



JOHNS HOPKINS
UNIVERSITY

MSEM STUDENT GUIDEBOOK

The Center for Leadership Education
Master of Science in Engineering Management
Graduate Student Guide

2022 - 2023

Lindsey Menzies

Welcome & History of MSEM at JHU!

Welcome to the Master of Science in Engineering Management Program. This manual can help you plan a program of graduate study leading to the Master of Science in Engineering Management (MSEM) degree. Its pages are devoted to policies, rules, procedures, and suggestions that can be useful as you plan your studies. For your reference, please find our faculty and staff directory below. We are delighted to welcome you to the JHU MSEM cohort/family!

If you need additional information, or have any questions or concerns, please contact us at: msem@jhu.edu. Our offices are located on the Johns Hopkins University Homewood Campus in the Wyman Building, first floor for staff, and third floor for faculty. Our doors are always open for students! For information on the program, please peruse the MSEM website: <https://msem.engineering.jhu.edu/>

Upon arrival at Johns Hopkins University (JHU), please stop by the office and introduce yourself. We look forward to meeting you. At this time, we will also give you keys to the building, to the Suite and to the dedicated MSEM Lounge, specifically dedicated for your use and productivity (Wyman N115).

The History of MSEM at JHU:

The MSEM Program was sent to the Maryland Higher Education Commission (MHEC) in August 2008 and approved shortly thereafter. Our first students were accepted for the spring of 2009 and our first class of 13 students graduated in May 2010.

MSEM or MEM degrees are growing in popularity, but in 2009 only UMBC offered an Engineering Management degree locally. JHU MSEM was admitted to the Master of Engineering Management Programs Consortium (MEMPC) in 2016. Other members include Northwestern, Cornell, Dartmouth, Duke, Massachusetts Institute of Technology, Purdue, Tufts, and the University of Southern California.

In addition to our full-time, Homewood based program, the Whiting School of Engineering also offers a Master's in Engineering Management through the Engineering for Professionals Program; this program is part-time for working professionals and many of the courses are online.

MSEM began with 12 technical tracks (formerly concentrations) and we have added several additional tracks (Systems Engineering, Cybersecurity, Space Systems Engineering, Energy). We anticipate other tracks in the future, among them BME, Computational Medicine, Electrical Engineering, and Robotics.

Faculty and Staff Directory

Director of MSEM:

Pamela H. Sheff: Pamsheff@gmail.com

Associate Director of MSEM:

Trevor Mackesey: tmackes1@jhu.edu

Full-Time CLE Faculty:

Nusaybah Abu-Mulaweh: nabumul1@jhu.edu

Lawrence Aronhime: aronhime@jhu.edu

Alissa Burkholder Murphy: alissa@jhu.edu

MC Coghlan: mcoghla2@jhu.edu

Shadi Esnaashari: sesnaas1@jhu.edu

Joseph Forte: jforte8@jhu.edu

Jenna Frye: jfyre8@jhu.edu

Amanda Hilliard: ahillia5@jhu.edu

Illysa Izenberg: izenberg@jhu.edu

Leslie Kendrick: kendrick@jhu.edu

Annette Leps: aleps@jhu.edu

Rob Murray: rmurra30@jhu.edu

Julie Reiser: juliereiser@jhu.edu

Eric Rice: ericmrice@gmail.com

Andy Ross: aross55@jhu.edu

Mia Russell: mrusse29@jhu.edu

William Smedick: smedick@jhu.edu

Sarah Harrison Smith: ssmit263@jhu.edu

CLE Staff:

Carey Arkwright: carey.arkwright@jhu.edu

Administrative Coordinator, CLE

Cynthia Plain: cdohony1@jhu.edu

Administrative Manager, CLE

Lindsey Menzies: lconkli4@jhu.edu

Academic Program Administrator, CLE & MSEM

Emily Myrick: emyrick2@jhu.edu

Sr. Communications Specialist, CLE

Corale Roten: croten1@jhu.edu

Academic Program Coordinator

Management Course Requirements for Degree Completion

Course No.	Course Title	Semester/Year	Credits
662.611	Strategies: Accounting & Finance – <i>required cohort</i>	Fall	3
662.692	Strategies for Innovation & Growth– <i>required cohort</i>	Fall	3
663.618	Professional Presentations – <i>required cohort</i>	Fall	3
662.643	The Practice of Consulting – <i>required cohort</i>	Winter	1.5
663.660	Managing People/Resolving Conflict – <i>required cohort</i>	Spring	1.5
663.671	Leading Change – <i>required cohort</i>	Spring	1.5
663.xxx	Elective (one elective is required)	Elective	1.5
662.811 & 812	MSEM Seminar – <i>required cohort</i>	Fall & Spring	1

Students must take the following management & technical courses for degree completion:

- *Required:* five advanced courses (15 credits) in a declared technical track of engineering, or applied science. Typically, students begin by taking one technical course in the fall semester, two-three technical courses in the fall semester, and complete the technical requirement in their final fall semester.
- *Fall semester:* a cohort-based management curriculum consisting of four required courses:
 - Strategies: Accounting & Finance
 - Strategies: Innovation and Growth
 - Professional Presentations
 - MSEM Seminar
- *Immersion:* The Practice of Consulting during the January term.
- *Spring Semester:* Two-half semester courses and seminar:
 - Managing People and Resolving Conflicts
 - Leading Change
 - MSEM Seminar
- *Electives:* one required elective selected from the Professional Development Program modules. Students may choose as many electives as they can comfortably complete. In addition, 663.653 Innovation and Design also serves as a management elective, or as a course from the Technical Track (with the approval of your technical advisor). *Please note: Innovation and Design II does not count as a technical track in Computer Science, Operations Research, or Probability and Statistics.

○ Other Requirements

EP Courses: Interdivisional Course Registration

Students may need to register in another division. You must complete an [Interdivisional Course Registration](#) form (IDR) with approval from the EP instructor and the technical advisor. All requests must be submitted to the registrar: <https://support.sis.jhu.edu/case/>

The Whiting School of Engineering's (WSE) Engineering for Professionals (EP) program offers a variety of classroom and online courses. Depending on the policies of your technical track, you may count up to two EP courses toward your degree. For EP courses to count to the degree, they must receive approval from their technical track advisor. For more information, please refer to: <http://ep.jhu.edu>

Whiting School of Engineering Degree Requirements:

All Whiting School of Engineering master's degree candidates must meet the requirements found below:

- Every student must register for a minimum of two semesters as a full-time graduate student.
- Full time students are required to take a minimum of nine credits per semester.
- Every student must provide certification by a department or program committee that all departmental or committee requirements have been fulfilled.
- All courses applied to the master's degree must be at the 600-level or higher. 400-level courses require advisor approval (approvals must be sent to the MSEM program coordinator).
- Every student must earn the master's degree within five consecutive academic years (10 semesters). Only semesters during which a student has a university-approved leave of absence are exempt from the ten-semester limit.

Specific Requirements to MSEM:

- Candidates must complete all of the required courses.
- Only one C will apply toward the degree (no grade lower than a C will apply).
- All courses must be at the 600-level or higher (exceptions require advisor approval).
- Departments sponsoring technical tracks may impose stricter requirements for coursework with the track.
- With permission of the technical advisor, a JHU alumni, MSEM student may double-count **two** JHU courses or apply undergraduate or graduate courses taken at JHU, but not applied to a degree (in accordance with conditions in the [WSE Policy on Double-Counting Courses](#)).

Rules & Regulations

Academic Ethics & Responsible Conduct of Research (RCR):

Enrollment in the online tutorial, EN.500.603 Graduate Orientation and Academic Ethics, which instructs on academic and ethical responsibilities, is automatic. This 20-minute tutorial is mandatory and to be completed within the first eight weeks of the student's first semester. The WSE will notify new students when the course is available. You must also complete the RCR, AS.360.624 (online) or AS.360.625 (in-person). Find more [here](#).

Academic Probation:

Students who receive more than one C in the program will be placed on Academic Probation. The student will be required to meet with the director on a regular basis during the following semester and to replace the course in which he/she received the second C with another course. If the student receives an additional C, he/she is subject to dismissal from the program. Please find more on WSE Probation Policies [here](#).

General Graduate Student Policies:

Read more on General WSE Graduate Student policies [here](#).

Diversity Information:

Read more on diversity at JHU [here](#).

Dual Degrees:

JHU MSEM students may not enroll in another graduate program simultaneously. Students may have two tracks within MSEM, but may not begin another graduate program until the MSEM degree is complete. Combined students cannot complete their MSEM degree before obtaining their undergraduate degree.

Advising:

Students are required to obtain approval for all engineering track course choices from their technical advisor. The MSEM director, Pamela Sheff, Associate Director, Trevor Mackesey, or MSEM program administrator will advise students on management courses. Technical advisors will have the authority and responsibility of placing holds, releasing holds, and clearing students' technical courses for acceptance at the time of graduation. In order to allow flexibility within the tracks, advisors have the authority to approve changes and/or substitutions to any courses in their track that they deem acceptable and appropriate.

Graduation:

Students will receive individual course check-sheets for verification each semester. Track advisors will receive check-sheets for approval and signature in the weeks before graduation.

Academic Deadlines:

Students preparing to complete a degree program should email Lindsey Menzies to ensure that all necessary documentation has been complete and submitted prior to the academic deadlines. The deadlines usually fall within the following time periods:

- Fall – early October
- Spring – early March
- Summer – mid-July

Audit Courses:

Students changing a course from “audit” (students receives no letter grade) to “credit” (student receives letter grade) 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, in progress, or missing) to audit is not permissible at any time. Find more [here](#).

Status Changes:

Students can only switch to [part-time status](#) in their final semester with the approval of the program and OIS (when appropriate – students must complete the [reduced course load form](#))

MSEM Technical Tracks & Advisors

Department	Advisor & Email	Tracks
Applied Mathematics & Statistics	James Spall: jspall1@jhu.edu Amitabh Basu: abasu9@jhu.edu Zachary Lubberts: zlubber1@jhu.edu Donniell Fishkind: dfishki1@jhu.edu Daniel Naiman: dnaiman2@jhu.edu Beryl Castello: beryl.castello@jhu.edu Ben Grimmer: grimmer@jhu.edu Avanti Athreya: dathrey1@jhu.edu Fred Torcaso: fred.torcasi@jhu.edu Fadil Santosa: fsantos9@jhu.edu	Operations Research Probability & Statistics
Chemical & Biomolecular Engineering	John Edison: dayakaran@jhu.edu	Chemical & Biomolecular Engineering, Chemical Product Design
Civil & Systems Engineering	Thomas Gernay tgeray@jhu.edu	Civil Engineering
Computer Science	Russ Taylor rht@jhu.edu Kevin Duh kevinduh@cs.jhu.edu	Computer Science
Computer Science/Information Security Institute	Anton Dahbura antondahbura@jhu.edu	Cyber Security
Electrical & Computer Engineering	Mark Foster mark.foster@jhu.edu	Smart Product & Device Design
Environmental Health & Engineering	Benjamin Hobbs bhobbs@jhu.edu	Environmental Systems Analysis, Economics & Public Policy, Energy
Materials Science & Engineering	Timothy Weihs weihs@jhu.edu	Biomaterials, Materials Science & Engineering, Mechanics & Materials, Nano-Biotechnology, Nanomaterials & Nanotechnology
Mechanical Engineering	Gretar Tryggvason gtryggv1@jhu.edu	Fluid Mechanics, Mechanical Engineering,

Space Systems Engineering, Engineering for Professionals Program	Patrick Binning Patrick.binning@jhu.edu	Space Systems Engineering
Systems Engineering (Civil & Systems Engineering)	Gonzalo Pita gpita1@jhu.edu	Systems Engineering

MSEM Technical Track Requirements

15 credit minimum is required

Biomaterials: *(Sponsored by the Department of Materials Science & Engineering)*

Prerequisites: (5)

Undergraduate calculus, chemistry, biology, physics, and introductory biomaterials course equivalents to 510.316.

Required Courses: (3)

Approval of substitutions for required courses are at the discretion of the technical advisor.

510.606 Chemical and Biological Properties of Materials (PR: UG Chemistry & biology or permission)

510.607 Biomaterials II (PR: 510.606 Biomaterials I or equivalent)

510.621 Structure and Thermodynamics of Biomolecules

Electives: (2)

Electives should be related to Materials Science and Engineering and must be approved by the DMSE graduate committee.

List of Pre-Approved Electives:

Courses not on this list are at the advisor's discretion.

- 510.400 Introduction to Ceramics
- 510.402 Dynamics of Soft Materials
- 510.403 Materials Characterization
- 510.422 Micro- and Nano-structured Materials and Devices
- 510.426 Biomolecular Materials I – Soluble Proteins and Amphiphiles
- 510.428 Materials Science Laboratory I
- 510.429 Materials Science Laboratory II
- 510.430 Biomaterials Lab
- 500.619 Fundamental Physics and Chemistry of Nanomaterials
- 510.601 Structure of Materials
- 510.602 Thermodynamics of Materials
- 510.603 Phase Transformation of Materials
- 510.604 Mechanical Properties of Materials
- 510.605 Electronic, Optical and Magnetic Properties of Materials
- 510.607 Biomaterials II: Host Response and Biomaterials Applications
- 510.608 Electrochemistry
- 510.610 Fundamentals of Biomaterials
- 510.615 Physical Properties of Materials
- 510.621 Biomolecular Materials I - Soluble Proteins and Amphiphiles
- 510.622 Micro- and Nano-structured Materials and Devices
- 510.624 X-Ray Scattering, Diffraction and Imaging
- 510.630 Molecular Simulation of Materials
- 510.636 Biomaterials for Cell Engineering
- 510.640 Stealth Science & Engineering
- 510.643 Chemistry & Physics of Polymers

510.658 Electroanalytical Chemistry & Energy Conversion
510.665 Transmission Electron Microscopy Principle & Practice

Chemical & Biomolecular Engineering: (Sponsored by the Department of Chemical & Biomolecular Engineering)

Required Courses: (5) *must be 600-level

Approval of substitutions for required courses are at the discretion of the technical advisor.

Core Requirements:

1. EN.540.671 Advanced Thermodynamics in Practice
2. EN.540.604 Advanced Transport Phenomena in Practice
3. EN.540.673 Chemical Reaction Engineering in Practice**

****New policy change** regarding the Core 3 course requirement:

- **Effective for students entering Fall 2021 or later**, any of the following six courses can count towards Core 3, regardless of undergraduate background:
 - EN.540.673 Adv Chemical Reaction Eng in Practice (now to be held in Spring 2023 and future Springs)
 - EN.540.602 Metabolic Systems Biotechnology (typically held in Fall, not held Fall 2022)
 - EN.540.615 Interfacial Science w/ App to Nano Systems (typically held in Fall)
 - EN.540.632 Projects in Design: Pharmacokinetics (typically held in Fall)
 - EN.540.638 Adv Topics in Pharmacokinetics and Pharmacodynamics I (typically held in Spring)
 - EN.540.681 Molecular Kinetics and Catalysis (typically held in Spring)

Civil Engineering: *(Sponsored by the Department of Civil & Systems Engineering)*

Two Required Courses: (2)

- 560.604 Introduction to Solid Mechanics
- Either 560.619 Advanced Structural Analysis **OR** 565.616 Applied Finite Element Methods (online)
Applied Finite Element Methods

Substitutions for required courses can be made at the advisor's discretion.

Three Elective Courses: (3)

- One course from 560.6xx or above (excluding seminar)
- Any two courses from 560.6xx or above, or 565.6xx or above (excluding seminar)

Courses not on this list can be used at the advisor's discretion.

Chemical Product Design: (Sponsored by the Department of Chemical & Biomolecular Engineering)

Required Courses: (5) *must be 600-level

Approval of substitutions for required courses are at the discretion of the technical advisor.

Core Requirements:

4. EN.540.671 Advanced Thermodynamics in Practice
5. EN.540.604 Advanced Transport Phenomena in Practice
6. EN.540.673 Chemical Reaction Engineering in Practice**

****New policy change** regarding the Core 3 course requirement:

- **Effective for students entering Fall 2021 or later**, any of the following six courses can count towards Core 3, regardless of undergraduate background:
 - EN.540.673 Adv Chemical Reaction Eng in Practice (now to be held in Spring 2023 and future Springs)
 - EN.540.602 Metabolic Systems Biotechnology (typically held in Fall, not held Fall 2022)
 - EN.540.615 Interfacial Science w/ App to Nano Systems (typically held in Fall)
 - EN.540.632 Projects in Design: Pharmacokinetics (typically held in Fall)
 - EN.540.638 Adv Topics in Pharmacokinetics and Pharmacodynamics I (typically held in Spring)
 - EN.540.681 Molecular Kinetics and Catalysis (typically held in Spring)

Computer Science: *(Sponsored by the Department of Computer Science)*

The student must take **at least 5** courses to satisfy the technical coursework requirement. These courses may be distributed as follows:

- **At least 4** graduate-level CS courses
 - At least 3 must be taught by the WSE CS Department (course numbers 601.6xx, 601.7xx)
 - Please find the WSE CS Department course listing and syllabus here:
<https://www.cs.jhu.edu/academic-programs/undergraduate-studies/undergraduate-and-graduate-course-information/>

One course (605.6xx or 605.7xx) may be selected from a list of EP courses preapproved by the WSE CS Department. [Please find a list of pre-approved EP courses here.](#)

- **At most 1** graduate-level WSE elective course, with the approval of the CS advisor
 - The student must present a formal, written rationale for selecting any non-CS course, together with a copy of the course syllabus. The rationale should include a clear statement of the relationship to the student's career goals. It should also explain the computational aspects of the course.
 - The written rationale, syllabus, and advisor's approval will be kept with the student's MSEM records.
 - Approval is completely at the discretion of the CS advisor.
 - Approval of any individual student's elective course will not create a precedent guaranteeing that other students will be able to count the same course toward their 5 course requirement

Note: No more than three graduate-level courses may be taken in one semester by MSEM students in this track.

Also, EN.663.657 Innovation and Design II does not count toward the CS track.

Cybersecurity: *(Sponsored by the Department of Information Security Institute)*

Pre-Requisites:

Entering students are expected to have completed a program of study equivalent to that required by at least an undergraduate minor in computer science and a BS in computer science is recommended. Applicants from other disciplines must have coursework (or equivalent experience) in Computer Science Fundamentals, Programming, Data Structures and Discrete Math.

If the necessary background courses are lacking, students must take undergraduate courses to possess these prerequisites. These courses will not count toward the MSEM degree, but will appear on the transcript.

Required Courses:

Approval of substitutions for required courses are at the discretion of the technical advisor.

A combination of five graduate courses, 600-level or higher, are taken from the Information Security Institute required as below:

Two courses from the Core Technology and/or the Elective Technology courselists;
One Core Policy Course and one Core Management course;
The fifth course from any of the above course categories.

No more than three graduate-level courses by the Information Security Institute may be taken in one semester by an MSEM student in this track.

Energy: (Sponsored by the Department of Environmental Health & Engineering)

Required Courses:

Approval of substitutions for required courses are at the discretion of the technical advisor.

Energy Technology Group: choose at least 1

030.404 Electrochemical Systems for Energy Conversion and Storage
510.405 Materials Science of Energy Technologies
510.627 Photovoltaics and Energy Devices
540.619 Projects in Design: Alternative Energy
540.630 Thermodynamics, Statistical Mechanics and Kinetics

Systems Management Group: choose at least 1

520.629 Networked Dynamical Systems
530.664 Energy Systems Analysis
570.607 Energy Policy and Planning Models
570.697 Risk and Decision Analysis

Electives: (choose up to 3)

030.403 Optoelectronic Materials and Devices: Synthesis, Spectroscopy, and Applications
271.402 Water, Energy and Food
410.777 Biofuels
425.604 Energy and Climate Finance
420.616 Environmental Consequences of Conventional Energy Generation
425.601 Principles and Applications of Energy Technology
425.625 Solar Energy: Science, Technology and Policy
425.640 The Future of the US Electric System in a Carbon-Constrained World
530.629 Simulation and Analysis of Ocean Wave Energy Systems
570.657 Air Pollution
570.695 Environmental Health and Engineering Systems Design
615.448 Alternative Energy Technology
680.697 Global Energy Fundamentals
680.714 Energy, Environment and Development in Developing Countries
680.730 Global Electricity Markets
680.790 Principles of Energy Economics and Finance
680.792 The Water, Energy and Food Nexus
680.855 Life Cycle Assessment
680.852 Energy Poverty
810.761 Energy in the Americas: Conflict, Cooperation and Future Prospects

Other elective courses must be approved at the advisor's discretion.

Environmental Systems Analysis, Economics and Public Policy: (Sponsored by the Department of Environmental Health & Engineering)

Required Courses: (3)

Approval of substitutions for required courses are at the discretion of the technical advisor.

Economics (preferably with calculus). This requirement may be waived by their advisor if the student has already had an intermediate microeconomics course. A list of qualifying courses is available from the advisor.

Mathematics of Decision Making: EN.570695 Environmental Health and Engineering Systems Design

Policy & Design Making: EN.570.697 Risk and Decision Analysis

OR EN.570.607 Energy Policy and Planning Models

Electives: (4)

Courses not on this list are at the advisor's discretion.

570.496 Urban and Environmental Systems

570.618 Multiobjective Programming and Planning

570.676 Stochastic Programming

Other courses in Environmental Economics, Systems, or Policy, as approved by the advisor.

Additional Notes:

The student's advisor must approve all courses

All courses must be at the 600-level or above.

No more than one course in Environmental Engineering may be used to fulfill the track and only with careful consultation with the student's advisor.

Fluid Mechanics: *(Sponsored by the Department of Mechanical Engineering & the Department of Materials Science and Engineering)*

Required Courses: (5)

Approval of substitutions for required courses are at the discretion of the technical advisor.

Any five courses in Fluid Mechanics or closely related discipline, at the 600-level or higher, as approved by the Faculty advisor.

Materials Science & Engineering: *(Sponsored by the Department of Materials Science & Engineering)*

Pre-requisites: (3)

UG calculus, chemistry and physics; biology is recommended

Required Courses: (1)

Approval of substitutions for required courses are at the discretion of the technical advisor.

510.601 Structures of Materials (PR: UG calculus, chemistry and physics or permissions)

Electives: (4)

Electives related to Materials Science and Engineering are approved by the DMSE graduate committee. Approval of alternative courses are at the discretion of the advisor.

List of Pre-Approved Electives:

510.400 Introduction to Ceramics
510.403 Materials Characterization
510.405 Materials Science of Energy Technologies
510.422 Micro- and Nano-structured Materials and Devices
510.426 Biomolecular Materials I – Soluble Proteins and Amphiphiles
510.428 Materials Science Laboratory I
510.429 Materials Science Laboratory II
510.430 Biomaterials Lab
510.431 Biocompatibility of Materials
510.456 Introduction to Surface Science
500.619 Fundamental Physics and Chemistry of Nanomaterials
510.604 Mechanical Properties of Materials
510.605 Electronic, Optical and Magnetic Properties of Materials
510.606 Polymer Chemistry & Biology
510.607 Biomaterials II: Host Response and Biomaterials Applications
510.608 Electrochemistry
510.611 Solid State Physics
510.612 Solid State Physics
510.622 Micro- and Nano-structured Materials and Devices
510.624 X-Ray Scattering, Diffraction and Imaging
610.657 Transmission Electron Microscopy: Principle & Practice

Mechanical Engineering: *(Sponsored by the Department of Mechanical Engineering)*

Required Courses: (5)

Approval of substitutions for required courses are at the discretion of the technical advisor.

Any five courses in Mechanical Engineering, or closely related discipline at the 600-level or higher, as approved by the faculty advisor.

Mechanics and Materials: *(Sponsored jointly by the Department of Mechanical Engineering & the Department of Materials Science & Engineering)*

Required Courses: (3)

Approval of substitutions for required courses are at the discretion of the technical advisor.

510.601 Structure of Materials
510.604 Mechanical Properties of Materials
530.605 Mechanics of Solids & Materials

Electives: (2)

Alternative selections are at the discretion of the advisor.

Any two of the following courses, approved by the faculty advisor:

510.403 Materials Characterization
510.428 Materials Science Laboratory I
530.405 Mechanics of Advanced Engineering Structures
530.414 Computer-Aided Design
530.416 Advanced Mechanical Design
530.418 Aerospace Structures and Materials
530.454 Manufacturing Engineering
510.602 Thermodynamics of Materials
510.603 Phase Transformation of Materials
530.612 Computational Solid Mechanics

Nano-Biotechnology: (Sponsored by the Department of Materials Science & Engineering)

Pre-requisites: (5)

UG Calculus, Chemistry, Biology, Physics and Introductory Biomaterials course equivalent to 510.316.

Required Courses: (3)

Approval of substitutions for required courses are at the discretion of the technical advisor.

510.422 Micro and Nano Structured Materials and Devices

510.607 Biomaterials II: Host Response and Biomaterials Applications (PR: 510.316 Biomaterials I)

670.619 Biopolymers Synthesis

Electives: (2)

Electives should be related to Materials Science and Engineering and must be approved by the DMSE graduate committee.

Elective courses on the list below can be approved at the advisor's discretion.

List of Pre-approved Electives:

510.400 Introduction to Ceramics

510.403 Materials Characterization

510.405 Materials Physics

510.422 Micro-and Nano-structured Materials and Devices

510.426 Biomolecular Materials I – Soluble Proteins and Amphiphiles

510.428 Materials Science Laboratory I

510.429 Materials Science Laboratory II

510.430 Biomaterials Lab

510.431 Biocompatibility of Materials

510.456 Introduction to Surface Science

500.619 Fundamental Physics and Chemistry of Nanomaterials

510.604 Mechanical Properties of Materials

510.605 Electronic, Optical and Magnetic Properties of Materials

510.606 Polymer Chemistry & Biology

510.607 Biomaterials II: Host Response and Biomaterials Applications

510.608 Electrochemistry

510.611 Solid State Physics

510.612 Solid State Physics

510.622 Micro- and Nano-structured Materials and Devices

510.624 X-Ray Scattering, Diffraction and Imaging

610.657 Transmission Electron Microscopy: Principle & Practice

Nanomaterials and Nanotechnology: *(Sponsored by the Department of Materials Science & Engineering)*

Pre-requisites: (3)

UG Calculus, Chemistry, and, Physics.

Required Courses: (2)

Approval of substitutions for required courses are at the discretion of the technical advisor.

510.422 Micro and Nano Structured Materials and Devices

510.619 Biopolymers Synthesis

Electives: (3)

Electives should be related to Materials Science and Engineering and must be approved by the DMSE graduate committee.

Elective courses on the list below can be approved at the advisor's discretion.

List of Pre-approved Electives:

510.400 Introduction to Ceramics

510.403 Materials Characterization

510.405 Materials Physics

510.422 Micro-and Nano-structured Materials and Devices

510.426 Biomolecular Materials I – Soluble Proteins and Amphiphiles

510.428 Materials Science Laboratory I

510.429 Materials Science Laboratory II

510.430 Biomaterials Lab

510.431 Biocompatibility of Materials

510.456 Introduction to Surface Science

500.619 Fundamental Physics and Chemistry of Nanomaterials

510.604 Mechanical Properties of Materials

510.605 Electronic, Optical and Magnetic Properties of Materials

510.606 Polymer Chemistry & Biology

510.607 Biomaterials II: Host Response and Biomaterials Applications

510.608 Electrochemistry

510.611 Solid State Physics

510.612 Solid State Physics

510.622 Micro- and Nano-structured Materials and Devices

510.624 X-Ray Scattering, Diffraction and Imaging

610.657 Transmission Electron Microscopy: Principle & Practice

Operations Research: *(Sponsored by the Department of Applied Mathematics & Statistics)*

Any five (5) of the following courses, approved by the faculty advisor:

- 553.761 Nonlinear Optimization I
- 553.762 Nonlinear Optimization II
- 553.766 Combinatorial Optimization
- 570.697 Risk and Decision Analysis
- 570.608 Uncertainty Modeling for Policy & Management Decision Making
- 570.495 Mathematical Foundations for Public Decision Making
- 553.400 Mathematical Modeling and Consulting
- 570.693 Economic Foundations for Public Decision Making
- 570.696 Urban and Environmental Systems
- 570.607 Energy Planning and Policy Models
- 553.626 Introduction to Stochastic Processes
- 553.627 Stochastic Processes and Applications to Finance
- 553.628 Stochastic Processes and Applications to Finance
- 553.633 Monte Carlo Methods
- 553.663 Network Models in Operations Research
- 553.639. Time Series Analysis
- 553.641. Equity Markets and Quantitative Trading
- 553.642. Investment Science
- 553.644. Introduction to Financial Derivatives
- 553.645. Interest Rate and Credit Derivatives
- 553.646. Risk Measurement/Management in Financial Markets
- 553.647. Quantitative Portfolio Theory and Performance Analysis
- 553.648. Financial Engineering and Structured Products

Substitutions from this list can be made at the advisor's discretion.

Innovation and Design II does not count as a technical course for Operations Research.

Probability and Statistics: *(Sponsored by the Department of Applied Mathematics & Statistics)*

Admissions Requirements

One upper-division undergraduate course in probability and one in mathematical statistics (equivalent to 550.420 Introduction to Probability and 550.430 Introduction to Statistics).

Curricular Requirements

Any five (5) of the following courses, approved by the faculty advisor:

553.613 Applied Statistics and Data Analysis I
553.614 Applied Statistics and Data Analysis II
553.620 Introduction to Probability
553.626 Introduction to Stochastic Processes
553.627 Stochastic Processes and Applications to Finance I
553.628 Stochastic Processes and Applications to Finance II
553.629 Introduction to Research in Discrete Probability
553.630 Introduction to Statistics
553.632 Bayesian Statistics
553.633 Monte Carlo Methods
553.636 Introduction to Data Science
553.639 Time Series Analysis
553.688 Computing for Mathematics
553.692 Mathematical Biology
553.693 Mathematical Image Analysis
553.720 Probability Theory I
553.721 Probability Theory II
553.722 Introduction to Stochastic Calculus
553.723 Markov Chains
553.727 Large Deviation Theory
553.729 Topics in Probability: Random Graphs and Percolation
553.730 Statistical Theory I
553.731 Statistical Theory II
553.732 Bayesian Statistics
553.733 Advanced Topics in Bayesian Statistics
553.734 Introduction to Nonparametric Estimation
553.735 Topics in Statistical Pattern Recognition
553.736 System Identification and Likelihood Methods
553.737 Distribution-free Statistics and Resampling Methods
553.738 High-Dimensional Approximation, Probability and Statistical Learning
553.739 Statistical Pattern Recognition Theory & Methods
553.740 Machine Learning I
553.741 Machine Learning II
553.742 Statistical Inference on Graphs
AS.110.653 Stochastic Differential Equations: An Introduction with Applications

Substitutions for required courses can be made at the advisor's discretion.

Innovation and Design II does not count as a technical course for Probability and Statistics.

Smart Product and Device Design: (Sponsored jointly by the Department of Mechanical Engineering and Department of Electrical and Computer Engineering)

When electing a track in ECE, here are additional options as to what you can pursue:

Human Language Technologies

Computation and Bio Photonics

Microsystems and Computer Engineering

Machine Learning & Artificial Intelligence

Signal Processing & Sensory Processing

Required Courses: (3)

Approval of substitutions for required courses are at the discretion of the technical advisor.

530.414 Computer-Aided Design

OR

520.691 CAD Design of Digital VLSI Systems I

530.421 Mechatronics

OR

520.448 Electronics Design Lab

Elective Courses: (2)

Approval of substitutions for required courses are at the discretion of the technical advisor.

Any two related courses, approved by the faculty advisor.

Systems Engineering: (Sponsored by the Department of Civil & Systems Engineering)

Required Courses: (3)

Approval of substitutions for required courses are at the discretion of the technical advisor.

Two courses with course numbers from EN.560.640—EN.560.659 **OR** choose one from both.

Electives: (2)

Courses not on this list are at the advisor's discretion.

Three courses from any combination of the following:

560.6xx or above, or 565.4xx or above (excluding seminar)

645.6xx or above (EP Systems Engineering)

570.495 Mathematical Foundations for Public Decision Making

550.661 Foundations of Optimization

570.497 Risk and Decision Analysis

570.608 Uncertainty Modeling for Policy & Management Decision Making

550.400 Mathematical Modeling and Consulting

570.493 Economic Foundations for Public Decision Making

570.496 Math Models/Urban System

570.607 Energy Planning and Policy Modeling

**663.657 Innovation and Design II, if taken EN.663.653, and with advisor approval only.

*For systems engineering track students only: 605.607 Agile Software Development will count as a management elective.

Space Systems Engineering: (Sponsored by the Engineering for Professionals Program)

Required Courses: (2)

Approval of substitutions for required courses are at the discretion of the technical advisor.

675.600 Systems Engineering for Space

675.601 Fundamentals of Engineering Space Systems I

Electives: (3)

Courses not on this list are at the advisor's discretion.

Three courses from any combination of 675.xxx.

Resources for MSEM Students

Campus Map (Homewood)

<https://www.jhu.edu/maps-directions/>

Counseling Center

3003 N. Charles St., Homewood Apartments, Suite S-200

<https://studentaffairs.jhu.edu/counselingcenter/>

Disability Services

Garland Hall Room 385

<http://homewoodgrad.jhu.edu/student-services/disabilities-services-at-jhu/>

Graduate & Postdoctoral Affairs (Graduate Credits)

<http://homewoodgrad.jhu.edu/academics/wse-graduate-credit-hours/>

Health Insurance

<https://studentaffairs.jhu.edu/student-health/insurance/>

Housing

<https://studentaffairs.jhu.edu/community-living/offcampus/>

International Student Offices

Garland Hall, Room 385

http://ois.jhu.edu/Contact_Us/Homewood/index.html

IT

Garland Hall basement

<http://www.it.jhu.edu/>

Outreach and Support Case Manager for Graduate and Postdoctoral Affairs

[Allison Leventhal](#)

<http://homewoodgrad.jhu.edu/>

Recreation Center

Ralph S. O'Connor Recreation Center

<https://studentaffairs.jhu.edu/recreation/experiential-education/trips/backpacking-hiking/>

Registrar

75 Garland Hall (Basement)

<https://studentaffairs.jhu.edu/registrar/>

Safety & Security (410-516-7777)

3001 Remington Avenue

<http://security.jhu.edu/>

JH Shuttles

<http://ts.jhu.edu/Shuttles/>

Student Accounts (Billing)

Garland Hall, Suite B31 (Basement)

<https://studentaffairs.jhu.edu/student-accounts/>

Student Employment Services

Garland Hall, Suite 72 (Basement)

<https://studentaffairs.jhu.edu/studentemployment/>

Student Health & Wellness

1 E. 31st St

<https://studentaffairs.jhu.edu/student-health>

Tax Information

<https://studentaffairs.jhu.edu/student-accounts/tax-information/>

Transportation

<http://ts.jhu.edu/Shuttles/>

Whiting School of Engineering Dean

Dean ED Schlesinger

<https://engineering.jhu.edu/about/ed-schlesinger-benjamin-t-rome-dean/>

Whiting School of Engineering Asst. Dean for Engineering Educational Program Services

Christine Kavanagh

<http://homewoodgrad.jhu.edu/>

ZIP Cars

<http://ts.jhu.edu/Services/ZipCar/>

Academic Calendar

<https://registrar.jhu.edu/academic-calendar/2022-2023/>