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Welcome to the Master of Science in Engineering Management program!

We are very happy you have agreed to be the advisor for your department's MSEM technical track(s). The Master of Science in Engineering Management Program, or MSEM, is a cohort-based master’s program offered through the JHU Whiting School of Engineering. The program is designed to further engineering education while simultaneously providing preparation in management, leadership and communication as well as other skills required for professional success.

In the advisor’s role for your department’s MSEM(s), you will evaluate applications and determine if the applicant is qualified for acceptance in the specified track. If the student is accepted, you will meet with him/her during each semester to advise the student about appropriate track courses and course loads.

The MSEM Program requires five (5) track courses along with a suite of required management courses and electives. Please note the MSEM double counting policy: because there are only five technical courses in this program, students are allowed to double count up to TWO graduate-level courses for their technical track with their technical advisor’s approval. These must be JHU graduate level courses taken as an undergraduate, but not counted toward the bachelor’s degree.

Please refer to the guidebook for questions regarding the program, your role as an advisor, and course information.
Faculty and Staff Directory

Director: Pamela H. Sheff: pamsheff@gmail.com

Full-time Faculty:

Lawrence Aronhime: aronhime@jhu.edu
Jennifer Bernstein: jberns12@jhu.edu
Illysa Izenberg: izenberg@jhu.edu
Leslie Kendrick: kendrick@jhu.edu
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Julie Reiser: julieresier@jhu.edu
Eric Rice: ericmrice@gmail.com
Pamela Sheff: pamsheff@gmail.com
William Smedick: smedick@jhu.edu
Sarah Harrison Smith: sarah.harrison.smith@gmail.com

Program Coordinator: Lindsey Menzies
msem@jhu.edu
410-516-1108
### Management Course Requirements for Degree Completion

<table>
<thead>
<tr>
<th>Course No.</th>
<th>Course Title</th>
<th>Semester</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>662.611</td>
<td>Strategies: Accounting &amp; Finance – <em>required cohort</em></td>
<td>Fall</td>
<td>3</td>
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<tr>
<td>662.692</td>
<td>Strategies for Innovation &amp; Growth – <em>required cohort</em></td>
<td>Fall</td>
<td>3</td>
</tr>
<tr>
<td>663.618</td>
<td>Professional Presentations – <em>required cohort</em></td>
<td>Fall</td>
<td>3</td>
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<tr>
<td>662.643</td>
<td>The Practice of Consulting – <em>required cohort</em></td>
<td>Winter</td>
<td>1.5</td>
</tr>
<tr>
<td>663.660</td>
<td>Managing People/Resolving Conflict – <em>required cohort</em></td>
<td>Spring</td>
<td>1.5</td>
</tr>
<tr>
<td>663.671</td>
<td>Leading Change – <em>required cohort</em></td>
<td>Spring</td>
<td>1.5</td>
</tr>
<tr>
<td>662.802</td>
<td>MSEM Internship (optional)</td>
<td>Optional</td>
<td>3</td>
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<tr>
<td>663.xxx</td>
<td>Elective</td>
<td>Elective</td>
<td>1.5</td>
</tr>
<tr>
<td>663.653</td>
<td>Innovation and Entrepreneurship (elective)</td>
<td>Fall &amp; Spring</td>
<td>6</td>
</tr>
<tr>
<td>662.811/812</td>
<td>MSEM Seminar</td>
<td>Fall &amp; Spring</td>
<td>1</td>
</tr>
</tbody>
</table>

Students must take the following for degree completion:

- **Required**: five advanced courses in a declared technical area of engineering or applied science.
- **Fall semester**: a cohort-based management curriculum consisting of three required courses, plus the MSEM seminar:
  - Strategies in Accounting and Finance
  - Strategies for Innovation and Growth
  - Professional Presentations
- **Winter Intersession**: The Practice of Consulting
- **Spring Semester**: Two half-semester courses:
  - Managing People/Resolving Conflict
  - Leading Change
- **Electives**: two required electives, selected from an approved list of Professional Development Program seven-week modules, or the internship. Please note: students may choose as many electives as they can comfortably complete. In addition, the second semester of 663.653 Innovation and Entrepreneurship may serve as a Technical Track course with your approval. Students in the Civil Engineering track already have approval.
Notes on MSEM Courses:

**662.643: The Practice of Consulting**, a January Intersession course that enables students to put their management and engineering expertise to use in a real-world setting. Known in the program as the Immersion Experience, the course allows students to work intensively in teams on a client problem either in the US or abroad. Our students have worked in Israel, Honduras, Panama and Portugal. An additional partner, The Danish Technical University, will be a host in 2019.

Internship Guidelines:

The internship should meet the following criteria:

- A defined project or projects ideally including:
  - Interaction with a variety of people within or external to the organization or company
  - Guidance and input from a supervisor
  - Analysis and resolution of a problem or challenge
  - The Project should provide opportunities for students to observe organizational communication and processes
  - The Project should provide opportunities for students to receive both on-going feedback as well as a more formal end-of-experience evaluation
  - At least 8 weeks (generally 8-12 weeks) or longer and at least 320 hours in duration
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, resident graduate student.
- Full time students are required to take a minimum of 9 credits each semester.
- Every student must be registered in the semester that degree requirements are met.
- 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 graduate-level or higher. At their discretion, individual graduate departments may institute a higher course level as the minimum for their own students; sponsoring departments of our tracks may do the same.
- Every student must earn the master’s degree within 5 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; otherwise, all semesters from the beginning of the student’s graduate studies—whether the student is resident or not—count toward the ten semester limit.

MSEM Specific Degree Requirements:

- Candidates must complete all of the required courses.
- No grades lower than C may be applied to the degree.
- Only one C may be applied toward the degree.
- All courses must be at the 400-level or higher.
- Departments sponsoring technical tracks may impose stricter requirements for coursework within the track.
- With your permission, an MSEM student may double-count up to two JHU courses or apply undergraduate or graduate courses taken at JHU or elsewhere but not applied to a degree (in accordance with conditions in the WSE Policy on Double-Counting Courses).
Admissions Process:

- MSEM applicants will submit their applications via Slate through our MSEM website [http://msem.engineering.jhu.edu/](http://msem.engineering.jhu.edu/) **NOTE: Slate is new application system that will be in place for Fall 2019 applicants**
- Students must have or be in the process of earning an undergraduate engineering degree, or a STEM degree from an accredited school
- The Office of Graduate Admissions handles the application documents and usually will indicate on the student’s Slate page when they are received. Applications are also migrated to JH Box where our office reviews all students’ “combined folders” containing all documents.
- Students submit:
  - Application and application fee
  - Official GRE and TOEFL scores (JHU undergrads exempt from this requirement)
  - Official transcripts
  - Statement of Purpose
  - 3 letters of recommendation
  - Resume

Johns Hopkins undergraduates who apply to the program are not required to take the GRE. International Johns Hopkins undergraduates who apply to the program are not required to take the TOEFL.

International students must earn a minimum 100 internet-based TOEFL score OR score a minimum 7 on the IELTS.

The MSEM Admissions Committee reviews all completed applications and monitors both AY and JH Box to make sure the credentials have been received. While test scores and GPAs are important, we evaluate the entire application; letters of recommendation factor highly in the decision. Typically, GRE scores for accepted students are in the high 160’s for quantitative and high 150’s for verbal scores.

When an applicant has been accepted by us, we then forward a pdf of the combined student file for review and evaluation to you. After you review the application, please email the decision to us. Grad Admissions will then send the student the appropriate letter of acceptance or denial.
Advising:

Students who enroll are assigned an advisor by the Registrar. Students are required to clear all course choices for their technical courses with their technical advisor. The MSEM director, Pamela Sheff, and the MSEM coordinator, Lindsey Menzies, will advise students on their management courses. You, as the technical advisor, 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 they feel are appropriate and acceptable.

The program coordinator can release the advising hold if you wish.

Graduation:

Advisors will be sent MSEM Check Sheets for their advisees for approval and signature in the weeks before graduation. When returned to our office, they will be forwarded to the Dean’s office. We will make sure that students meet the requirements after the final grades are posted in SIS.
MSEM Technical Tracks & Advisors:

Currently our technical tracks and their sponsoring departments are:

<table>
<thead>
<tr>
<th>Department</th>
<th>Advisor &amp; Email</th>
<th>Tracks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Applied Mathematics</td>
<td>Amitabh Basu <a href="mailto:basu.amitabh@jhu.edu">basu.amitabh@jhu.edu</a></td>
<td>Operations Research Probability &amp; Statistics</td>
</tr>
<tr>
<td>Chemical &amp; Biomolecular Engineering</td>
<td>Marc Donohue <a href="mailto:mdd@jhu.edu">mdd@jhu.edu</a></td>
<td>Chemical &amp; Biomolecular Engineering Chemical Product Design</td>
</tr>
<tr>
<td>Chemical &amp; Biomolecular Engineering</td>
<td>Marc Donohue <a href="mailto:mdd@jhu.edu">mdd@jhu.edu</a></td>
<td>Chemical &amp; Biomolecular Engineering Chemical Product Design</td>
</tr>
<tr>
<td>Civil Engineering</td>
<td>Thomas Gernay <a href="mailto:tgernay@jhu.edu">tgernay@jhu.edu</a></td>
<td>Civil Engineering</td>
</tr>
<tr>
<td>Computer Science</td>
<td>Russ Taylor <a href="mailto:rht@jhu.edu">rht@jhu.edu</a></td>
<td>Computer Science</td>
</tr>
<tr>
<td>Cyber Security</td>
<td>Anton Dahbura <a href="mailto:antondahbura@jhu.edu">antondahbura@jhu.edu</a></td>
<td>Computer Science/Information Security Institute</td>
</tr>
<tr>
<td>Electrical &amp; Computer Engineering</td>
<td>Ralph Etienne Cummings <a href="mailto:retienne@jhu.edu">retienne@jhu.edu</a></td>
<td>Communications Science Smart Product &amp; Device Design</td>
</tr>
<tr>
<td>Geography &amp; Environmental Engineering</td>
<td>Benjamin Hobbs b <a href="mailto:hobbs@jhu.edu">hobbs@jhu.edu</a></td>
<td>Environmental Systems Analysis, Economics &amp; Public Policy</td>
</tr>
<tr>
<td>Materials Science &amp; Engineering</td>
<td>Timothy Weihs <a href="mailto:weihs@jhu.edu">weihs@jhu.edu</a></td>
<td>Biomaterials, Materials Science &amp; Engineering, Nano-Biotechnology, Nanomaterials &amp; Nanotechnology</td>
</tr>
<tr>
<td>Mechanical Engineering</td>
<td>Gretar Tryggvason <a href="mailto:gtryggv1@jhu.edu">gtryggv1@jhu.edu</a></td>
<td>Fluid Mechanics, Mechanical Engineering, Mechanics &amp; Materials</td>
</tr>
<tr>
<td>Space Systems Engineering</td>
<td>Patrick Binning <a href="mailto:Patrick.binning@jhu.edu">Patrick.binning@jhu.edu</a></td>
<td>Space Systems Engineering</td>
</tr>
</tbody>
</table>
MSEM Technical Track Requirements:

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

Prerequisites (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 advisor*
- 510.606 Chemical and Biological Properties of Materials (PR: UG chemistry and 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
- 510.403 Materials Characterization
- 510.405 Materials Physics
- 510.422 Micro- and Nano-structured Materials and Devices
- 510.426 Biomolecular Materials
- 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
2. **Chemical and Bimolecular Engineering** *(Sponsored by the Department of Chemical and Biomolecular Engineering)*

**Required Courses (3)**

*Substitutions for required courses can be made at the advisor’s discretion*

- 540.671 Advanced Thermodynamics in Practice
- 540.604 Advanced Chemical Reaction Engineering in Practice
- 540.673 Transport Phenomena in Practice

**Electives Courses (2)**

*Elective courses can be made at the advisor’s discretion*

- Any two courses from 540.6xx or above, or 545.6xx or above (excluding seminar)
- Other elective courses must be approved at the advisor’s discretion

3. **Civil Engineering** *(Sponsored by the Department of Civil Engineering)*

**Required Courses (3)**

*Approval of substitutions for required courses are at the discretion of the advisor*

- 560.604 Solid Mechanics for Structures
- 560.440 Applied Finite Methods
- **OR**
- 560.730 Finite Element Methods
Elective Courses (2)

*Alternative selections are at the discretion of the advisor.*

- Any two courses from 560.4xx or above, or 565.4xx or above (excluding seminar)
- One course from 560.6xx or 560.7xx (excluding seminar)

4. **Chemical Product Design** *(Sponsored by the Department of Chemical and Biomolecular Engineering)*

Required (2)
540.690 Product Design
540.691 Product Design

Elective Courses (3)
Two 540.6xx ChemBE courses
One Approved Elective in Engineering, Science, Math, Applied Math

5. **Communications Science** *(Sponsored by the Department of Electrical & Computer Engineering)*

Required Courses: (5)

A combination of five courses in communications and related fields from the list below. Approval of substitute courses are at the discretion of the advisors.

- 520.401 Basic Communications
- 520.410 Fiber Optics and Devices
- 520.435 Digital Signal Processing
- 520.447 Introduction to Information Theory & Coding
- 520.465 Digital Communications I
- 520.619 Optical Communications
- 520.645 Adaptive Filtering
- 520.646 Wavelets and Filter Banks
- 520.651 Random Signal Analysis
- 520.652 Filtering and Smoothing
- 520.666 Information Extraction
- 520.674 Information Theoretic Methods in Statistics
- 520.735 Sensory Information Processing
- 520.753 Free Space Optical Communications

Elective Courses (2)

Courses not listed below are approved at the advisor’s discretion.

Option #1: Geared toward those with interest in a broad range of communications
Any two (2) of the following courses, approved by the faculty advisor:
520.447 Information Theory and Coding
520.460 Error Control Coding
520.435 Digital Signal Processing
520.443 Digital Multimedia Coding and Processing

Option #2: Geared toward those with interest in optical communications
Any two (2) of the following courses, approved by the faculty advisor:
520.410 Fiber Optics and Devices
520.413 Introduction to Photonics
520.619 Optical Communications

6. Computer Science (Sponsored by the Department of Computer Science)

Prerequisites
- Entering students must have completed a program of study equivalent to that
  required by B.S. in Computer Science
- Applicants from other disciplines are required to have coursework (or equivalent
  experience) in intermediate programming (C++ and Java), data structures,
  automata theory, computer systems fundamentals and algorithms.

Required Courses (5)
Alternative selections are made at the advisor’s discretion.
- Any five regular graduate courses, 400-level or higher, from the Department of
  Computer Science, not including the senior thesis.
- MSEM students in this track may take no more than three graduate-level
  courses in one semester.

7. Cybersecurity (Sponsored by the 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 computer science
  BS is recommended.
- Applicants from other disciplines must have coursework (or equivalent experience) in
  Computer System 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.

Curricular Requirements (5):
• A combination of five graduate courses, 600-level or higher, are taken from the Information Security Institute required as below:
  o Two courses from the Core Technology and/or the Elective Technology course lists;
  o One Core Policy course and one Core Management course;
  o 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.

Alternative selections are allowed at the advisor’s discretion.

8. Fluid Mechanics (Sponsored by the Department of Mechanical Engineering and the Department of Materials Science and Engineering)

Required Courses (5)

Alternative selections can be made at the advisor’s discretion.
  • Any five courses in Fluid Mechanics, or closely related discipline, at the 400-level or higher, as approved by the Faculty advisor.
  • At least two of the required technical courses must be at the 600-level or higher.

9. Materials Science & Engineering (Sponsored by the Department of Materials Science & Engineering)

Prerequisites (3)
  • UG calculus, chemistry and physics; biology is recommended

Required Courses (1)

Approval of alternative course are at the discretion of the advisor.
  • 510.601 Structures of Materials (PR: UG calculus, chemistry and physics or permissions)

Electives (4)
  • Electives related to Materials Science and Engineering and 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 Physics
10. **Mechanical Engineering** *_(Sponsored by the Department of Mechanical Engineering)_*

**Required Courses (5)**

*Approval of alternative courses are at the discretion of the advisor.*

- Any five courses in Mechanical Engineering or closely related discipline at the 400 level or higher, as approved by the Faculty advisor.
- At least two of the required technical courses must be at the 600-level or higher.

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

**Required Courses (3)**

*Approval of alternative courses are at the discretion of the advisor.*

- 510.601 Structures of Materials
- 510.604 Mechanical Properties of Materials
- 530.602 Mechanics of Solids
Electives (2)
Approval of alternative courses are at the discretion of the advisor.

Any two (2) of the following courses, approved by the faculty advisor:
- 510.403  Materials Characterization
- 510.428  Materials Science Laboratory I
- 530.405  Mechanics of Solids and Structures
- 530.414  Computer-Aided Design
- 530.416  Advanced Mechanical Design
- 530.418  Aerospace Structures
- 530.454  Manufacturing Engineering
- 530.487  Introduction to Microelectromechanical Systems
- 510.602  Thermodynamics of Materials
- 510.603  Phase Transformations in Materials
- 530.612  Computational Solid Mechanics

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

Prerequisites (5)
- UG calculus, chemistry, biology, physics and introductory biomaterials course equivalent to 510.316

Required Courses (3)
Substitutions for required courses are at the advisor’s discretion.
- 510.422  Micro-and Nano-Structured Materials and Devices
- 510.607  Biomaterials II (PR: 510.316 - Biomaterials I or permission)
- 670.619  Fundamental Physics and Chemistry of Nanomaterials

Electives (2)
- Electives should be related to Materials Science and Engineering and must be approved by the DMSE graduate committee
- Elective courses not 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
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  Chemical and Biological Properties of Materials
510.607  Biomaterials II
510.608  Electrochemistry
510.611  Solid State Physics
510.612  Solid State Physics
510.617  Advanced Topics in Biomaterials
510.619  Biopolymer Synthesis
510.620  Amorphous and Nanocrystalline Metals
510.622  Micro- and Nano-Structured Materials and Devices
510.624  Theory of X-ray Diffraction
510.650  Principles of Quantum Physical Interactions
510.657  Materials Science of Thin Films

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

Prerequisites (3)
- UG calculus, chemistry, and physics

Required Courses (2)
*Approval of substitutions for required courses are made at the advisor’s discretion.*
- 510.422  Micro- and Nano-Structured Materials and Devices
- 500.619  Fundamental Physics and Chemistry of Nanomaterials (PR: Permission of the instructor)

Electives (3)
- Electives should be related to Materials Science and Engineering and must be approved by the DMSE graduate committee
- Courses not on this list can are 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
14. **Operations Research** *(Sponsored by the Department of Applied Mathematics & Statistics and Geography and Environmental Engineering)*

**Prerequisite (1)**
- Calculus-based background in Probability and Statistics. Students wishing to strengthen their background in this area may enroll in 550.420 (Probability) and/or 550.430 Statistics, but these courses may not be used in fulfillment of this track’s requirements.

**Required Courses (3)**
*Substitutions for required courses are at the advisor’s discretion.*
- 570.495 Mathematical Foundations for Public Decision Making
  - OR
- 570.497 Risk and Decision Analysis.
- 570.608 Uncertainty Modeling for Policy & Management Decision Making
  - OR

**Electives (2)**
*Courses not on this list are at the advisor’s discretion.*
- 570.493 Economic Foundations for Public Decision Making
• 570.496 Math Models/Urban System
• 570.607 Energy Planning and Policy Modeling
• 550.662 Optimization Algorithms
• 550.426 Stochastic Processes
• 550.427 Stochastic Processes in Finance
• 550.433 Monte Carlo Simulation
• 550.463 Network Models

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

Prerequisites (2)
- One upper-division undergraduate course in probability (equivalent to 550.420 Introduction to Probability)
- One upper-division undergraduate course in mathematical statistics (equivalent to 550.430 Introduction to Statistics)

Required Courses (5)
*Any five (5) of the following courses, or an elective approved by the discretion of the faculty advisor:*

- 550.413 Applied Statistics and Data Analysis
- 550.426 Introduction to Stochastic Processes
- 550.432 Linear Statistical Models
- 550.433 Monte Carlo Simulation and Reliability
- 550.434 Nonparametric and Robust Methods
- 550.435 Bioinformatics and Statistical Genetics
- 550.436 Data Mining
- 550.437 Information, Statistics, and Perception
- 550.438 Statistical Methods in Computer Intrusion Detection
- 550.439 Time Series Analysis
- 550.620 Probability Theory I
- 550.630 Statistical Theory I
- 550.631 Statistical Theory II
- 550.632 Multivariate Statistical Theory
- 550.633 Time Series Analysis
- 550.634 Nonparametric and Robust Inference
- 550.635 Topics in Bioinformatics
- 550.730 Topics in Statistics
Additional Requirements:

- An overall GPA of 3.0 must be maintained in courses used to meet the program’s technical requirements.
- At most, two course grades of C or C+ are allowed, and the rest of the course grades must be B- or better.
- Students must satisfy the department’s graduate student computing requirement.
- With advisor’s approval, one non-departmental course containing appropriate mathematical or statistical content can count to satisfy the five-course requirement.

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

Required Courses (3)
Substitutions for required courses can be made at the advisor’s discretion

- 530.414 Computer-Aided Design
  OR
- 520.491 CAD of Digital VLSI Systems
- 530.421 Mechatronics
  OR
- 520.448 Electronics Design Laboratory
  OR
- 530.487 Introduction to Microelectromechanical Systems

Electives (2)
Any two (2) related courses, approved by the faculty advisor.

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

Required Courses (3)
Approval of substitutions for required courses are at the advisor’s discretion.
At least one (1) course from each of the three following groups:

Economics (with calculus) - acceptable courses include:

- 570.493 Economic Foundations or equivalent. (This requirement may be waived if the student has already had an intermediate microeconomics course accepted by their advisor)

Mathematics of Decision Making - acceptable courses include:

- 570.495 Mathematical Foundations
  AND
- 570.497 Risk and Decision Analysis
**Policy** - acceptable courses include:
- 570.659 Environmental Policy Analysis

**Environmental Engineering** – acceptable courses include:
- 570.446 Biological Processes for Water and Wastewater Treatment
- 570.490 Solid Waste Engineering and Management
- 570.491 Hazardous Waste Engineering and Management
- 570.605 Water Resources Systems Engineering
- 570.647 Mass Transfer Processes in Environmental Engineering
- 570.657 Air Pollution, etc.

**Electives (2)**
*Courses not on this list are at advisor’s discretion.*
- 570.496 Mathematical Models for Managing Urban and Environmental Systems
- 570.618 Multi-objective Programming and Planning
- 570.676 Stochastic Programming

**Additional Notes:**
- The student’s advisor must approve all courses.
- All courses must be at the 400-level or above.
- No more than one course in environmental engineering may be used to fulfill the track and only with careful consideration with the student’s advisor.

**18. Systems Engineering (Sponsored by the Department of Systems Engineering)**

**Required (3)**
- Two courses with course numbers from EN.560.640—EN.560.659 OR choose one from both

**Electives (2)**
*Three courses from any combination of the following: Courses not on this list are at advisor’s discretion.*
- 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
• 663.653 Innovation and Entrepreneurship
• 663.657 Innovation and Entrepreneurship II

19. Space Systems Engineering:

Sponsored by the Engineering for Professionals Program.

Required Courses:

• 675.600 Systems Engineering for Space
• 675.601 Fundamentals of Engineering Space Systems I

Elective Courses

Three courses from any combination of 675.xxx

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

History of MSEM at JHU:

The Johns Hopkins Master of Science in Engineering Management (MSEM) Program was submitted to MHEC (Maryland Higher Education Commission) 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, Tufts, and the University of Southern California.
In addition to our full-time, Homewood based program, the Whiting School also offers a Master’s in Engineering Management through the Engineering for Professionals School; their program is part-time for working professionals and many of their courses are offered online.

MSEM began with 12 technical tracks (formerly concentrations), and we have added several additional tracks. More recently, we added Cybersecurity, Chemical Product Design, Space Systems Engineering and Systems Engineering.