Bioinspired Science and Technology - EN.530.439 / 639 Comparative Biomechanics - EN.530.445 Introduction to Biomechanics - EN.530.448 Biosolid Mechanics - EN.530.473 Molecular Spectroscopy and Imaging - EN.530.474 / 674 Effective Design for Biomedical Instrumentation - EN.530.475 / 675 Locomotion I - Mechanics - EN.530.495 Microfabrication Laboratory - EN.530.610 Statistical Mechanics in Biological Systems - EN.530.633 Mechanics of the Biological Systems and Biophysical Methodologies |

(See next page...)

| MECHANICAL ENGINEERING - COURSES - ANTICIPATED OFFERINGS | | | | | |
|--|---|--|---|---|--|
| Semester | Math/ Computational | Robotics, Systems and Controls | Fluid Mechanics / Energy | Mechanics and Materials | Biomechanics |
| Spring 2020 (anticipated) | | <ul style="list-style-type: none"> - EN.530.421 Mechatronics - EN.530.676 Locomotion II: Dynamics - EN.530.678 Nonlinear Control and Planning in Robotics - EN.530.707 Robot System Programming | <ul style="list-style-type: none"> - EN.530.425 Mechanics of Flight - EN.530.426 Biofluid Mechanics - EN.530.427/627 Intermediate Fluid Mechanics - EN.530.432 Jet and Rocket Propulsion - EN.530.464/664 Energy Systems Analysis - EN.530.622 Fluid Dynamics II - EN.530.767 Computational Fluid Dynamics | <ul style="list-style-type: none"> - EN.530.381 Engineering Design Process - EN.530.417/618 Fabricatology - EN.530.606 Mechanics of Solids and Materials II - EN.530.730 Finite Element Methods | <ul style="list-style-type: none"> - EN.530.426 Biofluid Mechanics - EN.530.441 Intro to Biophotonics - EN.530.480 Image Processing and Data Visualization - EN.530.672 Biosensing and BioMEMS |
| Fall 2020 (anticipated) | <ul style="list-style-type: none"> - EN.530.414 Computer Aided Design - EN.530.430 Applied Finite Element Analysis - EN.530.761 Math Methods for Engineers | <ul style="list-style-type: none"> - EN.530.420 Robot Sensors and Actuators - EN.530.424 / 624 Dynamics of Robots and Spacecraft - EN.530.603 Applied Optimal Control - EN.530.645 Kinematics - EN.530.646 Robot Devices, Kinematics, Dynamics, and Control - EN.530.654 Advanced Systems Modeling II - 530.691 Haptic Interface Design for Human-Robot Interaction | <ul style="list-style-type: none"> - EN.530.443/643 Fundamentals, Design Principles, and Applications and Microfluidic Systems - EN.530.621 Fluid Dynamics I - EN.530.629 Simulation and Analysis of Ocean Wave Energy Systems - EN.530.726 Hydrodynamic Stability - EN.530.766 Numerical Methods - 530.777 Multiphase Flow | <ul style="list-style-type: none"> - EN.530.483/683 Computational Modeling in Aerodynamics and Heat Transfer - EN.530.605 Mechanics of Solids and Materials I - EN.530.656 Mechanisms of Deformation and Fracture - EN.530.790 AFEM Multi-Scale | <ul style="list-style-type: none"> - EN.530.639 Comparative Biomechanics - EN.530.446 Experimental Biomechanics - EN.580.451 Cell and Tissue Engineering Laboratory - EN.530.473 Molecular Spectroscopy and Imaging - EN.530.474/674 Effective and Economic Design for Biomedical Instrumentation - EN.530.495 Microfabrication Laboratory - EN.530.610 Statistical Mechanics in Biological Systems |

Table 1 – Anticipated Course Frequencies

3. Ph.D. Degree Program

3.1. Degree Requirements

The Ph.D. degree certifies that the holder has demonstrated the ability to conduct independent research and develop new knowledge. The requirements for a Ph.D. in Mechanical Engineering are as follows:

Fulfill the University-wide requirements by:

- a) Completing a minimum of two consecutive semesters as a full-time resident graduate student,
- b) Passing the Graduate Board Oral examination (GBO), and...
- c) Submitting and defending a dissertation approved by at least three referees appointed by the Mechanical Engineering Department faculty.

In addition to the University-wide requirements, students must:

- a) Pass the Departmental Qualifying Examination (DQE) before the start of the fifth semester as a doctoral candidate. This examination is preliminary to the GBO and its primary purpose is to evaluate the candidate's suitability for continuing study.
- b) Act as Teaching Assistant to at least two Mechanical Engineering courses.
- c) For each semester that a student maintains full-time status (that is, not change to non-resident status), each student must register for and pass:
 - i. EN.530.801 (Fall) and EN.530.802 (Spring) Graduate Research.
 - ii. EN.530.803 (Fall) and EN.530.804 (Spring) Mechanical Engineering Seminar by attending the required number of presentations.
- d) Earn an appropriate grade for all classes taken (see Section 3.1.1).

3.1.1. Academic Performance Requirements

A course is satisfactorily completed if a "P" grade or a grade from A+ to B- is obtained. Grades of C+ or lower are evidence of unsatisfactory academic performance.

A student earning one C+, C, or C- grade will receive notification, with a copy to his or her advisor, of academic performance concerns and an explanation that a second C+, C, or C- or the student's first D or F grade will typically result in termination from the program.

A student receiving a termination notification can appeal to the Graduate Program chair by the official date by which "Incomplete" grades must be resolved for that semester, as established by the Registrar's Office. The chair, who may consult with the student and the student's advisor, is required to formulate a final written decision within two weeks after that date.

3.1.2. “Pass” Grade Not Accepted

Pass grades are not accepted for courses counting toward the Ph.D. degree.

Deviations to this policy must be explicitly authorized in writing by the Mechanical Engineering student advisor before the official last day for dropping courses established by the Registrar's Office.

3.2. Ph.D. Degree Timeline

Students can generally expect the degree program experience to unfold in these timeframes:

Year 1

- Discuss program plan with advisor to determine academic courses, research topics, and research plan
- Take required introductory courses: Academic Ethics, Title IX, and Opioid Dangers
- Take academic courses
- Take required Graduate Research and MechE Graduate Seminar courses
- Begin preliminary research work as determined by your advisor
- Work with advisor to create annual evaluation
- Prepare for Departmental Qualifier Exam (students matriculating Fall 2018 and later)

Year 2

- Take academic courses
- Take required in-person course: 360.625 Responsible Conduct of Research
- Take required Graduate Research and MechE Graduate Seminar courses
- Act as a Teaching Assistant for one of two required courses
- Prepare for Departmental Qualifier Exam (students matriculating Spring 2018 and earlier)
- Take Departmental Qualifier Exam
 - Mid-September (students matriculating Fall 2018 and later)
 - Mid-January (students matriculating Spring 2018 and earlier)
- Continue research work, start discussion on dissertation topic
- Work with advisor to create annual evaluation.

Year 3

- Take academic courses, as needed
- Take required Graduate Research and MechE Graduate Seminar courses
- Continue research work, continue discussion and decide on dissertation topic
- Act as a Teaching Assistant for the second of two required courses
- Prepare for and take (preliminary) Graduate Board Oral exam
- Work with advisor to create annual evaluation

Year 4

- Take required Graduate Research and MechE Graduate Seminar courses
- Work with advisor to create annual evaluation
- Continue research work and hone dissertation topic. Perhaps begin writing it.

Year 5

- Take required Graduate Research and MechE Graduate Seminar courses
- Work with advisor to create annual evaluation
- Write dissertation
- Prepare for and complete the Dissertation Defense. The University also sometimes calls this the "Final Graduate Board Oral exam."
- Prepare completed dissertation for submission to the JHU Library for publication
- Graduate!

Individual experiences may vary.

3.3. Ph.D. Departmental Qualifying Examination

The completion of a doctoral degree at a major research university requires a high level of academic sophistication in the candidate's field, as well as the ability to apply this advanced background in the creation of new knowledge. The Departmental Qualifying Examination (DQE) is an approximately one-hour oral examination in which students are tested in their principal research areas: fluid mechanics, mechanics and materials, biomechanics, or robotics, and also in applied mathematics.

The examination is given after three semesters, in late-January or by special arrangement with the Director of Graduate Studies, who in 2018-19 is Professor Rajat Mittal. Note that for students matriculating in Fall 2018 and later, the DQE will be given after two semesters in September 2019 and at the same time in subsequent years.

DQE Result Possibilities

The possible outcomes of the DQE are...

- **Pass** - no additional action is necessary
- **Not Pass** - with one of the following three possibilities:
 - Conditions - which are to be met by a specified date
 - Partial Retake - required by a specified date
 - Full Retake - required by a specified date
- **Failure**

Conditions must be met or the retake must be passed to avoid a Failure, which is grounds for automatic dismissal from the Ph.D. program. Only one retake is allowed.

3.3.1. Fluid Mechanics and Heat Transfer

All students in Fluid Mechanics and Heat Transfer are tested in Math and Graduate Level Fluid Mechanics. The third subject area for most students in this track is Convection, but it may be replaced by another subject area per the recommendation of your Advisor.

MATHEMATICS

The Math portion of the exam has two options. Students should check with their advisors as to which option is suitable for them.

Option 1 – Based on EN 530.761 Mathematical Methods in Engineering only. This includes the following topics:

Linear Algebra

- Systems of linear equations and their solution
- Linear Independence, Rank of Matrix
- Vector (Linear) Spaces
- Matrix Eigenvalue Problems (Real and Complex Matrices)
- Special Matrices
- Eigenbases, Diagonalization and Quadratic Forms

Ordinary Differential Equations (ODEs)

- First Order Exact ODEs
- Linear ODEs (Homogeneous and Nonhomogeneous)
- Solving Systems of ODEs

Kernel Transforms

- Laplace Transforms (including solving ODEs, and integral equations)
- Fourier Series and Transforms (including half range expansions)
- Generalized Fourier Series (e.g. Sturm-Liouville problems)

PDEs

- Separation of Variables
- d'Alembert's Solution of the Wave Equation
- Method of Characteristics
- Solution by Transform (Laplace and Fourier transforms)

Option 2 – Based on EN 530.761 (as above) as well as EN 530.766 Numerical Methods. The topics from Numerical Methods that are covered in the exam are:

- Finite-Difference (FD) Operators
- Truncation Error, Consistency, Convergence of FD Approximations
- Numerical Stability Analysis (Von-Neumann & Matrix)
- Discrete Conservation
- Boundary Conditions

- FD Methods for Parabolic, Elliptic and Hyperbolic PDEs
- Explicit and Implicit Time Advancement Schemes
- Direct and Iterative Solution Methods for Sparse Systems
- Numerical Dissipation, Dispersion and Modified Wavenumber

FLUIDS

The topics for this subject area of the exam are covered in EN 530.621 Fluid Dynamics I and EN.530.622 Fluid Dynamics II. The specific topics for the DQE are:

EN 530.621

- The Continuum Model of Fluids
- Lagrangian and Eulerian Descriptions
- Mass Conservation
- The Euler Equations
- Potential Flow
- Local Kinematics
- Navier-Stokes Equations
- Some Incompressible Flow
- Integral Momentum Balance
- Kinetic Energy Balance
- Scaling and Dimensional Analysis
- Vorticity and Vorticity Transport Equation
- Boundary Layer Theory
- Shear Flows
- Creeping Flows
- Quasi-Parallel Flows and Lubrication Approximation

EN 530.622

- Potential Flow (Conformal mapping, unsteady potential flow, bubbles, virtual mass)
- Classical Aerodynamics (Thin airfoil theory and finite wings)
- Interfacial Phenomena, Free Surface Waves
- Instabilities
- Compressible Flow
- Fundamentals of Acoustics

CONVECTION

The topics for this subject area are covered in EN 530.632 Convection. The specific topics for the DQE are:

- Governing Equations
- Conservation Laws in Integral and Differential Forms, and Boundary Conditions
- Dimensional Analysis and Scaling Laws
- Scalar Transport in Boundary Layers and Free Shear Flows

- Laminar Duct Flow and Heat Transfer
- Basics of Mass Diffusion, Natural Convection & Turbulent Transport

3.3.2. Mechanics and Materials

In mathematics, students are required to have taken, or have the knowledge equivalent to EN.530.761 Math Methods for Engineers.

Students in this area typically follow either a mechanics-intensive track or a materials-intensive track.

Mechanics-intensive Track: Students are presumed to be prepared on completion of courses EN.530.605 Mechanics of Solids and Materials, and appropriate undergraduate courses in statics, dynamics, mechanics of materials, and vibrations. Depending on their research focus, students will also be examined on EN.530.730 Finite Element Analysis, EN.530.612 Computational Solid Mechanics, or EN.510.604 Mechanical Properties of Materials.

Materials-intensive Track: Students are presumed to be prepared on completion of courses EN.530.605 Mechanics of Solids and Materials, EN.510.601 Structure of Materials, EN.510.602 Thermodynamics and Kinetics of Materials, EN.510.604 Mechanical Properties of Materials, and appropriate undergraduate courses in statics, materials selection, and mechanics of materials.

3.3.3. Robotics

Students are presumed to be prepared on completion of EN.530.646 Robotics, Kinematics, Dynamics, and Control or EN.530.616 (equivalent to EN.580.616/EN.520.601) Introduction to Linear Dynamical Systems, and at least three of the following courses as approved by the student's advisor:

Graduate Courses (at least 2 from this list)

- EN.530.603 Applied Optimal Control
- EN.530.616 (equivalent to EN.580.616/EN.520.601) Introduction to Linear Dynamical Systems
- EN.530.624 Dynamics of Robots and Spacecraft
- EN.530.645 Kinematics
- EN.530.646 Robotics, Kinematics, Dynamics, and Control
- EN.530.649 System Identification
- EN.530.653 Advanced Systems Modeling
- EN.530.675 Locomotion I: Mechanics
- EN.530.676 Locomotion II: Dynamics
- EN.530.678 Nonlinear Control and Planning in Robotics
- EN.530.761 Math Methods for Engineers

Upper-level Undergraduate Courses (at most 1)

- EN.530.420 Robot Sensors/ Actuators
- EN.530.421 Mechatronics
- EN.530.470 Space Vehicle Dynamics and Control

- EN.530.485 Physics and Feedback in Living Systems

Graduate Courses Outside Mechanical Engineering (at most 1)

- EN.520.621 Introduction to Nonlinear Systems
- EN.600.636 (or EN.601.663 beginning Fall 2017)
Algorithms for Sensor-Based Robotics
- EN.600.661 (or EN.601.661 beginning Fall 2017) Computer Vision

Students should have proficiency in calculus, linear algebra, differential equations, linear systems, physics, statics, dynamical systems, vibrations, and strength of materials as appropriate for the conduct of their research.

In mathematics, students are required to use ordinary differential equations, linear algebra, and multidimensional calculus, as well as to perform frequency domain analysis. It is assumed that incoming students have knowledge equivalent to at least that of undergraduate third-year courses and will have taken two graduate-level mathematically intensive courses as agreed by the student's advisor.

Each student should select a course of study consistent with their research and approved by their advisor.

3.3.4. Biomechanics

Students in the biomechanics area should demonstrate good knowledge in the areas of engineering mathematics, numerical/computational methods, mechanics and biological sciences.

To fulfill these requirements, the student must successfully complete at least six courses (at least two from the mathematics/numerical methods area and at least four from mechanics/biosciences area), or show knowledge equivalent to these courses:

1) *Engineering Mathematics*

- EN.530.761 Math Methods for Engineers
- EN.553.291 Linear Algebra and Differential Equations
- EN.553.391 Dynamical Systems
- EN.553.426 Introduction to Stochastic Processes

2) *Numerical and Computational Methods*

- EN.530.612 Computational Solid Mechanics
- EN.530.766 Numerical Methods

3) *Mechanics*

- EN.530.605 Mechanics of Solids and Structures
- EN.530.621/EN.530.622 Fluid Mechanics I and II

EN.530.633 Mechanics of the Biological Systems and Biophysical Methodologies
EN.530.671 Statistical Mechanics in Biological Systems
EN.530.672 BioMEMS and Biosensing

4) *Biological Science*

AS.020.306 Cell Biology
AS.020.380 Chromatin, Chromosomes, and the Cell Nucleus
EN.530.410 Biomechanics of the Cell and Organisms
EN.530.441 Introduction to Biophotonics
EN.530.473 Molecular Spectroscopy and Imaging
EN.580.687/EN.580.688 Foundations of Computational Biology and Bioinformatics

This is not an exhaustive list. Other courses offered at the Homewood Campus, the Medical School, and the School of Public Health may be approved by your advisor.

NOTE: Some of these courses have prerequisites or require the permission of the instructor to take the course. Please consult the University's *Undergraduate and Graduate Programs* course catalog for further information.

3.4. Ph.D. Graduate Board Oral Examination

The Graduate Board Oral (GBO) examination is the University-wide “quality-control” check on our program.

The GBO is sometimes known as the “preliminary” Graduate Board Oral Examination, where the future dissertation defense is known as the “final” Graduate Board Oral Examination.

For all departments, the GBO exam has the following basic structure:

The two-hour examination is conducted by five faculty members: two Mechanical Engineering professors and three from outside the Department, who are selected by the Department Chair in consultation with the student's advisor. One departmental alternate and one outside alternate are also required. The examination is chaired by the most senior of these outside members, usually a Professor. The examination chair has the right to set the scope of the exam.

The Mechanical Engineering Department frequently adheres to the following:

- a) Students normally take the GBO examination about a year after completion of their Departmental Qualifying Examination, usually during or after their sixth semester.
- b) Although there are no formal course requirements, students are presumed to be prepared for the GBO by studies equal to six graduate level (xxx.EN.600-xxx.799) courses in their field of specialization and six advanced (xxx.400-xxx.799) courses in related fields.

- c) The members of the GBO examining committee are nominated by the student's advisor and approved by the Department Chair.
- d) While it is usual for students to provide examiners with a brief synopsis of their research project two weeks before the examination, they are not usually asked to make a presentation on their research. The examination most frequently begins with questions from members of the department on any subject of their choosing.

Students take this examination very seriously and use it as an opportunity to synthesize the knowledge gained in the different courses they have taken. Each examination is different, but students are required to display significant depth in the areas related to their research and to demonstrate the ability to think and apply their advanced knowledge. Fundamental concepts, from sophomore-level mechanics to rigorous expressions of physical phenomena are all within the scope of the exam. General scaling laws, dimensional analysis, and basic physical principles (for example, conservation laws) are tools on which students may be asked to draw.

Candidates may be required to give formal definitions for concepts and terms germane to their research and to give numerical values of physical parameters with which they work. The usefulness and potential application of a student's research or field of study may also be examined.

On rare occasion, an examiner from outside Johns Hopkins University may be asked to serve on an examination committee. Pre-approval will be required. Visit the Graduate Board website on GBOs at <https://homewoodgrad.jhu.edu/academics/graduate-board/graduate-board-oral-exams/>.

Students preparing to take the GBO must contact Sr. Academic Program Coordinator Kevin Adams to arrange the exam at least eight weeks prior to the intended exam date. The advisor and Department Head will then select examiners and alternates. Eight weeks' notice will allow time to confirm availability of the proposed examiners and notify the Graduate Board by their notification deadlines.

3.5. Ph.D. Dissertation Defense

The final and principal requirement for the doctorate is a piece of original research worthy of publication. Candidates must write a dissertation describing their work in detail and pass a final oral examination, which is essentially a defense of the dissertation.

Students should schedule their defense with Sr. Academic Program Coordinator Kevin Adams and make arrangements necessary for the successful completion of their program.

Dissertation defense preparation information is available in the "Preparing to Graduate" page at <https://me.jhu.edu/preparing-for-graduation/>.

3.5.1. International Students must visit the Office of International Services

All international students must visit the International Office at least two months in advance of the defense date to ensure that their visa status and application for their EAD card and Optional Practical Training is in place.

3.5.2. Dissertation Readers

The University's Graduate Board requires two readers: your advisor and another JHU professor. The Mechanical Engineering department requires an additional reader for a total of three.

At least one of the three readers must be a full-time tenure-track Mechanical Engineering professor, whether that is your advisor or another professor. With the Department Head's and the University Graduate Board' prior approval, the third reader can come from outside of Johns Hopkins University. Information is available at <http://homewoodgrad.jhu.edu/academics/graduate-board/graduate-board-oral-exams/>.

3.5.3. Submission and Printing of Dissertations

Ph.D. dissertations will be submitted only by electronic media. For information, contact David Reynolds, the Library ETC Coordinator at 410-516-7720 or dissertations@jhu.edu.

To celebrate degree accomplishments, the department will order bound and printed copies of dissertations for the student, his or her advisor and for the department library. The Academic Administrative staff will arrange for printing and shipping.

3.6. Academic Deadlines

Students preparing to complete a degree program in a given semester should see Sr. Academic Program Coordinator Kevin Adams to ensure that all necessary forms and requirements have been completed and submitted *prior* to the academic deadlines for the semester. The deadlines to submit all certification material are usually:

- Fall: late-October
- Winter: mid- to late-January
- Spring: late-March (PhD), early-May (MSE)
- Summer: late-July

Students who have not completed their requirements by the first day of classes must register for the current semester. Those who complete their requirements prior to the October deadline will receive a full tuition refund for the fall semester, including any non-resident status fees. Tuition paid from departmental funds or research grants will also be refunded.

Those who have completed their requirements in the summer or fall will receive an interim certificate from the registrar's office indicating that all requirements have been met, and notation will be made on their transcript. Additional information is available at

<http://engineering.jhu.edu/graduate-studies/academic-policies-procedures-graduate/>.

4. Miscellaneous Academic Information

4.1. General Policy Information

The Whiting School of Engineering and Johns Hopkins University set and administer a variety of policies that affect students. The following websites provide information on these policies; but are not all-inclusive. Your academic staff can help with policy questions and interpretations.

- Graduate and Postdoctoral Affairs at Homewood - <https://homewoodgrad.jhu.edu/>
- Graduate and Postdoctoral Affairs at Homewood – Graduate Residency and Registration - <http://homewoodgrad.jhu.edu/academics/graduate-board/new-grad-board-residency-page/>
- Whiting School of Engineering’s Graduate Academic Policies - <https://engineering.jhu.edu/graduate-studies/academic-policies-procedures-graduate/>
- Johns Hopkins University E-Catalog section for Graduate Students - <http://e-catalog.jhu.edu/grad-students/>
- Johns Hopkins University Policy on Probation, Funding Withdrawal, and Dismissal: <https://grad.jhu.edu/downloads/Prob%20Fund%20Withdraw%20and%20Dismiss%20Policy%202011.pdf>

4.2. Graduate Student Annual Evaluations

The Whiting School of Engineering requires that once per academic year all full-time Homewood graduate programs carry out a written evaluation of all doctoral and master’s students conducting thesis research. The evaluation process includes the opportunity for the advisor to initiate the student evaluation on his or her research and academic progress.

Mechanical Engineering Graduate Program Committee, with the support of the faculty and the Mechanical Engineering Graduate Student Association (MEGA) created a formal annual evaluation form, thinking it is good practice and a worthwhile investment. The evaluation form is in the back of this manual and at <http://me.jhu.edu/graduate-studies/academic-advising-graduate/>.

In Spring, advisors will initiate the evaluation process with their doctoral students and master’s students conducting thesis research, who will be expected to complete the evaluation form and meet with their advisors to discuss progress and goals for the next year. The student and advisor will both sign the evaluation, after which it will be delivered to the Academic Administrative staff by April 30.

4.3. Departmental Seminars

Part of the graduate experience is to be informed and learn to evaluate the research done by others, both here at Johns Hopkins and at leading institutions worldwide.

SEMINAR REGISTRATION REQUIRED EVERY SEMESTER for Ph.D. STUDENTS!

Ph.D. students are **required** to register for and attend the EN.530.803 (Fall) and EN.530.804 (Spring) Mechanical Engineering Departmental Seminars, which occur every Thursday at 3:00p.m.

Registered students must attend 12 total seminars, with at least 8 of them being Mechanical Engineering Departmental Seminars.

BEGINNING IN FALL 2019:

SEMINAR REGISTRATION IS REQUIRED only for 1st year, 2nd year, and 3rd year Ph.D. STUDENTS.

Registered students must attend 12 total seminars, with at least 8 of them being Mechanical Engineering Departmental Seminars.

If a student has a scheduling conflict that interferes with his or her ability to attend a minimum of 8 official Mechanical Engineering graduate seminars, the student's advisor can approve attendance at alternate seminars, as long as the student attends 12 seminars in that semester.

There are a number of special department seminars and other department seminars. Materials Science and Engineering, Earth and Planetary Sciences, and Biomedical Engineering; and Centers, such as CEA FM, CAMCS, HEMI, and CISST offer seminars. These seminars are beneficial, as it is common for GBO examiners to include questions addressed in such seminars.

4.4. Informal Student Seminars - Registration May be Required

In preparation for their thesis defense, students are required to present their work at informal seminars within the Department. Your advisor will explain the scope and expectations of your role as spectator and presenter in these presentations.

4.4.1. Fluids Seminars

The Fluids group holds student presentations on Fridays. All Fluids graduate students must register for this seminar using course numbers EN.530.807 in the Fall semester and EN.530.808 in the Spring semester.

4.4.2. Mechanics and Materials Seminars

The Mechanics and Solid Materials Student Seminar Series group meets Fridays at 12:00 noon. All Mechanics and Materials graduate students must register for this seminar using course numbers EN.530.809 in the Fall semester and EN.530.810 in the Spring semester.

4.4.3. Robotics Seminars

The Robotics group meets regularly at the discretion of the group. All Robotics graduate students must register for this seminar using course number EN.500.745 each semester.

As information is received, schedules will be sent to you in advance. Students are expected to attend these seminars, which provide an informal opportunity to learn about the ongoing research work of their colleagues.

4.5. Ethics

Unethical behavior can lead to a student's expulsion from the program. Graduate students are therefore expected to be aware of what actions constitute unethical behavior. For example, students must submit work that represents their own efforts. Whenever ideas or results are drawn from other sources, those sources must be cited in the submitted or presented work. **Unless otherwise explicitly permitted by the instructor for that course, students must not collaborate or discuss any assignments prior to submission of the work.** Students must be aware of and adhere to the ethical issues associated with the use of, and in particular the duplication of computer software and must abide by the rules of use set by the developer.

5. Masters Degree Program

The M.S.E. degree may be a final degree or it may be earned *en route* to the Ph.D. Either way, the requirements remain the same, and the advisor's approval is required. Students who complete the M.S.E. degree are not automatically admitted to the Ph.D. program. The requirements for an M.S.E. in Mechanical Engineering as described in Sections "A" and "B," must be met:

SECTION A: Satisfactory completion of eight one-semester advanced courses approved by your advisor, as follows:

- a) **At least four courses must be at the graduate level** (xxx.600 or higher, up to two Engineering for Professionals xx5.4xx or higher).
- b) **No more than four courses may be at the advanced undergraduate level** (full-time programs xxx.400 – xxx.499, Engineering for Professionals xx5.3xx).
- c) **At least two courses should be in applied mathematics, numerical analysis, or computational methods.** This requirement can be waived in writing by your advisor, if sufficient prior preparation in these areas can be demonstrated.
- d) **Ineligible Courses:** EN.530.800 Independent Study, EN.530.600 MSE Graduate Research, and other departments' Graduate Research, Independent Study, and Special Studies are not eligible courses to complete Section A's requirement.
- e) **At least half of all courses** counted toward the master's degree – at least 5 of 10, or at least 4 of 8 if writing an essay - **must be Mechanical Engineering:** either - all EN.530.xxx Mechanical Engineering - or - up to two courses from EN.535.xxx Engineering for Professionals' Mechanical Engineering and the rest EN.530.xxx Mechanical Engineering.
- f) **No more than two courses** may be chosen from the **Engineering for Professionals** program.

SECTION B: In addition to the eight courses above, students must also complete either two more courses or an essay:

COURSE OPTION

- a) **Two additional one-semester graduate-level courses** (xx.xxx.6xx or higher, Engineering for Professionals EN.xx5.4xx or higher).
- b) **PhD students earning the MSE degree cannot count EN.530.600 MSE Graduate Research.**
- c) **Ineligible Courses:** EN.530.800 Independent Study, EN.530.602 Master's Thesis Research and Writing, and other departments' Graduate Research, Independent Study, and Special Studies are not eligible courses to complete Section B's requirement.

ESSAY OPTION

- An M.S.E. essay (the official title of master's theses at Johns Hopkins) acceptable to your advisor and one other eligible reader.

If an essay is going to be written, students must register for the course EN.530.602 Master's Thesis Research and Writing every semester that he or she works on master's thesis research and writing. This is separate from the Ph.D. dissertation.

This "Pass/Fail" course **does not** count as one of the eight courses required in addition to the thesis. The course is generally the equivalent of six credits and can be taken in one semester or split into three-credit courses taken over two semesters. If a student needs subsequent semesters to continue thesis work, he or she can simply register for the same course each semester.

For the essay, the Responsible Conduct of Research and Research Laboratory Safety courses described elsewhere in this manual must be completed.

COURSE LEVELS DEFINED

Subject to the degree requirement restrictions, one-semester advanced courses include:

Graduate

- Full-time program courses numbered xxx.6xx and higher (e.g. EN.530.621)
- Engineering for Professionals program courses numbered xx5.4xx and higher (e.g. 535.415).
- For courses taken before Fall 2017, some graduate courses in Computer Science numbers EN.600.4xx are considered graduate-level courses. Please contact the Computer Science department to confirm their graduate course offerings or visit <http://cs.jhu.edu>.

Undergraduate

- Full-time program courses numbered xxx.300-xxx.499
- Engineering for Professionals program courses numbered xx5.300-xx5.399.

5.1. Eligible MSE Essay Readers

While the University requires one reader for master's essays, departments are allowed to enforce stricter standards by requiring more than one reader. The Mechanical Engineering department requires two readers, the first one being the person (ordinarily a member of the Department's faculty) who supervised the student's project. The second reader is any duly appointed member of a department holding the rank of assistant professor or higher (excluding lecturers). The advisor will consult with the Department Chair if there are questions of eligibility for a proposed second reader, or if the proposed second reader is from outside Johns Hopkins University.

5.2. Required Mechanical Engineering Courses

At least half of the courses taken to complete the M.S.E. degree (not including those listed in section 2.3), including at least two .600- or .700-level courses, must be offered through the

Mechanical Engineering department or the Engineering for Professionals Mechanical Engineering program, whose course numbers begin with EN.530.xxx and EN.535.xxx respectively.

5.3. Only One C-type Grade Can Count Toward the MSE

No more than one C grade (C+, C, or C-) can be counted toward the master's degree course requirements.

5.4. "Pass" Grade Not Accepted

Pass grades are not accepted for courses counting toward the master's degree.

Deviations to this policy must be explicitly authorized in writing by the Mechanical Engineering student advisor before the official last day for dropping courses established by the Registrar's Office.

5.5. Double-Counting Courses

The Mechanical Engineering department double-counts courses using Whiting School of Engineering policy at <http://engineering.jhu.edu/graduate-studies/academic-policies-procedures-graduate/>.

5.6. Degree Completion Forms

Students who have completed the requirements for the M.S.E. degree should complete both the "Application for Graduation" and the "Certificate of Departmental Approval" forms.

Visit the "Preparing to Graduate" section of the Graduate Academic Advising page at <http://me.jhu.edu/graduate-studies/academic-advising-graduate/> for more information.

5.7. Degree Deadlines

The master's degree completion deadlines are available at <http://engineering.jhu.edu/graduate-studies/academic-policies-procedures-graduate/>. Be sure to meet the deadlines when completing your degree and related applications to graduate.

5.8. Submission and Printing of Essays

Masters essays will be submitted only by electronic media. For information, contact David Reynolds, the Library ETC Coordinator at 410-516-7720 or dissertations@jhu.edu.

To celebrate degree accomplishments, the department will order bound and printed copies of essays for the student, his or her advisor and for the department library. The Academic Administrative staff will arrange for printing and shipping.

6. Part-Time vs. Non-Residency Status

6.1. Part-Time Status

Mechanical Engineering Ph.D. students may switch to part-time status after the successful completion of the Graduate Board Oral examination and the Teaching Assistant

requirement, with approval of both the research advisor and the Graduate Program Chair, as well as the International Office for international students.

PART-TIME TUITION

Students are charged tuition per-credit, which in the 2018-19 academic year is \$1,791 per-credit. The student's advisor or the department may choose to cover this charge, but that is not guaranteed.

COURSE REGISTRATION

Part-time students will take three credits of EN.530.801/802 Graduate Research each semester and some may continue to take the one-credit EN.530.803/804 Mechanical Engineering Graduate Seminar.

Once a student is on part-time status, the research advisor may excuse the student from the EN.530.803/804 Mechanical Engineering Graduate Seminar requirement. Part-time students or their advisors will pay the part-time per-credit tuition.

PART-TIME RESTRICTIONS

- Part-time students are ineligible to work as a student worker, including as a Teaching Assistant, and will not be eligible for graduate student salary.
 - EXCEPTION: International students in their final semester who are part-time are eligible to work as a student worker. (International students are full-time students every semester except for the last semester if they need less than a full-time course load to complete the degree. They can then become part-time.)
- Part-time students enrolled in the University health insurance must pay the full premium, which in 2018-19 is \$1,038 per semester.

HOW TO OBTAIN PART-TIME STATUS

- Contact Academic Program Manager Mike Bernard to confirm eligibility to switch.
- Obtain approval from both the research advisor and the Graduate Program Chair
- International students must first obtain approval from the Office of International Services.

RESOURCES

- Whiting School Graduate Credit Hours:
<http://homewoodgrad.jhu.edu/academics/wse-graduate-credit-hours/>

6.2. Non-Residency Status

Whiting School graduate students are eligible for non-residency status when all degree requirements except the writing of the dissertation are complete. The dissertation research must be finished before the non-resident status can be obtained.

Whiting School graduate students are typically granted only one semester of non-residency with the expectation that the dissertation will be written and prepared for defense in that semester. The dissertation defense can occur during that semester or shortly thereafter. The Whiting School will consider exception requests for an additional semester of non-residency.

NON-RESIDENT TUITION

Non-resident students pay only 10% of the full-time tuition but will still have all the privileges of full-time students such as access to campus services and faculty advising.

NON-RESIDENT RESTRICTIONS

Non-resident students cannot enroll in courses and would lose the Whiting School's financial support for health insurance. The department could choose to cover health insurance charges, but that is not guaranteed.

Non-resident students are automatically enrolled in health insurance, but can waive the insurance, if eligible, for waiver by proof of enrollment in another health insurance plan with similar coverage.

To maintain non-resident status, students will have to register for non-resident status each semester and provide a letter explaining their progress toward the degree's completion.

HOW TO OBTAIN NON-RESIDENT STATUS

- Contact Academic Program Manager Mike Bernard to confirm eligibility for non-resident status.
- Complete the Non-Resident Status for Whiting School form, which Mike will send to the Whiting School Academic Affairs office for review and approval.
- If the Non-Resident request is denied, a student may be eligible for part-time status.

RESOURCES

- Graduate Residency and Registration Policies:
<http://homewoodgrad.jhu.edu/academics/graduate-board/new-grad-board-residency-page/>
- Graduate Board Forms, which include the Non-Resident Application and the Non-Resident Annual Report: <http://homewoodgrad.jhu.edu/academics/graduate-board/policies-and-forms/>
- Whiting School of Engineering Policy on Health Insurance page:
<http://engineering.jhu.edu/graduate-studies/academic-policies-procedures-graduate/>
(then select the Health Insurance tab)

7. Financial Aid

There is a variety of sources of financial aid available to Mechanical Engineering Ph.D. students.

7.1. Tuition Fellowships

At the Dean's discretion, tuition fellowships may be awarded to full-time Ph.D. students who are supported by the Department through either faculty research projects or fellowships. Ph.D. candidates may be eligible for 100% tuition fellowships in their first year as a Ph.D. student, 80% tuition fellowships in years 2-6, and 60% in years 7 and later.

7.2. Teaching Assistant

To assist in the teaching function of the Department, Teaching Assistant opportunities are provided to students who grade papers, conduct laboratories and hold office hours. TAs are

remunerated for their efforts according to a formula that quantifies the number of hours required for a particular course, multiplied by an hourly rate, to be determined by the beginning of each semester.

7.3. Research Assistantships

Students working directly on funded research projects are paid by the faculty member's projects conducting that research. In the 2018-19 academic year Research Assistants are typically paid a salary of US \$1,300.50 semi-monthly at an annual full-time rate of \$31,212. This rate may vary depending on the grant or funding agency.

Continuation of a Research Assistantship is determined by a student's performance and the availability of research funding. This support allows students to progress towards completion of their degrees, but also requires the completion of specific research accomplishments.

There are a few basic rules regarding the holding of a Research Assistantship.

- Regular meetings between the student and faculty advisor are the norm, but vary from advisor to advisor.
- Both the Intersession in January and the summer, June through August are particularly important periods for research progress. Students are expected to make significant effort during these periods.
- Students should discuss any planned absences with their advisors.

7.4. Departmental Fellowships

Mechanical Engineering offers the Departmental Fellowship, provided to an outstanding first-year student to allow the opportunity to find an appropriate advisor and embark on research. The current fellowship award includes full tuition remission, health insurance, matriculation fee, a one-time \$2,000 admission bonus, and a stipend of \$1,300.50 semi-monthly at an annual full-time rate of \$31,212.

The one-time \$2,000 admission bonus will be paid in the first month of the Department Fellow's matriculation.

The Whiting School of Engineering maintains a website on additional external fellowships at <http://eng.jhu.edu/wse/page/external-fellowships> where a student can apply for additional financial aid.

7.5. Other Financial Aid

The Office of Student Financial Services has other financial aid sources available, even to those who current have full financial support, including research assistantships and some fellowships. Any enrolled or accepted graduate student who is a U.S. citizen, U.S. permanent resident, or eligible non-citizen may apply for federal and state financial aid. Sources of aid, eligibility requirements, applications, and other information are available at <http://engineering.jhu.edu/graduate-studies/graduate-financial-aid/>.

7.6. Student Employment

The Student Employment Services office offers opportunities for employment for many positions on the campus. They will help you determine your work eligibility. Should you wish to obtain additional employment, please speak with your advisor so you will be able to fulfill the obligations of your education and research. The Student Employment Services office is located in the basement of Garland Hall, and their website is located at <http://www.jhu.edu/stujob/>.

8. Administration

8.1. Department Offices

The Department Administrative Office is located in Latrobe 223. The office provides services and assistance to faculty, staff, graduate students, and undergraduate students. All purchasing, payroll, budget and accounting transactions, shipping, receiving, and other administrative services are handled through this office.

8.2. Supplies and Services

Most of the services you will need will be provided through the Department Office.

COPIER and SCANNER - Graduate students are welcome to use the department copier in Latrobe 217 for tasks related to the conduct of research or the academic pursuits of the faculty. Informal training of use of the copier and its features is available.

FAX MACHINE - The number for the fax machine in Latrobe 217 is 410-516-4316. Since many people rely on this machine, incoming faxes must be labeled or have a fax cover sheet. Students may use the outgoing fax for communication related to the conduct of research or the academic pursuits of the faculty.

This is how to dial a fax number for the following types of numbers:

- Local Number in the Baltimore area, with area codes 410, 443, or 667:
Dial 9, the area code and telephone number; e.g. 9-410-555-3818.
- Long Distance numbers in Maryland (area codes 240, 301, some numbers in area codes 410, 443, and 667), the United States, Canada, and Caribbean locations using a three-digit Area Code: *Dial 9, 1, the area code and telephone number; e.g. 9-1-717-555-8203.*
- Elsewhere: *Dial 9, 011, the country code and telephone number; e.g. 9-011-39-555241156.*

STUDENT MAILBOXES - Graduate students may opt to have a mailbox on the 3rd floor of Latrobe Hall. Mail is ordinarily distributed daily. It is important to check your mailboxes regularly. The administrative staff will help with questions regarding pickup, delivery, postage, and Express Mail services.

SHIPPING AND RECEIVING - FedEx regularly delivers to the Department Office. FedEx picks up on demand and delivers as required. Other carriers may be used in special circumstances.

An e-mail will be sent to you notifying you of any delivery that has arrived for you, which is stored in the receiving area in Latrobe 217. When picking up a package, sign and date the package log before taking your package. Outgoing shipments must be received in the Department Office before 2:00 p.m. As a convenience, personal items may be shipped and received through the Department Office, but the Department does not pay shipping fees for these. Please contact the administrative staff in Latrobe 223 with your questions.

OFFICE EQUIPMENT - Paper cutters, staplers, telephone books, and other items are available for general use. **These items must be kept in Latrobe 217.**

KITCHEN, including COFFEE and TEA SERVICE - A refrigerator and microwave oven are available on the 3rd floor of Latrobe Hall to store and heat your meals. Please help keep the kitchen area clean. Coffee, tea, and hot chocolate are available at 50 cents per cup on the honor system. You may also pay \$10.00 per month for a one-cup-a-day supply.

8.3. Additional Services and Resources

The University offers a variety of services. These are among some that cater to graduate students:

- **Registrar** - <https://studentaffairs.jhu.edu/registrar/>
- **Parking and Transportation Services** - <http://ts.jhu.edu/>
- **Center for Social Concern** – service opportunities and advocate for social change - <http://csc.jhu.edu>
- **Campus Ministries** – for all faiths and those seeking spiritual connection – <http://web1.johnshopkins.edu/chaplain>
- **Counseling Center** – whenever we need a little extra help from our friends - <http://web.jhu.edu/counselingcenter>
- **JHU Gazette** - the University's official news publication - <http://hub.jhu.edu/gazette>
- **Johns Hopkins Magazine** - <http://hub.jhu.edu/magazine>

9. Purchasing and Travel Reimbursements

9.1. Account Numbers are Necessary for Purchases

Account or “budget” numbers for research project expenditures are extremely important. Your advisor has a series of account numbers, and will supply you with the number to use for purchases. Orders cannot be processed without this number, which is either a 9-digit “Internal Order” number for sponsored projects or a 10-digit “Cost Center” for non-sponsored accounts.

9.2. Ordering Equipment, Supplies, and Services

Orders for the purchase and acquisition of supplies, equipment and materials must be arranged with the Accounting Specialist. Orders must be received by 3:00 p.m. to allow the possibility of same-day ordering. Orders received after 3:00 p.m., in most cases, will be ordered the next business day.

Send your orders with the following information:

- The vendor's name and contact information – include when possible the postal address, telephone number, e-mail address, and the vendor's website address.
- Description of the item
- Part number
- Price or valid vendor quote
- The complete Internal Order or Cost Center number to be charged.
- Approval from your advisor or principal investigator, as necessary.
- Tag number for any "equipment" (see sections 6.2.1 and 6.2.2).

Do not send a "shopping cart" link or other link to the product, because the information on the link may change between the time you send the request and the time of the order.

9.2.1. Equipment Items

Equipment is defined as an article of non-expendable, tangible property having a useful life of more than one year and an acquisition cost of \$5,000 or more per unit. To order such equipment, three quotes from three vendors are necessary, or a sole source justification letter explaining why a specific vendor must supply the item must be provided.

9.2.2. Tag Numbers

The JHU Office of Cost Analysis is responsible for identifying, recording, and tagging equipment. Whenever possible, equipment items costing \$5,000 or more are tagged with a University property tag, using a tag that contains a bar-coded property identification number. Property tags are affixed to equipment by Cost Analysis staff in a standard, visible location on the equipment.

Never remove the Tag Number from your equipment! The bar-coded Tag Number labels are self-destructive. When removed, bar-coded labels leave a checkered design imprinted on the equipment and the tag cannot be reapplied.

9.2.3. Component Parts

Component parts are those that will be used to fabricate or build a piece of equipment. Parts to be used in the fabrication of an item of equipment are defined as "equipment" when the total cost is more than \$5,000.

Installation costs and freight charges are considered a part of the cost of equipment. They should be included in the total cost and charged to an equipment object code if the total cost is more than \$5,000.

9.2.4. Supply Items

Supply items are defined as articles that cost less than \$5,000 and/or have a useful life of less than one year.

9.2.5. Replacement Parts

Items purchased as replacement parts for a particular piece of equipment are considered supply items since they do not enhance the value of the piece of equipment.

9.3. Return of Merchandise Purchased with a Purchase Order

In the case where merchandise must be returned to the vendor because it is not suitable or a duplicate shipment was received, please observe the following procedures:

- It is your responsibility to contact the vendor to explain the reason for the return and request a Return Merchandise Authorization (RMA) Number. Ask the vendor if they will pay the return shipping charges, and if so, what procedure should be used to ship the merchandise. Often the vendor will send you a return-shipping label.
- Label the item with the vendor's name and address; write the RMA Number clearly on the package next to the mailing label.
- Bring the package to the Department Office and notify our Administrative Coordinator that the package is a return. Be sure to provide an account number to apply shipping charges.

9.4. Get a Tax Exempt Sales Certificate

JHU is a non-profit organization, and therefore, is exempt from paying sales tax. **If purchases are made with personal funds, sales tax will not be reimbursed to you.**

Purchasing equipment or materials with a personal credit card or with cash is not recommended, but if you absolutely need to do so, please obtain a copy of the tax-exempt sales certificate in the Department Office before making your purchase. Presenting this certificate at the time of purchase will eliminate sales tax from your bill, in most cases.

Visit <https://me.jhu.edu/wp-content/uploads/sites/38/2017/11/MD-Tax-Exempt-2022-002.pdf> to print a copy of the current Tax Exempt Sales Certificate.

Note that some stores, e.g. Wal-Mart will require that you obtain an in-store tax exemption certificate in addition to the JHU tax exemption. Please check with the store before making purchases to ensure that you have all required documents.

9.5. Reimbursements

The Department office processes reimbursements for official travel and out-of-pocket expenses for the purchase of materials and supplies.

Reimbursements may be obtained in one of two ways:

- Up to \$100.00: from the Petty Cash Office in Garland Hall using a Petty Cash Voucher.

- Over \$100.00: Check requested from and paid through the Accounts Payable Office. Please allow up to three weeks for the reimbursement to be processed.

9.6. Travel

9.6.1. Preferred Vendor: World Travel Services

World Travel Services (WTS) is a preferred vendor for travel arrangements. They will send invoices instead of requiring a credit card up front, so your credit line will not be accessed or held while waiting for reimbursement or payments. Info is available at www.worldtravelservice.com and e-mail jhuttravel@worldtravelservice.com.

9.6.2. Travel Expense Reimbursements

Reimbursement for travel expenses must be submitted with a completed and signed Travel Expense Report and will be processed and forwarded to the Accounts Payable Office. Allow two to three weeks for the reimbursement to be processed. Travel Expense Report forms can be obtained from the staff in the Mechanical Engineering administrative office.

It is the student's responsibility to complete the form and attach the necessary original receipts, obtain a signature approval, and account number from the Principal Investigator. In 2018, business mileage is reimbursed at 54.5 cents per mile and may change yearly.

9.6.3. Reimbursements for Air Travel

To reimburse air travel costs, you will need a credit card statement reflecting the cost of the ticket, along with payment confirmation from the airline. For upgrade, luggage, or other additional charges, a receipt is required. A flight itinerary from the airline will not be accepted because proof of payment is not indicated.

9.6.4. International Air Travel and the Fly America Act

The Fly America Act should be followed when foreign travel is required. Federal regulations require that individuals whose travel is supported by federal funds use American flag carrier airlines. Most sponsored accounts have federal fund sources. If you have questions, please see our Administrative Coordinator before arranging air travel.

9.6.5. Automobile Insurance

JHU carries automobile insurance coverage; therefore, if you rent a car that is used for University business, DO NOT purchase additional insurance coverage. You will not be reimbursed for that purchase.

10. Payroll

Paychecks are distributed semi-monthly, on the 15th and the last day of the month. If payday falls on a weekend or holiday, paychecks are distributed the last regular working day preceding the payday. Checks will be placed in your mailbox.

You may set up direct deposit in your person Employee Self-Service file.

- Visit <http://my.jhu.edu>. Sign in with your JHED ID and password.
- Select the "HR" Icon on the left side of your "home" screen.

- Then select the “ESS” icon. Follow the instructions to sign in and select the “Payroll Information” link

10.1. Salaries – Research Assistantships

The department determines the salaries for Research Assistantships. Other financial assistance, criteria of the grant or contract on which you are performing research may cause your salary to vary from those of your colleagues. Research Assistants are paid from the research funds of their particular advisor.

Salaries are subject to Federal and State tax withholding, which is done automatically through the Payroll Office and will be reflected on the pay stub. Students will want to complete a W-4 Federal Tax withholding form and a MW-507 Maryland State withholding form and return them to the Student Employment Services office in the basement of Garland Hall.

10.2. Stipends - Fellowships

Stipends are paid to those students on Departmental or other Fellowships.

*NOTE: Stipends usually have no income tax withheld.
Students on fellowships are responsible to file and pay income taxes.*

Students receiving stipends may have to file quarterly withholding reports with the Internal Revenue Service. For information contact the Tax Office at http://finance.jhu.edu/depts/tax/about_tax.html, 443-997-8442, or tax@jhu.edu.

11. Safety and Security

11.1. Laboratory Safety

Lab Safety is the responsibility of all who use, maintain, or visit the labs within the Mechanical Engineering department. Laboratory researchers are responsible for working with the principal investigator to become familiar with the appropriate hazard information and safety policies before performing any work.

For each lab, a Principal Investigator (PI) is assigned. That person is responsible for the safe operation of the lab, training on all chemicals in the work area, the training of the persons on the equipment within the lab, and is a ready source to answer any questions on a specific lab concerning its operation and all safety aspects. The PI's for each lab are listed on the entrance door to each lab.

11.1.1. Research Laboratory Safety – Training

The University offers research laboratory safety training, which is now a requirement for all Mechanical Engineering graduate students. The training is offered in the following modes:

A series of eight online learning modules

- Introduction in ethics, hazards, and risk evaluation
- Physical hazards
- Chemical hazards

- Biological
- Radiation
- Hazard analysis
- Design for safety
- Writing protocols and procedures

EN.500.601 Research Laboratory Safety – a six-week lecture course. Completion of the online learning modules is a prerequisite.

ONLINE LEARNING MODULES REQUIRED FOR ALL GRADUATE STUDENTS

All new Mechanical Engineering graduate students should complete the online learning modules within the first two weeks of their first enrolled semester.

The online modules are currently available at My.JHU.edu -> My Learning. Search for “Laboratory Safety Assessment Part 1...,” “Laboratory Safety Assessment Part 2...,” and so on. Once all eight courses are completed, an internal SIS “course” numbered EN.990.600 will be entered on students’ records, which will allow students to enroll in EN.500.601 (but EN.990.600 will not appear on a student's transcript nor on a student's course registration in SIS).

LECTURE ENCOURAGED OR REQUIRED FOR SOME GRADUATE STUDENTS

Advisors may encourage or require Mechanical Engineering graduate students to take EN.500.601 Research Laboratory Safety.

- The course is offered in the last six weeks of a semester
- Students must complete the online modules before registering for the course.

11.1.2. Safety Resources

The JHU Department of Health, Safety and Environment maintains a website to ensure updated information on policies, issues, and concerns are available to all. Visit <http://www.hopkinsmedicine.org/hse> to view directives concerning Safety Responsibilities and Policies, Environmental Monitoring, Fire Safety, Chemical Safety, Laboratory Safety, and Radiation Safety.

Also, visit the Homewood Campus Laboratory Safety page at <http://labsafety.jhu.edu/> for important information.

11.2. Campus Security

While the Hopkins Security Department provides ample and appropriate security to the campus, they remind us that we must play our part. Please exercise common sense when entering and leaving your office, classrooms, and labs.

- When you leave your office, if you are the only one there, lock the doors even if you leave only for a minute! Thefts take only a few seconds and valuable equipment and your work can disappear instantly.
- Secure your computers, especially laptops! Take your laptops with you when you leave your office.
- Back up your work onto separate disks or systems in case something happens to computer via virus, equipment problems, or theft. The University provides free anti-virus software that can be downloaded from the website at <http://it.jhu.edu/alerts/>.
- Secure your laptop cases or any bag that might be mistaken for a computer bag.
- Lock your car and do not leave any items inside your car in plain sight. Secure them in your trunk or bring them with you.
- Secure your personal items such as your purse, wallet, books, equipment, and your coat or jacket.
- If you see someone suspicious in your lab or office, do not confront the individual, contact Security at 410-516-7777 right away. Your personal safety is most important.
- If you are uncomfortable walking through campus or to your car at night or otherwise are concerned for your safety, the Security department provides escort services to selected locations. Call 410-516-8700 to arrange for an escort.

12. Facilities

12.1. Graduate Student Offices

As space provides, full-time Ph.D. graduate students are provided with a desk in a group office. In consultation with the faculty Space Committee, the department assigns the desks. *The department does not furnish computers or other desk supplies.*

The department will provide you with your office assignment, as well as arrange to issue you keys or provide J-card swipe access. A \$5 deposit is charged for each key issued, which will be returned to you when you return the keys.

12.2. Libraries

The Milton S. Eisenhower Library offers a variety of online, research, and book lending services, which are outlined at <http://library.jhu.edu>.

The Library also purchases books and journals based on departmental requests. Student requests for books and journals should be discussed with their advisor who may communicate the request to the faculty member designated as the Library Liaison, currently Professor Jaafar El-Awady, who is located at Latrobe 123, and can be contacted at jelawady@jhu.edu or 410-516-6683.

12.3. WSE Manufacturing

The WSE Manufacturing student machine shop is located in the basement of the Wyman Park Building, and is open to students, faculty, and staff across the Johns Hopkins University. An orientation regarding shop safety, shop rules, and equipment operations is required before one can work in the student machine shop.

To learn more about the WSE Manufacturing equipment and services available to students, please visit their website at <http://engineering.jhu.edu/wse-research/wse-manufacturing/>.

12.4. Computing

There are a cornucopia of computing facilities and services available to the Johns Hopkins community. The Information Technology website at <http://it.jhu.edu> offers an overview of the IT Organization, its projects and services, support for applications and general questions, and news about emerging technologies and strategic imperatives, as well as e-mail, web, and file sharing services.

12.4.1. JHU Information Technology

Information Technology at Johns Hopkins is the online resource for IT-related information. Their primary focus is to support the missions of the Johns Hopkins Institutions and provide technology solutions for faculty, staff, patients, and students in support of teaching, research, and patient care.

This Web site serves as a repository for all IT-related information at Johns Hopkins. You will find a lot of useful information within this site, including an overview of the IT Organization, its projects and services, support for applications and general questions, and news about emerging technologies and strategic imperatives.

12.4.2. WSE Information Technology

WSE IT is tasked with supporting the IT needs of the Whiting community. They are a component of the WSE Dean's office, and not a branch of IT@JH. Please visit their website at <http://wseit.engineering.jhu.edu/> to learn how WSE IT can serve you.

12.4.3. Software Downloads

The university owns licenses to many software packages, many of which may be downloaded from the WSE IT website. Please visit <http://wseit.engineering.jhu.edu/software-downloads/> to learn more.

13. Student Disability Services

The Office of Student Disability Services (SDS) assists full-time undergraduate and graduate students in the Krieger School of Arts and Sciences and the Whiting School of Engineering with disability concerns, in compliance with the provisions of the Americans with Disabilities Act of 1990 (ADA) and Section 504 of the Rehabilitation Act of 1973. SDS assists the University community in understanding the effects of disabilities and in eliminating the physical, technical, attitudinal and programmatic barriers that limit the range of opportunities for students with disabilities, as well as provides individuals with reasonable accommodations. The SDS maintains and protects the confidentiality of individual records as required by law.

For additional information and to access the services of the SDS office, please visit <http://web.jhu.edu/disabilities/index.html>, contact them at 410-516-4720 or studentdisabilityservices@jhu.edu, or visit their office in 385 Garland Hall.

14. Groups and Activities

14.1. Mechanical Engineering Graduate Student Association (MEGA)

MEGA is a social and advocacy organization for the graduate students of Mechanical Engineering. As a graduate student, you will be invited to various events throughout the year. For information, visit <https://me.jhu.edu/mega/>.

14.2. University and Departmental Graduate Student Representation

Each year the graduate students elect a full-time Ph.D. student to serve as a departmental representative to the University's Graduate Representative Organization. The GRO, whose website is <http://gro.jhu.edu>, is an advocacy group for all graduate students. The GRO serves the student body as a liaison to the University's schools, administration, and dean's offices as well as hosts social activities and provides extensive information about life on campus and Baltimore.

Each department sends a graduate student representative to serve in the GRO, and an announcement is made each year as to who will represent the department. You are welcome to forward to the representative your questions and concerns, which will be presented at GRO meetings.

14.3. American Society of Mechanical Engineers (ASME)

Visit the ASME Faculty Advisor, Dr. Steven Marra for information and application materials. Information about ASME can be found at <http://www.asme.org/>.

14.4. Extracurricular Activities

As a department, Mechanical Engineering participates in University intramural athletics. Mechanical Engineering has and will continue to field strong teams in softball, and periodically participates in basketball, volleyball, and other sports.

Periodically, students, staff, and faculty will host social events off-campus. You will be notified of these events as the department hears of them. If you want to host a social event, notify Mike Bernard, who will announce it to the Mechanical Engineering community.

Many groups and organizations throughout the University provide many opportunities for social times and fun. Check out these websites for information:

14.4.1. Johns Hopkins University

- **Campus Life** - <https://www.jhu.edu/life/>
- **Arts and Culture** - <https://www.jhu.edu/life/arts-culture/>
- **Recreation Center** - grad students have free membership - <http://web.jhu.edu/recreation>.
- **Hopkins Athletics** - <http://www.hopkinssports.com/>

14.4.2. In the Baltimore Area

- **Baltimore Collegetown** - things to do and resources for college students - <http://baltimorecollegetown.org/>
- **Baltimore Area Convention and Visitors Association** - <http://baltimore.org/>
- **Baltimore Office of Promotion and the Arts** - <http://www.bop.org/>

15. Notice of Non-Discriminatory Policy

The Johns Hopkins University admits students of any race, color, sex, religion, national or ethnic origin, handicap or veteran status to all of the rights, privileges, programs, benefits and activities generally accorded or made available to students at the University. It does not discriminate on the basis of race, color, sex, religion, sexual orientation, national or ethnic origin, handicap or veteran status in any program or activity, including the administration of its educational policies, admission policies, scholarship and loan programs, and athletic and other University-administered programs. Accordingly, the University does not take into consideration personal factors that are irrelevant to the program involved.

Questions regarding access to programs following Title VI, Title IX, and Section 504 should be referred to the Affirmative Action Officer, 205 Garland Hall, 410-516-8075.

16. Appendices

Please see the next page for appendices.



Department of Mechanical Engineering, Johns Hopkins University

Graduate Student Evaluation Form

Name: _____

Calendar Year: _____

Part 1 - to the student: This form is intended to summarize your accomplishments in the past year and indicate your plans for the coming year. Please complete, sign, and discuss this with your advisor. Your advisor will also sign it and see to it that it is placed in your student file. Continue on as many sheets as necessary.

Responsible Conduct of Research course completed? No Yes (When? _____)

- COURSES COMPLETED IN THE PAST 2 SEMESTERS:

- PLANNED COURSES FOR THE NEXT 2 SEMESTERS:

- TEACHING ASSISTANT REQUIREMENTS:

- PAPERS SUBMITTED OR PUBLISHED:

- CONFERENCE AND INTERNAL/INFORMAL PRESENTATIONS:

- MAJOR RESEARCH ACCOMPLISHMENTS:

- RESEARCH, ACADEMIC, AND OTHER GOALS IN THE COMING YEAR (advisor must agree):

- YOUR COMMENTS:

- ADVISOR'S COMMENTS:

I have reviewed this document with my advisor and I have seen his/her comments

Student signature _____ Date _____

Advisor signature _____ Date _____

Part 2 - to the advisor: This form is intended to guide a discussion with your student about their accomplishments, progress, and areas for improvement. This discussion is an opportunity to evaluate the student/advisor relationship and create a more effective research partnership. Below are several topics that should be covered in the discussion. Please think about these issues before meeting with the student. Space is provided for notes. **Both you and the student will sign this form.**

- Research** (discuss as applicable: thesis topic, future publications, ability to conduct quality research, ability to think of and discuss new ideas, overall progress)
Comments:

- Professionalism** (discuss as applicable: conduct, presentation skills, writing skills, communication skills, teamwork)
Comments:

- Logistics** (discuss as applicable: graduation timeframe, future state of student funding, specific grant requirements, present funding, progress towards students post-graduate goals)
Comments:

- Educational Progress** (discuss as applicable: academic progress, progress towards DQE or GBO, teaching opportunities, TA opportunities)
Comments:

- Other** (discuss as applicable) – Unaddressed student or advisor concerns
 - Importance of research with respect to greater research community
 - Students impressions of their progress
 - _____
 - _____

Student signature _____

Date _____

Advisor signature _____

Date _____

| Certificate of Degree Completion | | | | |
|---|-------------------------------|---|---|----------------|
| Master of Science in Engineering - Department of Mechanical Engineering | | | | |
|  | Name | | | |
| | Hopkins ID# | | | |
| | Faculty Advisor | | | |
| | I am a... | <input type="checkbox"/> Master's student | <input type="checkbox"/> PhD student earning an MSE | |
| | Semester of Graduation | | | |
| | Last Semester Registered | | | |
| | Required Intro Courses | EN.500.603 Academic Ethics | Title IX | Opioid Dangers |
| | Semester Completed | | | |

SECTION A: Eight one-semester courses approved by faculty advisor

| Course Number | Course Title | Math Course? | Semester | Grade | Double Counted from JHU BS? |
|---------------|--------------|--------------|----------|-------|-----------------------------|
| | | | | | |
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- **At least four courses must be at the graduate level** (xxx.600 or higher, up to two Engineering for Professionals xx5.4xx or higher).
- **No more than four courses may be at the advanced undergraduate level** (full-time programs xxx.300 – xxx.499, Engineering for Professionals xx5.3xx). Note: for students matriculating in Spring 2018 and later, only advanced undergraduate courses (xxx.400-499, xx5.4xx) are accepted.
- **At least two courses should be in applied mathematics, numerical analysis, or computational methods (“Math Course?” above).** This requirement can be waived in writing by your advisor, if sufficient prior preparation in these areas can be demonstrated.
- **Ineligible Courses:** EN.530.800 Independent Study, EN.530.600 MSE Graduate Research, and other departments’ Graduate Research, Independent Study, and Special Studies are not eligible courses to complete Section A’s requirement. See Section B regarding how EN.530.600 MSE Graduate Research could possibly be counted.
- **At least half of all courses** counted toward the master’s degree – at least 5 of 10, or at least 4 of 8 if writing an essay - must be Mechanical Engineering: either - all EN.530.xxx Mechanical Engineering - or - up to two courses from EN.535.xxx Engineering for Professionals’ Mechanical Engineering and the rest EN.530.xxx Mechanical Engineering.
- **No more than two courses** may be chosen from the Engineering for Professionals program.
- **A course is satisfactorily completed if a grade from A+ to B- is obtained.** Grades of C+ or lower are evidence of unsatisfactory academic performance. If necessary, one course with a C+, C, or C- final grade can be counted toward the degree. “Pass” or “P” grades are not accepted.

Please see the next page for SECTION B...

SECTION B: Complete either the “Course Option” or the “Essay Option” but not both.

Course Option

Two additional one-semester courses approved by the faculty advisor.

- **Two additional one-semester graduate-level courses** (xx.xxx.6xx or higher, Engineering for Professionals EN.xx5.4xx or higher).
- **EN.530.600 MSE Graduate Research***
 - **BS/MSE and MSE students only:** one of these two courses can be EN.530.600 MSE Graduate Research. Students must also have completed the appropriate Responsible Conduct of Research and Research Laboratory Safety courses.
 - **PhD students** earning the MSE degree cannot count EN.530.600 MSE Graduate Research.
- **Ineligible Courses:** EN.530.800 Independent Study, EN.530.602 Master’s Thesis Research and Writing, and other departments’ Graduate Research, Independent Study, and Special Studies are not eligible courses to complete Section B’s requirement.

| Course Number | Course Title | Math Course? | Semester | Grade | Double Counted from JHU BS? |
|---------------|--------------|--------------|----------|-------|-----------------------------|
| | | | | | |
| | | | | | |

* If counting EN.530.600 MSE Graduate Research, this section must be completed.

| Requirement | Date or Semester Completed / Training Description |
|---|---|
| EN.360.624 or EN.360.625 Responsible Conduct of Research | |
| Research Laboratory Safety – date completed and briefly describe training done. | |

Essay Option

Write an essay acceptable to the faculty advisor and one other reader, plus the completion of these requirements.

| Requirement | Date or Semester Completed / Training Description |
|--|---|
| EN.360.624 or EN.360.625 Responsible Conduct of Research | |
| Research Laboratory Safety – date completed and briefly describe training done. | |
| EN.530.602 Master’s Essay Research and Writing Six credits (one 6-credit or two 3-credit courses). List semester(s) the course(s) were completed. | |

Essay Title: _____

Was the Essay Submitted to the Library? No Yes Date Submitted, if “Yes:” _____

ADVISOR’S CERTIFICATION

After reviewing the degree requirements, I am satisfied that this student has completed all of the requirements for the Master of Science in Engineering Degree in the Department of Mechanical Engineering.

Advisor’s Signature

Date



Graduate Board Oral Examination for Ph.D. Degree

Student: _____ 6-digit Student Hopkins ID: _____ Advisor: _____

Please submit this form to the Mechanical Engineering staff eight weeks in advance of the earliest proposed date of the GBO to help ensure that the examiners and alternates will be available on at least one of the dates.

EXAMINATION DATES

Please provide choices of examination dates and periods, with at least a one-month span of dates where possible.

Table with 3 columns: Choice, Date, Preference. Rows for 1st through 6th choices, each with checkboxes for morning, afternoon, and either.

GBO Examination Committees have two examiners whose primary faculty appointment is with the Mechanical Engineering department and three examiners with faculty appointments in other departments.

Advisors are asked to confirm availability with each prospective examiner and alternate about their availability to serve on the committee before submitting this form.

Faculty with these primary appointment titles are eligible to serve on GBO Examination Committees: Assistant Professor, Associate Professor, Professor, Assistant Research Professor, Associate Research Professor, Research Professor, Academy Professor, Emeritus Professor.

Faculty with other appointment titles are generally ineligible to serve on GBO Examination Committees, and require prior approval of the Graduate Board.

A complete list of academic titles and their eligibility to serve on GBO Examination Committees is provided in a table in the document "Description of Academic Titles" available on the Homewood Academic Council website.

EXAMINERS and ALTERNATES

A. Please list, in order of preference three or more Mechanical Engineering professors to serve. The advisor and the first available choice will serve as examiners. The next available choice will serve as an alternate.

| Choice | Professor's Name | Professor's Rank | Professor's E-mail |
|---------------------------|------------------|------------------|--------------------|
| 1 st - Advisor | | | |
| 2nd | | | |
| 3rd | | | |
| 4th | | | |
| 5th | | | |

B. Please list, in order of preference at least four and up to 10 professors from other departments, any of whom you would like to be the examiners or alternates. The first three available will serve as examiners. The next available will serve as an alternate.

| Choice | Professor's Name | Professor's Rank | Professor's E-mail |
|--------|------------------|------------------|--------------------|
| 1st | | | |
| 2nd | | | |
| 3rd | | | |
| 4th | | | |
| 5th | | | |
| 6th | | | |
| 7th | | | |
| 8th | | | |
| 9th | | | |
| 10th | | | |

Please note any equipment needs or special circumstances:

For additional information, please review the Graduate Board Oral Exams policy at <http://homewoodgrad.jhu.edu/academics/graduate-board/graduate-board-oral-exams/>.

Advisor's Signature _____ Date _____

Date Received by Mechanical Engineering staff: _____

Received by: _____

| Certificate of Degree Completion | | | | |
|---|-------------------------------|-------------------------------|--|----------------------------|
| Doctor of Philosophy - Department of Mechanical Engineering | | | | |
|  | Name | | | |
| | Hopkins ID# | | | |
| | Faculty Advisor | | | |
| | Semester of Graduation | | | |
| | Last Semester Registered | | | |
| | Required Introductory Courses | EN.500.603 Academic Ethics | EN/AS.360.625 Responsible Conduct of Research | Research Laboratory Safety |
| | Semester Completed | | | |

REQUIREMENTS

| Requirement | Requirement Level | Date or Semester Completed |
|---|-------------------|----------------------------|
| Complete a minimum of two consecutive semesters as a full-time resident graduate student. | University | |
| Serve as Teaching Assistant for at least two courses. | Department | |
| Departmental Qualifying Exam – unconditional pass. | Department | |
| Graduate Board Oral Exam – unconditional pass | University | |
| Register and Pass EN.530.801 (Fall) and EN.503.802 (Spring) Graduate Research every semester while full-time | Department | |
| Register and Pass EN.530.803 (Fall) and EN.530.804 (Spring) Mechanical Engineering Graduate Seminar every semester while full-time, unless there is documented exoneration that must be provided with this document. | Department | |
| Defend dissertation | University | |

DISSERTATION

Dissertation Title: _____

Was the Dissertation submitted to the Library? No Yes Date Submitted, if "Yes:" _____

ADVISOR'S CERTIFICATION

After reviewing the degree requirements, I am satisfied that this student has completed the requirements for the Doctor of Philosophy Degree in the Department of Mechanical Engineering.

Advisor's Signature

Date