2026-2027 Advising Manual
Master of Science in Engineering in
Robotics

Laboratory for Computational Sensing and Robotics
G.W.C. Whiting School of Engineering
Johns Hopkins University

JOHNS HOPKINS
WHITING SCHOOL
of ENGINEERING

CONTENTS

1 WELCOME

Welcome to the JHU Robotics MSE program in the Laboratory for Computational Sensing and Robotics (LCSR)

This manual is designed to serve as a guide for graduate students in LCSR to work more effectively and to describe the basic academic requirements for the Robotics MSE degree. This manual covers policies, rules, and procedures, and offers suggestions regarding our program. The detailed planning of an academic program, such as choosing courses and the like, must be done with the guidance of the academic advisor. Please note that like any complex program, the Robotics MSE is a living program and while the MSE manual is as accurate as possible, it is important that you clarify any unclear issues with your academic advisor and/or Robotics MSE Academic Program Manager, Sonya Brown. Also, please note it is the student's responsibility to read the entire MSE advising manual, and to take complete responsibility for fulfilling the academic and other graduate requirements. Your Advisor and the Robotics Academic Staff are here to help, answer questions, and offer suggestions, but ultimately you must take ownership in your own degree program.

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3 ROBOTICS MSE DEGREE REQUIREMENTS

Course Option: 10 full-time academic courses (each class at least 3 credits, e.g. not seminars, safety training, etc.).

Research Essay/Internship Option:

Essay: 8 full-time academic courses (each class at least 3 credits, e.g. not seminars, safety training, etc.) and a Master's Essay supervised by a WSE faculty member who has been approved by the Robotics MSE Curriculum Committee to serve as an academic advisor. (See the Essay Option section for more information.)

Internship: 8 full-time academic courses (each class at least 3 credits, e.g. not seminars, safety training, etc.) and an Internship with a Report supervised by a WSE faculty member who has been approved by the Robotics MSE Curriculum Committee to serve as an academic advisor. (See the Internship Option section for more information.)

At least 6 of these courses must be at the graduate level as defined by the offering department/center. All courses counted toward the MSE degree requirements must be at the 400 level or above. Any dual listed courses (e.g. listed at both the 600 and 400 level) must be taken at the 600 level. All courses counting towards the foundation, track, or elective requirements must be for a letter grade (e.g. no pass/fail). Any exceptions must be approved in writing by your academic advisor and the LCSR Education Director. Non-credit and one-credit courses such as the weekly seminar courses offered by LCSR may not count toward this course requirement.

If you are a combined student (i.e. graduated with your undergraduate degree from JHU) who took required courses at the 400 level during your undergraduate course work, the classes can count as fulfilling the requirement. You will still need to fulfill the requirement of at least six (6) 600 level courses or above to complete the degree.

3.1 MSE Core Course Requirements

(2 courses)

These courses can be taken in either order. DO NOT take them concurrently (i.e. DO NOT take them both in the same term). Both classes are required.

> **601.663 Algorithms for Sensor-Based Robotics (3 credits)** This course surveys the development of robotic systems for navigating in an environment from an algorithmic perspective. It will cover basic kinematics, configuration space concepts, motion planning, and localization and mapping. It will describe these concepts in the context of the ROS software system, and will present examples relevant to mobile platforms, manipulation, robotics surgery, and human-machine systems. **Recommended Course Background:** EN.601.226 Data Structures, linear algebra, multivariable integral and differential calculus, probability.
>
> **530.646 Robot Devices, Kinematics, Dynamics, and Control (4 credits)** Graduate-level introduction to the mechanics of robotic systems with emphasis on the mathematical tools for kinematics and dynamics of robot arms and mobile robots. Topics include the geometry and mathematical representation of rigid body motion, forward and inverse kinematics of articulated mechanical arms, trajectory generation, manipulator dynamics, actuation, and design issues, manipulator control, and additional special topics. **Recommended Course**

Background: multivariable integral and differential calculus, classical physics, linear algebra, ordinary differential equations. Programming: Knowledge of the Matlab programming language including data input/output, 1-D and 2-D arrays, and user-defined function calls. Students with experience with these language elements in other programming languages (C, C++, Python, Java, etc.) should be able to self-tutor themselves in the Matlab language as part of the programming exercises.

3.2 Robot Mathematics – Recommended for all Robotics MSE Students

All Robotics MSE students are **strongly recommended to** take a **graduate level applied math course in their first semester of study.** Here are three good options:

- The ME Department offers **530.761 Mathematical Methods of Engineering 1** every **Fall**. This is an in-person lecture course. You can sign up for this course in SIS. *"This course is a fast-paced overview of some fundamental topics in applied mathematics including: linear algebra and matrix theory, ordinary differential equations, Laplace and Fourier transforms, as well as an introduction to partial differential equations.*

- The JHU Engineering for Professionals (EP) MSE Program offers **535.641 - Mathematical Methods for Engineers** every **Fall and Spring.** This is an **ONLINE** course. "*This course covers a broad spectrum of mathematical techniques needed to solve advanced problems in engineering. Topics include linear algebra, the Laplace transform, ordinary differential equations, special functions, partial differential equations, and complex variables. Application of these topics to the solutions of physics and engineering problems is stressed."* A special section of is course includes applications to robotics. You need to complete a special inter-divisional registration (IDR) request and ask both the instructor/s of the course and your advisor for permission to enroll. You may obtain these permissions via email rather than as signatures on the IDR form; however, the permission should list the full class title and semester. Then, submit the IDR form and both permission to register through JHU SEAM. For assistance with this process, reach out to Sonya Brown.

- The Civil Engineering Department offers **560.601 Applied Math for Engineers** every **Spring**. This is an in-person lecture course. You can sign up for this course in SIS. *"This course presents a broad survey of the basic mathematical methods used in the solution of ordinary and partial differential equations: linear algebra, power series, Fourier series, separation of variables, integral transforms."*

3.3 Robotics Seminar Course Requirement

Students are required to register for the following one-credit weekly robotics research seminar course every term in which they are in full-time residency. Seminar is pass-fail (P/F grades) only, not a lecture course; there are no assignments or exams. Topics include

- medical robotics, including computer-integrated surgical systems and image-guided intervention;
- sensor-based robotics, including computer vision and biomedical image analysis;
- algorithmic robotics, robot control and machine learning;
- autonomous robotics for monitoring, exploration and manipulation with applications in home, environmental (land, sea, space), and defense areas;

- biorobotics and neuromechanics, including devices, algorithms and approaches to robotics inspired by principles in biomechanics and neuroscience;
- human-machine systems, including haptic and visual feedback, human perception, cognition and decision making, and human-machine collaborative systems.

If you have changed to part-time status, please talk to your academic staff about this requirement.

The course number is: 620.745 Seminar in Computational Sensing and Robotics

3.4 Additional Required Courses

Every effort should be made to take these within the first semester.

Graduate Orientation and Academic Ethics (EN.500.603)
Online tutorial required for all incoming MSE students. Students are auto-enrolled in first semester, usually approximately three weeks into the semester. This course includes required Opioid training and Title IX training, and is completed through Canvas. Students cannot register through SIS on their own but once added by the registrar, should not drop the course.

Research Laboratory Safety (EN.500.601)
Required for all incoming MSE students. It is recommended that this course be taken in the student's first semester. It is required that the student take it by the end of their first year

Responsible Conduct of Research course
AS.360.624 (online) required for all incoming MSE students. Instructions for registering: https://engineering.jhu.edu/research/resources-policies-forms/online-training-course-responsible-conduct-of-research/. **IMPORTANT: MAKE SURE TO REGISTER WITH YOUR JHU EMAIL ADDRESS.**

OR

AS.360.625 (in-person) may be required for certain research projects.
Additional information about the Responsible Conduct of Research course can be found here: https://engineering.jhu.edu/research/resources-policies-forms/responsible-conduct-of-research-training-for-students-and-postdoctoral-fellows-revised-spring-2020/

3.5 MSE Degree Track Requirements

(4 Courses)

Tracks consist of course sequences that provide the student with strength in a specific area. Track requirements are listed below. Other courses may be substituted only with the written approval of both the student's academic advisor and the Robotics Education Director. Many of these courses are offered in multiple departments – alternative course numbers for the same class are acceptable substitutions. Please confirm with your advisor that you have signed up for the correct courses. Not all courses will necessarily be offered each semester or each year. **Note: Students should discuss their academic plan with their advisor. Specific choices are subject to approval of plan by advisor.** Courses counted towards the track requirement may not be used to satisfy the elective requirement. *Note: at most two EP Courses (eg. 535.xxx.xx) can be counted toward the MSE with prior approval of advisor.*

3.5.1 Automation Science and Engineering Track

Choose four (4) courses from the following list.

Starred and bolded choices are strongly recommended.

520.648	**Electronics Design Lab ***
520.637	Foundations of Reinforcement Learning
520.640	Machine Intelligence on Embedded Systems
520.650	Machine Intelligence
520.657	Design of Advanced Instruments and Systems
520.662/520.663	Leading Innovation Design Team
520.681	Perception for Embodied AI
520.738	Advanced Electronic Design Lab
520.773	Advanced Topics in Microsystem Fabrication
530.414	**Computer-Aided Design***
530.420	Robot Sensors/Actuators
530.421	Mechatronics
530.495	Microfabrication Laboratory
530.623	Design of Marine Robots
530.626	Optimal Control for Space Systems[1]
530.663	Robot Motion Planning
530.641	Statistical Learning for Engineers
530.645	Kinematics
530.649	System Identification
530.653	Advanced Systems Modeling
530.666	Magnetically Actuated and MRI Compatible Robots
530.692	Flexible Robotic Systems Modeling
530.688	Learning-enabled Multi-agent Systems
535.427	**Computer Aided Design* (NOT to be counted if 530.414 is taken)**
535.460	**Precision Mechanical Design***
535.459	**Manufacturing Systems Analysis***

[1] Formerly EN.520.626 Trajectory Generation for Space Systems; students who took this course under the former title will receive credit.

535.473	Mechanized Assembly: Hardware and Algorithms
553.663	Network Models in Operations Research
553.761	Nonlinear Optimization 1
553.762	Nonlinear Optimization 2
601.661	Computer Vision
601.690	Introduction to Human-Computer Interaction
601.695	Introduction to Robot Learning
601.784	The Future of Work with AI Systems

3.5.2 BioRobotics Track

Choose four (4) courses from the following list.
Starred and bolded choices are strongly recommended.

520.621	Introduction to Nonlinear Systems
530.485	Physics and Feedback in Living Systems
530.649	System Identification
530.668	**Locomotion Mechanics: Fundamentals***
530.669	**Locomotion Mechanics: Recent Advances***
530.676	**Locomotion Dynamics and Control***
530.691	Haptic Interface Design for Human-Robot Interaction
530.692	Flexible Robotic Systems Modeling
580.630	Theoretical Neuroscience
580.742	Neural Implants and Interfaces
530.616/580.616/520.601	Introduction to Linear Systems Theory
601.690	Introduction to Human-Computer Interaction
601.695	Introduction to Robot Learning

3.5.3 Control and Dynamical Systems Track

Choose four (4) courses from the following list.
Starred and bolded choices are strongly recommended.

520.621	**Introduction to Nonlinear Systems***
520.629	Networked Dynamical Systems
520.633	Intro to Robust Control
520.654	Control System Design
520.637	Foundations of Reinforcement Learning
530.470	Space Vehicle Dynamics and Control
530.603	Applied Optimal Control
530.623	Design of Marine Robots
530.624	Dynamics of Robots and Spacecraft

530.626 Optimal Control for Space Systems[2]
530.641 Statistical Learning for Engineers
530.647 Adaptive Systems
530.649 System Identification
530.653 Advanced Systems Modeling
530.654 Advanced Systems Modeling II
530.668 Locomotion Mechanics: Fundamentals
530.676 Locomotion Dynamics and Control
530.678 Nonlinear Control and Planning in Robotics*
530.692 Flexible Robotic Systems Modeling
530.696 Learning Based Control for Robotics
530.761 Mathematical Methods of Engineering I
553.792 Matrix Analysis
553.797 Intro to Control Theory and Optimal Control
530.616 Introduction to Linear Systems Theory
601.695 Introduction to Robot Learning

3.5.4 Medical Robotics Track

Two (2) required courses and two (2) courses from the following list.

Required for the track:

601.655 Computer-Integrated Surgery 1
601.656 Computer-Integrated Surgery 2

Choose two (2) of the following:

520.613 Adv Topics in Optical Medical Imaging
520.623 Medical Image Analysis
520.631 Ultrasound and Photoacoustic Beamforming
520.632 Medical Imaging Systems
530.420 Robot Sensors/Actuators
530.663 Robot Motion Planning
530.666 Magnetically Actuated and MRI Compatible Robots
530.691 Haptic Interface Design for Human-Robot Interaction
530.721 Medical Robotics System Design
530.761 Mathematical Methods of Engineering I
580.673 Magnetic Resonance in Medicine
580.679 Principles & Apps of Modern X-ray Imaging & Computed Tomography
580.683 Nuclear Medicine Imaging
580.684 Ultrasound Imaging: Theory and Applications
580.693 Imaging Instrumentation
580.713 Translating Healthcare AI: Essential Concepts

[2] Formerly EN.520.626 Trajectory Generation for Space Systems; students who took this course under the former title will receive credit.

580.740 Surgery for Engineers
601.653 Applications of Augmented Reality
601.654 Augmented Reality
601.661 Computer Vision
601.676 Machine Learning: Data to Models
601.784 The Future of Work with AI Systems

3.5.5 Perception and Cognitive Systems Track

Choose four (4) courses from the following list.
Starred and bolded choices are strongly recommended.

520.612 Machine Learning for Signal Processing
520.614 Image Processing and Analysis
520.615 Image Process and Analysis II
520.623 Medical Image Analysis
520.637 Foundations of Reinforcement Learning
520.638 Deep Learning
520.640 Machine Intelligence on Embedded Systems
520.641 Neuromorphic Circuits and Systems
520.646 Wavelets and Filter Banks
520.650 Machine Intelligence
520.665 Machine Perception
520.681 Perception for Embodied AI
530.420 Robot Sensors/Actuators
530.421 Mechatronics
530.641 Statistical Learning for Engineers
530.663 Robot Motion Planning
530.691 Haptic Interface Design for Human-Robot Interaction
530.696 Learning Based Control for Robotics
530.707 Robot System Programming
553.693 Mathematical Image Analysis
553.761 Nonlinear Optimization 1
553.762 Nonlinear Optimization 2
580.630 Theoretical Neuroscience
580.639 Models of the Neuron
580.742 Neural Implants and Interfaces
601.653 Applications of Augmented Reality
601.654 Augmented Reality
601.661 Computer Vision*
601.664 Artificial Intelligence*
601.675 Machine Learning
601.682 Machine Learning: Deep Learning

601.686 Machine Learning: AI System Design and Development
601.690 Introduction to Human-Computer Interaction
601.691 Human-Robot Interaction
601.695 Introduction to Robot Learning
601.692 Learning-Based Vision
601.760 FFT in Graphics and Vision
601.783 Vision as Bayesian Inference
601.784 The Future of Work with AI Systems
AS.050.675 Probabilistic Models of the Visual Cortex

3.6 General Robotics Track

Choose four (4) courses from the following list.

520.621	Intro to Nonlinear Systems		530.676	Locomotion Dynamics and Control
520.633	Intro to Robust Control		530.678	Nonlinear Control and Planning in Robotics
520.637	Foundations of Reinforcement Learning		530.691	Haptic Interface Design for Human-Robot Interaction
520.650	Machine Intelligence		530.692	Flexible Robotic Systems Modeling
520.654	Control System Design		530.707	Robot Systems Programming
520.662/ 520.663	Leading Innovation Design Team		530.721	Medical Robotics System Design
520.665	Machine Perception		530.761	Mathematical Methods of Engineering I
520.681	Perception for Embodied AI		553.761	Nonlinear Optimization 1
520.688	Learning-enabled Multi-agent Systems		553.762	Nonlinear Optimization 2
530.414	Computer-Aided Design		553.792	Matrix Analysis
530.420	Robot Sensors/Actuators		553.797	Intro to Control Theory and Optimal Control
530.421	Mechatronics		560.661	Additive Manufacturing and Design
530.470	Space Vehicle Dynamics and Control		580.713	Translating Healthcare AI: Essential Concepts
530.603	Applied Optimal Control		601.653	Applications of Augmented Reality
530.613	Mechanical Engineering Master's Design I		601.654	Augmented Reality
530.614	Mechanical Engineering Master's Design II		601.655	Computer-Integrated Surgery 1
530.616	Introduction to Linear Systems Theory		601.656	Computer-Integrated Surgery 2
530.623	Design of Marine Robots		601.660	Embodied AI with Web-Scale Video Data
530.624	Dynamics of Robots and Spacecraft		601.661	Computer Vision

530.626	Optimal Control for Space Systems[3]		601.664	Artificial Intelligence
530.641	Statistical Learning for Engineers		601.673	Machine Social Intelligence
530.645	Kinematics		601.675	Machine Learning
530.647	Adaptive Systems		601.682	Machine Learning: Deep Learning
530.648	Group Theory in Engineering Design		601.683	Generative Vision: The Art and Science of Visual Synthesis
530.649	System Identification		601.686	Machine Learning: AI System Design and Development
530.653	Advanced Systems Modeling		601.690	Introduction to Human-Computer Interaction
530.654	Advanced Systems Modeling II		601.691	Human-Robot Interaction
530.663	Robot Motion Planning		601.695	Introduction to Robot Learning
530.666	Magnetically Actuated and MRI Compatible Robots		601.697	Machine Learning: Reinforcement Learning
530.668	Locomotion Mechanics: Fundamentals		601.698	Hands-on Robot Learning
530.669	Locomotion Mechanics: Recent Advances		601.773	Machine Social Intelligence
530.676	Locomotion Dynamics and Control		601.784	The Future of Work with AI Systems

3.7 Robotics MSE Degree Electives Courses

(Four (4) Courses or Two (2) Courses + MSE Essay)

Elective courses may include any engineering or quantitative graduate courses **as approved by your academic advisor,** including but not limited to any course eligible to count towards any program track as listed in this manual. Any dual-listed courses (i.e. listed at both the 600 and 400 level) must be taken at the 600 level and any exceptions must be approved in writing by your academic advisor. All electives must be at least 3 credits. Electives include, **but are not limited to**, the following.

520.623	Medical Image Analysis		530.676	Locomotion Dynamics and Control
520.632	Medical Imaging Systems		530.678	Nonlinear Control and Planning in Robotics
520.640	Machine Intelligence on Embedded Systems		530.707	Robot Systems Programming
520.657	Design of Advanced Instruments and Systems		530.761	Mathematical Methods of Engineering I
520.662/ 520.663	Leading Innovation Design Team		553.663	Network Models in Operations Research
520.683	Bio-Photonics Laboratory		553.761	Nonlinear Optimization 1

[3] Formerly EN.520.626 Trajectory Generation for Space Systems; students who took this course under the former title will receive credit.

520.691	CAD Design of Digital VLSI Systems I		553.762	Nonlinear Optimization 2
520.773	Advanced Topics in Microsystem Fabrication		601.655	Computer Integrated Surgery 1
530.414	Computer-Aided Design		601.656	Computer Integrated Surgery 2
530.420	Robot Sensors/Actuators		601.661	Computer Vision
530.421	Mechatronics		601.664	Artificial Intelligence
530.495	Microfabrication Lab		601.675	Machine Learning
530.624	Dynamics of Robots and Spacecraft		601.682	Machine Learning: Deep Learning
530.628	Nonlinear Dynamical Systems		601.686	Machine Learning: AI System Design and Development
530.641	Statistical Learning for Engineers		601.690	Introduction to Human-Computer Interaction
530.647	Adaptive Systems		601.691	Human-Robot Interaction
530.649	System Identification		601.692	Learning-Based Vision
530.653	Advanced Systems Modeling		601.760	FFT in Graphics and Vision
530.668	Locomotion Mechanics: Fundamentals		601.783	Vision as Bayesian Inference
530.669	Locomotion Mechanics: Recent Advances			

Courses counted towards the track requirement may not be used to satisfy the elective requirement.

3.8 Master's Essay/Internship Option[4]

Many students elect to take the Course Option. In some cases, with the approval of a research advisor and the Robotics Director of Education, the Essay Option may be used to fulfill the MSE Robotics degree requirements. In the Course Option, ten (10) courses must be taken as articulated above. For the Essay and Internship Options, eight (8) courses must be taken, and research must be performed leading to a formal MSE Essay or Internship Report. Degree Track requirements are the same for both the Course and Essay Options. For more information on the policy and procedures for the Essay or Internship Options, please see the Section 5 Research Essay/Internship Option.

4 ADVISING

4.1 MSE Academic Advising

All incoming MSE students will be assigned a faculty Academic Advisor. Advising appointments are your opportunity to plan your academic career and track your academic progress. You should meet with your advisor at least once a semester, to plan your courses for your next semester.

[4] *Internship Option is pending final review of the Whiting School of Engineering's Graduate Committee.*

When planning for your advising meeting, you should fill out the Robotics Advising Worksheet, located here in the advising menu (+), which helps chart the progress you have already made and which classes you plan on taking.

NOTE: You are **required to bring a completed Advising Worksheet** (located in the advising menu (+) HERE), along with any questions you have for your advisor, to every advising meeting. Advisors reserve the right to refuse to meet with you or release your hold until you have completed this form. This means that you **must select all courses in advance of your first semester.** Of course, as time goes on you may end up selecting different courses for future semesters, but planning ahead is crucial to the success of your program.

These are some best practices for preparing to get the most out of your advising process:

1. Read this advising manual cover to cover.
2. Make a list of courses of interest, then look at previous semester listings in to SIS or JHU's public course search for previous years to know which term (spring / fall) the course is typically offered.
3. Check prerequisites of all courses and make sure to fulfill them (or discuss whether your previous coursework is a suitable prereq with your advisor) before registering for the course of interest.
4. Fill out both tabs (course list and term-by term) in the Advising Worksheet.
5. Repeat 2-4 (revise) every term.

4.2 MSE Course Planning

MSE students should make a full course plan prior to their first meeting with their academic advisor; the plan should show all semesters from their first semester to graduation! Here are the steps:

- Compose a list of courses you want to take including course number, name, and if it is offered in spring or fall. Most courses are only offered in either spring or fall term, not both.
- Review previous semesters using JHU Public Course Search to determine if a course is usually offered in fall or spring terms (or both). Note: Some courses in the manual have not been offered in a few terms; the faculty who teach those courses have confirmed they plan to offer the course at a future date, but you will want to plan back-up courses if they are not offered during your program semesters.
- Categorize the courses that you have selected:
    - "A" Required course or very highly desired course by you.
    - "B" Highly desired course
    - "C" Desired course
- Complete your term-by-term course planning spreadsheet available on the site here: List course NUMBER and NAME, and term of study (fall or spring, year).
- Meet with your academic advisor to introduce yourself and to discuss your objectives in the MSE.
- Review your term-by-term course plan with your advisor at every advising meeting. You should fill out the degree requirements spreadsheet available on the advising web above, and review it with your advisor at every advising meeting.
- Update your spreadsheet and degree requirements spreadsheet every term.
- Include the word "ADVISING" in the Subject line of all emails to your advisor regarding advising, it helps them find your email in their email queue.

4.3 Graduate Student Annual Reviews

A written review of all master's students is required. The review process includes the opportunity for a student to offer a self-evaluation to discuss with his or her advisor. If the student is completing an MSE Essay, the student is expected to hold an annual review with both the internship advisor *and* the academic advisor, to ensure that the student is staying on track on both academics and internship.

The Graduate Program Committee has created a review form, found here in the advising menu HERE: https://lcsr.jhu.edu/robotics-masters-program/robotics-mse-program/robotics-mse-academic-resources/

Annual reviews will be completed after midterms in Spring for Fall admitted students, and after midterms in Fall for Spring admitted students. The student and advisor will both sign the review, which must be submitted to the Robotics academic staff (email Sonya Brown).

5 Research Essay/Internship Option

5.1 MSE Essay Option

Students generally elect to take the 10-course Option to complete their MSE degree. In some cases, with the approval of a research advisor and the Robotics Director of Education, the Essay Option may be used to fulfill the MSE Robotics degree requirements. In the standard Course Option, ten (10) courses must be taken as articulated herein. For the Essay Option, eight (8) courses must be taken, not including any research courses, and research must be performed leading to a formal MSE Essay. Degree Track requirements are the same for both the Course and Essay Options.

Primary Robotics MSE Essay / Research Advisor Requirements: Research advisors for all Robotics MSE Essay must be approved in advance by the Robotics MSE Graduate Director. Currently approved Primary Robotics MSE Essay / Research Advisor are listed at the end of this document.

School of Engineering MSE Essay Advisor Requirement: To partially fulfill the degree requirement, the Essay must be approved and signed by the primary research advisor. If the primary advisor is *not* a robotics faculty member holding primary appointment in the Whiting School of Engineering, a second advisor (who satisfies this requirement) must also read and sign the essay. That secondary advisor must be identified and sign off on the Essay Advisor/Advisee Mutual Work Agreement form.

1. To qualify for the essay option, fill out and submit an MSE Essay Agreement Form located in the Advising menu (+) HERE at least two weeks (10 business days) before the beginning of your research. Note the form requires the signature of you, your essay advisor, and the Robotics Director of Education. In the extremely unlikely event that you need to change advisors mid-research, please contact Sonya Brown. **You are not admitted into the essay option until you have submitted an Advisor/Advisee Essay Agreement Form, and that form has been approved by the Education Director for the program.**
2. It is recommended that students meet with their essay advisors to develop a timeline for research and essay writing, and that portions of the essay be written as the research proceeds. For example, the introduction, background, and motivation for the research can and should often be written in the very early stages of the research. It is highly recommended that the student and advisor choose a second reader to review the essay. At least one reader must be a primary faculty in LCSR, and have their primary appointment in the Whiting School, or be approved by the Robotics Education Director.
3. Register for Essay Research classes
    - The correct course is 620.801 Robotics Graduate Research, please register in the section with your research advisor (if you have questions about this, talk to Sonya Brown).
    - *If you are on non-resident status*, sign up for the Non-Resident Course instead: EN.910.600
    - **If you have any questions about this requirement, confirm you are signed up for the correct course with** Dr. Sonya Brown**.**
4. Your essay must be submitted to your advisor for edits at least four weeks before the Robotics essay submission deadline

5. The final version of the master's essay must be submitted, with the cover page signed by the student's advisor, to the LCSR Academic Staff and EDT (Electronic Theses and Dissertation staff) by the essay completion date. See Sonya Brown for updated deadline information.

5.2 MSE Internship Option

A student may choose to fulfill the Robotics MSE degree requirements with the Internship Option, which requires having secured an internship of at least three months and no more than six months, approval and oversight of a research advisor, and a submitted report at the conclusion of the internship. The internship is expected to be full-time; any exceptions to this full-time requirement must be requested in advance and approved by the Director of Education. In the standard Course Option, ten (10) courses must be taken as articulated herein. For the Internship Option, eight (8) courses must be taken, not including any research courses, and internship activity must be performed through an Internship, leading to an Internship Report. Alternatively, a journal publication or a conference paper could be submitted, describing the student's original activity and work product conducted during the internship. This paper must have been submitted to, accepted by, or published in an archival, peer-reviewed technical journal or accepted for presentation at a peer-reviewed technical conference. The student must be the primary author of the article. Degree Track requirements are the same for all degree options.

During the term of the Internship-Option Internship, the student intern is expected to devote 100% of their effort to the internship. The student intern may not simultaneously take additional courses toward the Robotics MSE degree course requirements during the internship period.

JHU Internship Advisor Requirements: The internship advisor should be a member of the Robotics faculty, as listed in the Robotics Advising Manual. In some unusual cases, exceptions can be made, in which case the internship advisor must be a JHU professor holding an appointment in the Whiting School of Engineering. All internship advisors for all Robotics MSE internships must be approved in advance by the Robotics Director of Education.

Students should start the Internship Option process **early**. Identifying an internship and an internship advisor, completing the Internship Mutual Work Agreement, and completing the Internship Agreement take time. You are required to submit the Internship Mutual Work Agreement and the signed Internship Agreement **at least two (2) weeks before the start of the semester of the internship.** It is recommended that you start identifying an internship advisor at least a month before the semester of the internship and begin the paperwork then.

To Qualify for the Internship option:

- Robotics MSE students need to first identify and apply for an internship on their own, and if selected for an internship, then must identify a faculty internship advisor from within the Robotics faculty.
- Submit Internship Mutual Work Agreement to the Academic Staff: fill out and submit an Internship Mutual Work Agreement form at least two weeks before the beginning of the internship, which must be signed by the student, the internship supervisor, the nternship advisor, and the Robotics MSE Graduate Director. **You are not admitted into the internship option until you have submitted the Internship Mutual Work Agreement form, and that form has been approved by the program.** The Internship Mutual Work Agreement form can be found here.

- Submit the Internship Agreement to Academic Staff - a legal document to protect the faculty overseeing the internship must also be completed. This document must be signed once every three years, so please check with the Academic Staff to make sure it is necessary before starting the signature process.
    - Here is the JHU Approved Agreement that must be fully signed before the Internship Option can be approved. Download here: OGC Approved Internship Agreement.10.25
    - If the company offering the internship requires negotiations, then please send Sonya Brown the following (your internship supervisor and internship advisor should be able to assist in this process):
        - The full legal name of the company
        - The name of official authorized to sign for the company
        - A contact email for the official
    - If negotiations are not necessary, send the company signed agreement to Sonya Brown for the JHU signature. Please include the name and email address of the official authorized to sign for the company. Please also rename the file to be the Company Name_date signed.
    - **The fully executed document must be included with the Internship Mutual Work Agreement form. The Internship Option will not be approved without both documents.**

Additional Information:

- Students in the internship option are required to have a joint meeting (or teleconference) with their internship advisors and internship supervisors (together) at least on a monthly basis.
- Students will be required to apply for and register for the appropriate internship course (EN.620.802 Robotics MSE Graduate Internship, please check with Sonya Brown if you cannot find your advisor's section) ***and/or*** non-resident status/course.
- All international students need to work with Office of International Services (OIS) for Curricular Practical Training (CPT) approval and will need to additionally register for EN.500.851. Credits for this course will not count towards the degree. Additional details about CPT can be found on the Office of International Services (OIS) website: https://ois.jhu.edu/Immigration_and_Visas/F1_Student/F-1_Training_and_Employment/Curricular_Practical_Training/index.html. Please note that failure to comply with the CPT rules as laid out by OIS can result in loss of your F-1 status.
- Your internship report (or article) must be submitted to your advisor for edits at least 4 weeks before the graduation submission deadline. The internship report (or article) must be submitted within 4 weeks of the completion of the internship.

The final version of the internship report (or journal article) must be submitted, with the cover page signed by the student's internship advisor and internship supervisor, to the Robotics Academic staff by the completion date. See Sonya Brown for deadline information. In cases where the report must be confidential, then both the internship supervisor and the internship advisor must read and approve the

full report, and a non-confidential summary must be approved and submitted to the Robotics Academic Staff by the essay deadline for graduation.

6 GRADUATION

6.1 Academic Deadlines

Students preparing to complete a degree program in a given semester should see Sonya Brown 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 certification material usually fall within the following time periods:
Fall – early October
Spring – early March
Summer – mid-July

Essays deadlines are later – please check with Sonya Brown for current deadlines. Students who have not completed their requirements by the first day of classes must register for the current semester.

6.2 To Graduate

1. Submit Intent to Graduate form through SIS by the posted deadline.
2. Follow email instructions to complete the Graduation Intake Form and/or the departmental form sent to you by Dr. Sonya Brown. This will include uploading your degree checkout form, available in the advising menu HERE.
3. Review with your advisor, who signs the checkout form OR emails Dr. Brown approval of the final copy.
4. **For combined students only:** attach copies of your undergraduate transcript and your undergraduate checkout sheet to the form.
5. **If you are double counting courses** from another university: attach a copy of the other university's transcript to the form; note you will also need the syllabus and/or course description, evidence from the program that these courses did not count towards previous program requirements, and approval of transfer credit's from the Robotics MSE Education Director, Louis Whitcomb.
6. Return the form by the emailed deadline.
7. If you are finishing the essay option, the cover page of the essay must be signed by the student's essay advisor. Copies of the essay must be submitted to Robotics academic staff and ETD (Electronic Theses and Dissertation staff) by the essay completion date, which is provided by email from Dr. Brown to all students who register to graduate.

   ETD submission instructions are here: http://guides.library.jhu.edu/etd
   Note that there is a fee to submit your essay.
8. If you are completing the internship option, your internship report, signed by your internship advisor, must be submitted by the advertised deadline.

7 ACADEMIC POLICIES

Please read through all of the policies. It is your responsibility to adhere to all requirements and policies.

7.1 Academic Performance Requirements

Course Grade Requirement: A course is satisfactorily completed if a grade from A+ to B- is obtained. Only one C+, C, or C- can be counted toward the degree requirements. A grade of D or F, or a second grade below B- results in probation. A second D or F, or a third grade below B-, typically results in termination from the program. Any exceptions are rare and must be approved in writing by both the student's advisor and the Director of Education.

7.2 Audit Courses

Students may audit courses with the approval of their advisor. Credit hours from courses that are audited do not count towards degree requirements or towards full-time status. The Robotics program follows all standard WSE policies regarding auditing: https://engineering.jhu.edu/education/graduate-studies/graduate-academic-policies-procedures/ (Information under Homewood Grade and Registration Change Guidelines.) This includes: "Changing a course registration from "Audit" [student receives no letter grade] to "Credit" [student receives letter grade], or from "Credit" to "Audit" is permissible during the Office of the Registrar's official add/drop dates. Registration changes beyond this deadline are not permissible. Changing a final grade ("A" through "F", "Pass"), "Incomplete" grade, "In-Progress" grade or "Missing" grade to "Audit" is not permissible at any time."

7.3 Double Counting

Standard WSE policy and limitations on double counting apply: https://engineering.jhu.edu/education/graduate-studies/graduate-academic-policies-procedures/. Below is a basic description of the double-counting policy, for information purposes only; the official WSE policy is on the website, and the Robotics M.S.E. program adheres to that policy.

Coursework applied to a bachelor's degree:

Students either in a WSE combined (bachelor's/master's) program or seeking a WSE master's degree after having earned a WSE or Krieger School of Arts and Sciences bachelor's degree may double-count two (2) courses (400-level or higher) to both programs with the permission of the master's academic advisor. WSE master's degree candidates may not double-count courses applied to a bachelor's degree earned at a different institution.

Coursework not applied to a bachelor's degree:

For students who are either in a WSE combined bachelor's/master's degree program or have already earned a Whiting School of Engineering or Krieger School of Arts and Sciences bachelor's degree and are seeking a WSE master's degree, any graduate-level coursework (as defined by the WSE graduate program) not applied to the undergraduate degree may be applied to the graduate degree, regardless of when that course was taken (i.e., before or after the undergraduate degree has been conferred) with the permission of the master's academic advisor.

Note: If you are planning on double counting any courses (e.g. If you are a combined student who took graduate courses while still an undergraduate at JHU), it is your responsibility to understand the

double counting policy. Make sure to read the policy, and if you have any questions, contact the Academic Staff in Robotics.

7.4 Duration (Time to Completion Limit)

Typical time to completion is 1.5 to 2 years, depending on student pace. Students must complete degree within 5 years from matriculation in the M.S.E. program. A university-approved leave of absence does not count toward this limit. Please be aware that student visas granted by the US government to international MSE students typically have a maximum duration of two years.

7.5 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.

Please consider the following, which has previously been published on the Whiting School of Engineering Academic Affairs website: "An ethical campus fosters a positive sense of community and trust, while unethical actions and attitudes breed suspicion, cynicism, and negativity. Johns Hopkins University strives to be a community in which honesty and respect are valued and upheld, and in which all members of the community uphold the highest degree of ethical conduct.

"Academic ethics is the responsibility of every student, faculty member, and staff person at Johns Hopkins University. You must take the time to learn about what is ethical and what is not - ignorance of ethical rules is not an excuse for cheating. If you see a violation take place, it is your responsibility to report it.

"Every class you take at Hopkins should address ethics, and some activities that are allowed in one class may not be allowed in another class. If you are not sure if an action is ethical for a particular class, e.g. working in a group on homework, read the syllabus carefully and ask your professor."

Examples of Academic Misconduct:

- Cheating
- Reusing Assignments
- Improper Use of Electronic Devices
- Alteration of Graded Assignments
- Lying
- Unfair Competition
- Plagiarism
- Improper Use of the Internet
- Unauthorized Collaboration
- Forgery and Falsification
- Facilitating Academic Dishonesty
- Improper Use of AI

Note: Unauthorized uploading and downloading of course materials from online sites (like CourseHero, Quizlet, OPPapers, etc.) *is* considered academic misconduct.

Information about academic policies of the Whiting School of Engineering can be found at http://homewoodgrad.jhu.edu/academics/policies/. Please read it.

7.6 Graduate Research Courses

Coursework Option

No more than one 1-semester graduate research course (e.g. 620.801 Robotics Graduate Research) may be counted toward degree requirements. To substitute for a class, the graduate research course must be at least 3 credits. The course must be taken for a letter grade. In some exceptional cases, when the offering department of the course only permits pass/fail, and with the written permission of the academic advisor, the course may be counted towards degree requirements.

Research Essay/Internship Option

While a student may be required to sign up for graduate research courses while working on the master's essay/internship, these research courses may not count towards the 8 required courses for the Research Essay/Internship Option.

7.7 Laboratory Safety

Lab Safety is the responsibility of all who use, maintain, or visit the labs within LCSR. 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.

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.

Please also visit the Whiting School's Lab Safety page at http://labsafety.jhu.edu/ for important information.

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 with regards to its operation and all safety aspects. The PIs for each lab are listed on the entrance door to each lab.

7.8 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.

7.9 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. Complete information is available here: https://studentaffairs.jhu.edu/gro/graduate-student-groups/.

Information about part-time status can be found here: https://e-catalogue.jhu.edu/engineering/full-time-residential-programs/graduate-policies/academic-policies/#enrollmentstatusestext. In most cases, students can only be part-time in their final semester, with approval of the program and OIS (when appropriate). If you have any questions, please contact Sonya Brown.

7.10 Transfer Courses

Standard WSE policy and limitations on M.S.E. transfer credits apply (https://engineering.jhu.edu/education/graduate-studies/graduate-academic-policies-procedures/ In addition, use of each transfer course toward satisfaction of a specific Robotics M.S.E. degree requirement must be approved in writing by both the student's academic advisor and the Robotics M.S.E. Graduate Director.

7.11 WSE Engineering Management Courses

Two (2) 1.5 credit hour courses taken for credit (i.e. a letter grade) may count towards one class of the MSE degree elective requirements if they are pre-approved in writing by the student's academic advisor.

7.12 WSE Engineering for Professionals (EP) Courses

Up to two (2) EP courses may count toward the MSE degree elective requirements if they are pre-approved in writing by the student's academic advisor.

7.13 Course Listings

Term-by-Term Course Listing for full-time in-person and online courses:
https://courses.jhu.edu

Course Catalog:
https://e-catalogue.jhu.edu/engineering

7.14 Additional Policies

Whiting School of Engineering:
https://engineering.jhu.edu/education/graduate-studies/graduate-academic-policies-procedures/

Homewood Graduate policies and resources:
http://homewoodgrad.jhu.edu/

8 RESOURCES

8.1 Center for Leadership Education

The Center for Leadership Education provides many classes in engineering management, English as a second language, and professional communication. While these courses will not count towards the Robotics MSE, they can be useful. Please note: these classes will end up on your transcript, so the grades are important.

More information can be found here: http://engineering.jhu.edu/cle/programs-minors/

8.2 Financial Aid

The Office of Student Financial Services has other financial aid sources available, 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://www.jhu.edu/finaid/grads.html.

8.3 Graduate Student Organizations

Johns Hopkins has many student organizations. A list of some that are specifically geared to graduate students can be found here: http://homewoodgrad.jhu.edu/life-at-hopkins/graduate-student-organizations/

In addition, the Graduate Representative Organization (GRO) can be found here: http://studentaffairs.jhu.edu/gro/. The GRO maintains a list of student groups, which can be found here: https://studentaffairs.jhu.edu/gro/graduate-student-groups/

8.4 Information Technology

The Information Technology Department at Johns Hopkins, whose web site is located at http://it.jhu.edu is the online resource for all 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.

8.5 International Office

The Office of International Services can be emailed at ois@jhu.edu and their website is ois.jhu.edu. Please reach out to them with any visa related questions, including questions about Curricular Practical Training (CPT) and Optional Practical Training (OPT). When filing OPT forms, please make sure to inform your academic advisor of the following:

- Degree
- Field of study
- Date of completion (this should be the date degrees are conferred, not the end of classes)
- Whether the student has completed coursework and is working on thesis

8.6 Libraries

The JHU Libraries are extensive, both on-ground and online. The Sheridan Libraries, on the Homewood campus, include quiet room, group study rooms, and a café. Library resources can be found here: http://www.library.jhu.edu.

8.7 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.

- Secure your computers, especially laptops!
- 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 https://it.johnshopkins.edu/services/network/resnet/antivirus

Secure your laptop cases or any bag that might be mistaken for a computer bag.

- Lock your car and don't 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, don't 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.

8.8 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.

8.9 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. The Student Employment Services office is located in the basement of Garland Hall, and their website is located at https://studentjob.jh.edu/sessmile.cfm.

8.10 Writing Center

The Johns Hopkins Writing Center offers individual meetings with experienced tutors, including experts in scientific and engineering writing styles. More information can be found here: https://krieger.jhu.edu/writingcenter/.

9 LCSR ROBOTICS FACULTY

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11 Revision History

June 30, 2025	Revised for 2025-2026. Clarified internship option. Revised course Selection and planning. Updated track courses. Updated faculty and staff.
Nov 10, 2025	Clarified elective options. Updated track courses.
Jan 30, 2026	Added new course EN.520.681 as course option for General Robotics track, Perception, and Automation tracks.
April 2026	Academic Year updated and WSE Contacts updated to include Alison Morrow and Brendan Guerzon; links updated to advising resources; course title of EN.530.626 updated; new courses added to tracks and electives: EN.520.640 Machine Intelligence on Embedded Systems; EN.520.650 Machine Intelligence; EN.580.713 (01Translating Healthcare AI: Essential Concepts; EN.601.660 Embodied AI with Web-Scale Video Data; EN.601.673 Cognitive Artificial Intelligence; EN.601.683 Generative Vision: The Art and Science of Visual Synthesis; EN.601.697 Machine Learning: Reinforcement Learning; EN.601.698 Hands-on Robot Learning. Updates made to graduation and annual review processes. Affiliated faculty list and status updated.