

Comprehensive Requirements Guideline Mechanical Engineering Program Engineering for Professionals Johns Hopkins University

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Academic Advisor

Mohammad H. Rafiei, Ph.D.

mrafiei1@jhu.edu

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INTRODUCTION

My name is [Mohammad H. Rafiei, Ph.D.](#), and I am your [Academic Advisor](#) in the Engineering for Professionals (EP) Mechanical Engineering (ME) Program at Johns Hopkins University (JHU). Nice to meet you over this document! If you are just joining the Program, I extend a warm welcome to you! This is the beginning of an exciting academic journey!

Program ME has two Sub-Programs: ME Master of Science and ME Post-Mater's Certificate. Whether a Master of Science student or a Post-Mater's Certificate student, you must follow detailed guidelines to take proper steps. In this document, you will find these guidelines and how you should proceed to complete your journey at EP.

ABBREVIATIONS

The following abbreviations are frequently used in this document:

1. JHU: Johns Hopkins University
2. EP: Engineering for Professionals
3. ME: Mechanical Engineering

COMMUNICATION

Email is my preferred method of communication. My email address is mrafiei1@jhu.edu. When you email me, it helps a lot if you follow the following guideline: if your name is Jane Doe and this is Feb 5, 2023, and you have a request like "Need Signature," please title it as "AdvisingRequest-JaneDoe-230205-NeedSignature." This way, your emails go to a designated folder, which helps me not to miss it. I don't want to miss your email, so please follow this guideline!

JARGON, LINGO, COURSES, SPECIFICS, AND HEADS-UPS

Course Number and Title

Every course in EP has a number (e.g., EN.535.641) and a title (e.g., "Mathematical Methods for Engineers"). When a course number is "EN.535.641," the EN stands for Engineering, the 535 indicates the ME Program, and 641 is the course number. Well, 641 is called a 600-level course, and 742 is called a 700-course. When you pick/refer to a course in your communications/forms, please refer to the full course number and title correctly; for example, "EN.535.641 Mathematical Methods for Engineers."

Program

It is referred to as a major field in EP! For example, the ME, Civil Engineering, and Artificial Intelligence Programs. Well, you are in ME! Note that each EP Program usually has a few Sub-Programs, which are the kind of degree you are studying for. For example, ME Master of Science and ME Post-Mater's Certificate. Here is the list of all EP Programs as of **September 2023**:

1. [Applied and Computational Mathematics](#)
2. [Applied Biomedical Engineering](#)
3. [Applied Physics](#)
4. [Artificial Intelligence](#)
5. [Chemical and Biomolecular Engineering](#)
6. [Civil Engineering](#)
7. [Computer Science](#)
8. [Cybersecurity](#)
9. [Data Science](#)
10. [Electrical and Computer Engineering](#)
11. [Engineering Management](#)
12. [Environmental Engineering](#)
13. [Environmental Engineering and Science](#)
14. [Environmental Planning and Management](#)
15. [Financial Mathematics](#)
16. [Healthcare Systems Engineering](#)
17. [Information Systems Engineering](#)
18. [Materials Science and Engineering](#)
19. [Mechanical Engineering](#) (you are here!)
20. [Occupational and Environmental Hygiene](#)
21. [Robotics and Autonomous Systems](#)
22. [Space Systems Engineering](#)

23. [Systems Engineering](#)

[Focus Areas](#)

ME is a vast field with many courses to offer. You need to take a limited number of courses. We want you to have a focus area (based on your interest) where you take specific courses relevant to that area and some courses where you can touch other areas or even other EP [Programs](#) (the focus area selected does not appear as an official designation on your transcript). As of **June 2024**, the ME's [eight focus areas](#) are the following:

- Advanced Manufacturing
- Aerospace Engineering
- Biomechanical Engineering
- Fluid and Thermal Mechanics
- Hypersonic Technologies
- Ocean Engineering
- Robotics, Dynamics, and Controls
- Mechanics of Materials and Structures

[Program Options](#)

Students can choose one of two options to fulfill their ME master's degree requirements: the "All-Course" option or the "Thesis" option. You will find more details on each later in this document.

[Course Group 1](#)

This is the list of the [focus area](#)'s core courses; you must take two courses from this list during your study.

[Course Group 2](#)

This is the list of the [focus area](#)'s elective courses. You must take three courses from this list during your study.

[Recommended Courses](#)

These are a few ME [Program](#)'s (all [focus areas](#)) computationally oriented courses strongly recommended in place of at least one of the three required courses from Group 2.

[Non-Core Engineering Courses](#)

These are the courses in the following [Programs](#):

1. [Cybersecurity](#)
2. [Engineering Management](#)
3. [Environmental Planning and Management](#)
4. [Financial Mathematics](#)
5. [Healthcare Systems Engineering](#)
6. [Information Systems Engineering](#)
7. [Occupational and Environmental Hygiene](#)
8. [Space Systems Engineering](#)
9. [Systems Engineering](#)

[Core Engineering Courses](#)

These are courses under [Programs](#) other than [Non-Core Engineering Courses](#).

[Technical Electives](#)

A total of four courses from [Core Engineering Courses](#) and [Non-Core Engineering Courses](#). We will discuss more details later.

[Course Sections](#)

A course may have multiple sections; for example, our Math course, EN.535.641 "Mathematical Methods for Engineers" has a few sections usually based on the [focus areas](#). While taking the proper section is encouraged, attending a different section should be fine. Note that most of the EP courses usually have only one section.

[Program Options](#)

Students in the ME master's degree Program can choose one of two options to fulfill their master's degree requirements: the "All-Course" option or the "Thesis" option. I will explain these two options later.

Program Chair

[Jaafar A. El-Awady](#), Program Chair, Professor of ME, Whiting School of Engineering, JHU (jelawady@jhu.edu)

Academic Advisor

[Mohammad H. Rafiei, Ph.D.](#), Faculty of EP ME, Whiting School of Engineering, JHU (mrafiei1@jhu.edu)

Research Advisor

The [Research Advisor](#) can be any current [full-time faculty](#) member at the Department of ME at JHU. Prior written approval should be secured from the [Program Chair](#) if the [Research Advisor](#) will be a [Research staff member](#) at the JHU Applied Physics Laboratory or an [active instructor affiliated with the EP](#) ME.

Thesis Committee

It consists of the Thesis [Research Advisor](#) and one other member who is an expert in the Research area of the Thesis and is to be selected by the [Program Chair](#).

EP Forms

Please [click](#).

ME Catalog

Please [click](#).

Heads-up

You have a year from being accepted to start your first course; otherwise, you must reapply. You have five years from the start of your first class to complete your journey (courses, etc.).

ME MASTER OF SCIENCE

Your Very First Course

No matter which [Program Option](#) you are in, the very first course you should enroll in is the Math course, [EN.535.641, "Mathematical Methods for Engineers."](#) Math is vital in ME! We keep opening new sections in the required math course, so you should be able to enroll and not be on the waitlist. Reach out to the instructor and indicate what your [focus area](#) is. Ultimately, while taking the proper section is encouraged, attending a different section should be fine.

The Two Options

Students can choose one of two options to fulfill their master's degree requirements: the "All-Course" Option or the "Thesis" Option. The requirements for both options are summarized in this section.

All-Course Option - General

Students completing the "All-Course" option must take a coordinated sequence of ten courses. All courses must be completed within five years of the student's first class. Students are required to follow a [focus area](#). The [focus area](#) selected does not appear as an official designation on the student transcript. The curriculum consists of one core course in [mathematics](#), two core courses from [Group 1](#) and three other courses from [Group 2](#) of the student's chosen [focus area](#), and four [technical electives](#). At least two of the four electives must be from a [Core Engineering Discipline](#), and at most, two can be chosen from the [Non-Core Engineering courses](#). Courses from the ME Program may be substituted for a relevant requirement with the [Academic Advisor's](#) approval. One [computationally oriented](#) course is strongly recommended and can serve as a [technical elective](#) or a substitute for one of the three courses required from [Group 2](#) of the student's chosen [focus area](#). All course selections outside of the ME Program are subject to [Academic Advisor](#) approval.

Your Tasks in Semester 1 are:

1. Take the [math course](#).
2. Choose a [focus area](#).
3. Complete the [EP Student Academic Planning Checklists for ME](#) file and email it to your [Academic Advisor](#). You must fill out the [EP Student Academic Planning Checklists for ME](#) Excel file without changing its formatting; start by filling in the “FOCUS AREAS/CONC” highlighted area and type the exact title of your interest under the [focus area](#) (no abbreviation or change). Next, fill out the table similar to the examples below. Ensure the course numbering includes two three-digit numbers separated by a dot, for example, 535.641. **Do NOT include the section number**. Do not miss any field (all 10 fields must be filled up). Carefully review the examples in this document.

All-Course Option - General - Example

Here is an example of a course plan for a student with a [focus area](#) of “Robotic, Dynamics, and Controls:” This is basically the list of courses you are planning to complete within the guidelines above, and for each course, you have a semester to take it (check [here](#) to see when courses are offered). You may have a guess or a tentative date for courses in far future semesters. This will be adjusted eventually with your [Academic Advisor's](#) approval.

Math Core Course	535.641	Mathematical Methods for Engineers	Fall 2023
<i>Focus Area</i>	<i>Focus Area Courses</i>		
Group 1 Focus Area Course	525.609	Continuous Control Systems	Fall 2023
Group 1 Focus Area Course	535.630	Kinematics and Dynamics of Robots	Spring 2024
Group 2 Focus Area Course	535.741	Optimal Control and Reinforcement Learning	Spring 2024
Group 2 Focus Area Course	535.782	Haptic Applications	Summer 2024
Group 2 Focus Area Course	535.627	Computer-Aided Design	Fall 2024
<i>Technical Electives</i>	<i>Additional Classes</i>		
Technical Elective	585.617	Rehabilitation Engineering	Fall 2024
Technical Elective	535.742	Applied Machine Learning for ME	Spring 2025
Technical Elective	645.632	Applied Analytics for Model Based Systems Engineering.	Spring 2025
Technical Elective	645.780	Agile Systems Engineering	Summer 2025

All-Course Option - Research

One of the four elective courses can be substituted for EN.535.820 – “Masters Graduate Research.” This course is intended to give a Research experience to those pursuing an “All-Course” master’s degree. The Research must be approved by the student’s Research supervisor, which can be an [Academic Advisor](#), a current [full-time faculty](#) member at the Department of ME at JHU, a [research staff member](#) at the JHU Applied Physics Laboratory, or an active instructor affiliated with one of the Engineering for Professionals Programs. Prior written approval of the [Academic Advisor](#) and the [Program Chair](#) must be received before enrolling in this course. The approval form is [here](#).

An individually tailored, supervised project on a subject related to ME. The content and expectations are formalized in negotiations between the student and the faculty sponsor. This course may only be taken in the second half of a student’s master’s degree Program. All independent studies must be supervised by a current ME instructor (the ME [Program Chair](#) must approve exceptions) and must rely on material from prior ME courses. The independent study project proposal [form](#) must be approved before registration.

All-Course Option – Research -Example

Here is an example of a course plan for a student with a [focus area](#) of “Robotic, Dynamics, and Controls” that includes EN.535.820 – “Masters Graduate Research.”

Math Core Course	535.641	Mathematical Methods for Engineers	Fall 2023
<i>Focus Area</i>	<i>Focus Area Courses</i>		
Group 1 Focus Area Course	525.609	Continuous Control Systems	Fall 2023

Group 1 Focus Area Course	535.630	Kinematics and Dynamics of Robots	Spring 2024
Group 2 Focus Area Course	535.741	Optimal Control and Reinforcement Learning	Spring 2024
Group 2 Focus Area Course	535.782	Haptic Applications	Summer 2024
Group 2 Focus Area Course	535.627	Computer-Aided Design	Fall 2024
Technical Electives	<i>Additional Classes</i>		
Technical Elective	585.617	Rehabilitation Engineering	Fall 2024
Technical Elective	535.742	Applied Machine Learning for ME	Spring 2025
Technical Elective	645.632	Applied Analytics for Model Based Systems Engineering.	Spring 2025
Technical Elective	535.820	Masters Graduate Research	Summer 2025

All-Course Option – Grades

Only one C-range grade (C+, C, or C–) can count toward the Master’s degree.

Thesis Option - General

Students completing the “Thesis” option must take a coordinated sequence of eight courses and prepare and submit a Master’s Thesis. All requirements should be completed within five years. Students are required to choose a [focus area](#) to follow. The [focus area](#) selected does not appear as an official designation on the student transcript. The curriculum consists of one core course in [mathematics](#), two core courses from those listed in [Group 1](#) and three courses from [Group 2](#) of the student’s chosen [focus area](#), two [technical electives](#), and a Thesis. The Thesis should expand the body of theoretical or applied knowledge in the field of the student's chosen [focus area](#).

At least one of the two [electives](#) must be from a [Core Engineering Discipline](#), and at most, one can be chosen from [Non-Core Engineering Courses](#). Courses from the ME Program may be substituted for a relevant requirement with the [Academic Advisor](#)'s approval. One [computationally oriented](#) course is strongly recommended and can serve as a [technical elective](#) or as a substitute for one of the three courses required from [Group 2](#) of the student’s chosen [focus area](#). All course selections outside of the ME Program are subject to [Academic Advisor](#) approval.

Students electing to choose the Thesis option should get prior written approval from both their [Academic Advisor](#) and the [Program Chair](#) and must work with an approved [Research Advisor](#). An electronic version of the master Thesis should be delivered to the [Milton S. Eisenhower \(MSE\) library](#) after its approval by the [Thesis committee](#). The Research work should generally start after the student finishes all the course requirements for their chosen [focus area](#) and should not take more than 3 consecutive semesters. While working on the Thesis, students must enroll in the two-course sequence EN.535.820 - Master's Graduate Research and EN.535.821 - Master's Thesis Writing, where the [Research Advisor](#) serves as the instructor for both. The prerequisite for these courses is the completion of all course requirements in the student's [focus area](#) and the approval of the [Program Chair](#). The approval of the [Program Chair](#) follows the submission of a Research proposal by the student that is approved by their [Research Advisor](#). Hence, the student must contact a [Research Advisor](#) and discuss potential Research topics of interest to both parties, conduct a literature survey, and present a maximum of three-page Research proposal to be approved by the [Program Chair](#). The latest proposal can be submitted for consideration during the third to last semester of the [five-year limit](#).

Example of steps to complete the course plan for this option:

Your Tasks in Semester 1 are:

1. Take the [math course](#).
2. Choose a [focus area](#).
3. Complete the [EP Student Academic Planning Checklists for ME](#) file and email (mrafiei1@jhu.edu) it to your [Academic Advisor](#).

Your Tasks in Semester 3, assuming you completed all the course requirements for your chosen [focus area](#) in the first three semesters (these Tasks might change; always follow any direction/update given by the [Program Chair](#), your [Research Advisor](#), and your Academic Advisor)

1. Pick a topic of your interest for your Thesis.
2. Select a [Research Advisor](#) (you may need to contact the [Program Chair](#) to confirm your [Research Advisor](#) if they are not a full-time faculty at the JHU ME department; read more [here](#)) whose work is relevant to your research topic to some extent and email them to see if they are interested in working with you on your Thesis. You may adjust your topic to make sure the potential Research topics are of interest to both parties (i.e., you and your [Research Advisor](#)). Make sure you have confirmation from your [Research Advisor](#) on the topic.
3. Conduct a literature survey and develop a maximum of a three-page Research proposal under the supervision of your [Research Advisor](#). Your final Research proposal must be approved by your [Research Advisor](#). Make sure your [Research Advisor](#) confirms your Research.
4. Partially fill out the [Thesis/Research Project Approval Form](#) (the first three parts), sign it, and have it signed by your [Research Advisor](#).
5. Send an email to the [Program Chair](#) and your [Academic Advisor](#) with cc to your [Research Advisor](#), attaching your Research proposal and your partially completed [Thesis/Research Project Approval Form](#); in the email, please introduce yourself, indicate the two attachments, and ask for Thesis option approval and selection of the second member of your [Thesis Committee](#) member (remember the first committee member is your [Research Advisor](#)). Follow any direction given by the [Program Chair](#), your [Research Advisor](#), and your [Academic Advisor](#).

Thesis Option – General - Example

Here is an example of a course plan for a student with a [focus area](#) of “Robotic, Dynamics, and Controls:”

Math Core Course	535.641	Mathematical Methods for Engineers	Fall 2023
<i>Focus Area</i>	<i>Focus Area Courses</i>		
Group 1 Focus Area Course	525.609	Continuous Control Systems	Fall 2023
Group 1 Focus Area Course	535.630	Kinematics and Dynamics of Robots	Spring 2024
Group 2 Focus Area Course	535.741	Optimal Control and Reinforcement Learning	Spring 2024
Group 2 Focus Area Course	535.782	Haptic Applications	Summer 2024
Group 2 Focus Area Course	535.627	Computer-Aided Design	Fall 2024
<i>Technical Electives</i>	<i>Additional Classes</i>		
Technical Elective	535.742	Rehabilitation Engineering	Fall 2024
Technical Elective	585.617	Applied Machine Learning for ME	Spring 2025
Technical Elective/Thesis	EN.535.820	Master's Graduate Research	Spring 2025
Technical Elective/Thesis	EN.535.821	Master's Thesis Writing	Summer 2025

Thesis Option – Grades

Only one C-range grade (C+, C, or C–) can count toward the master’s degree.

POST-MASTER’S CERTIFICATE

Five courses must be completed within five years. At least four of the five courses must be from the ME Program, and at least two of the courses must be at the [700 level](#) (course number greater than 700). Certificate students may not enroll in graduate Research courses (EN.530.800, EN.535.820, EN.535.821).

Only grades of B– or above can count toward the post-master’s certificate. Courses from the full-time Program (530.xxx) may be substituted subject to [Academic Advisor](#) approval. [Focus areas](#) are not applicable to students pursuing certificates. Students are free to choose any five courses offered by the ME Program. All course selections outside of the ME Program are subject to [Academic Advisor](#) approval.