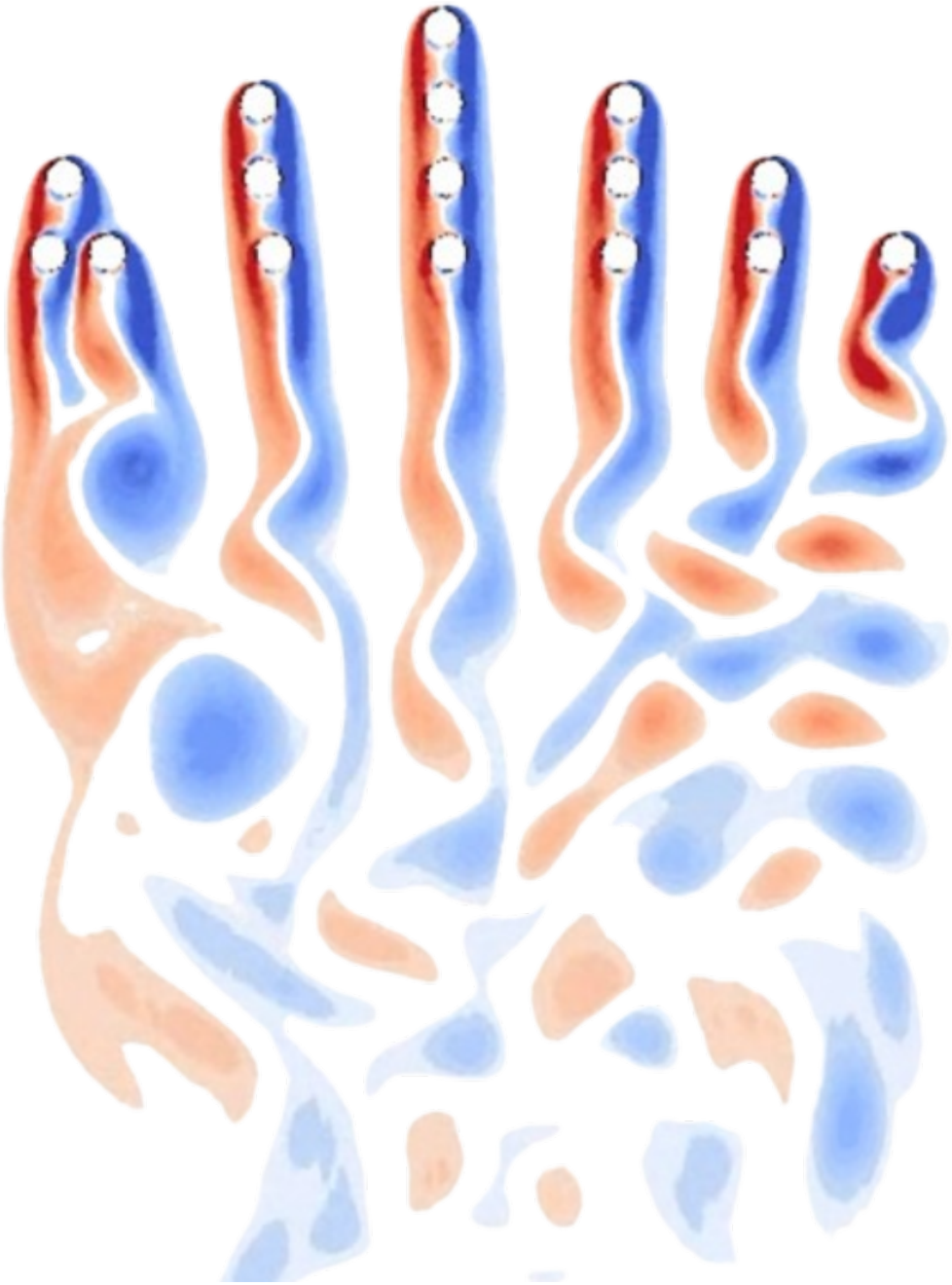
GRADUATE STUDENTS HANDBOOK



University of Massachusetts-Amherst

Department of Mechanical and Industrial Engineering

September 2024

Cover: Contribution to the Graduate Gallery Competition (2023)
by Daniela Caraeni (Advisor: Professor Yahya Modarres-Sadeghi)
Submissions for the 2024 competition are closed. Look out for announcements to send your 2025 contributions to Ms. Jennifer Blake: jblake@umass.edu. See Section 9 for details.

Contents

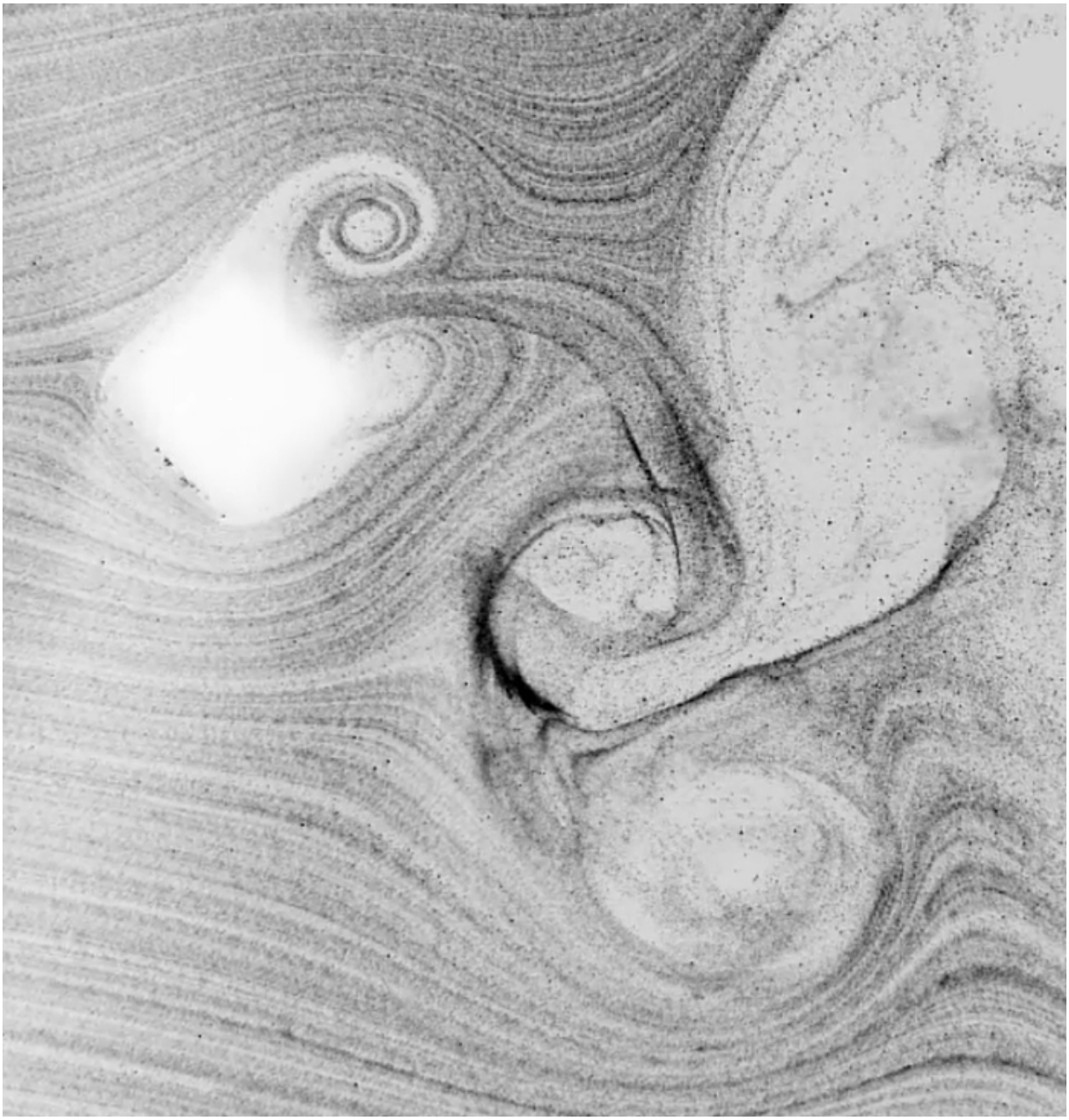


Image: Winner of Graduate Gallery Competition (2024)
by Sudhansh Tanneru (Advisor: Professor Yahya Modarres-Sadeghi)

1 WELCOME

Welcome to the Department of Mechanical and Industrial Engineering at the University of Massachusetts Amherst! We are thrilled that you have chosen to pursue your graduate studies with us. This *handbook* is designed to provide you with essential information about our department's regulations and policies for the graduate program. It is important that you *carefully review* this booklet, along with the Graduate Catalog and the "Graduate School Handbook." Our aim is to support you throughout your program, so please don't hesitate to reach out to your advisor or the Graduate Program Director (GPD), Professor Stephen S. Nonnenmann, or the Academic Advisor, Mr. Nauman Tazeem. if you have any questions or concerns. Remember, it is *your* responsibility to adhere to the guidelines set by the Graduate School and the Department. We wish you great success in your studies!

2 THE FIRST STEP FOR NEW STUDENTS

New students should regularly check their UMass email address for important messages pertaining to course enrollment, department announcements, degree requirements, etc. There is a mandatory orientation for all new graduate students in the MIE Department during the first week of classes.

Students should also familiarize themselves with the obligations to acknowledge their sources in all their class and research writing. Academic integrity requires that when we use the ideas or words of previous works, we use footnotes, endnotes, or quotation marks, as appropriate. At UMass, we must abide by the Code of Conduct which explicitly forbids plagiarism.

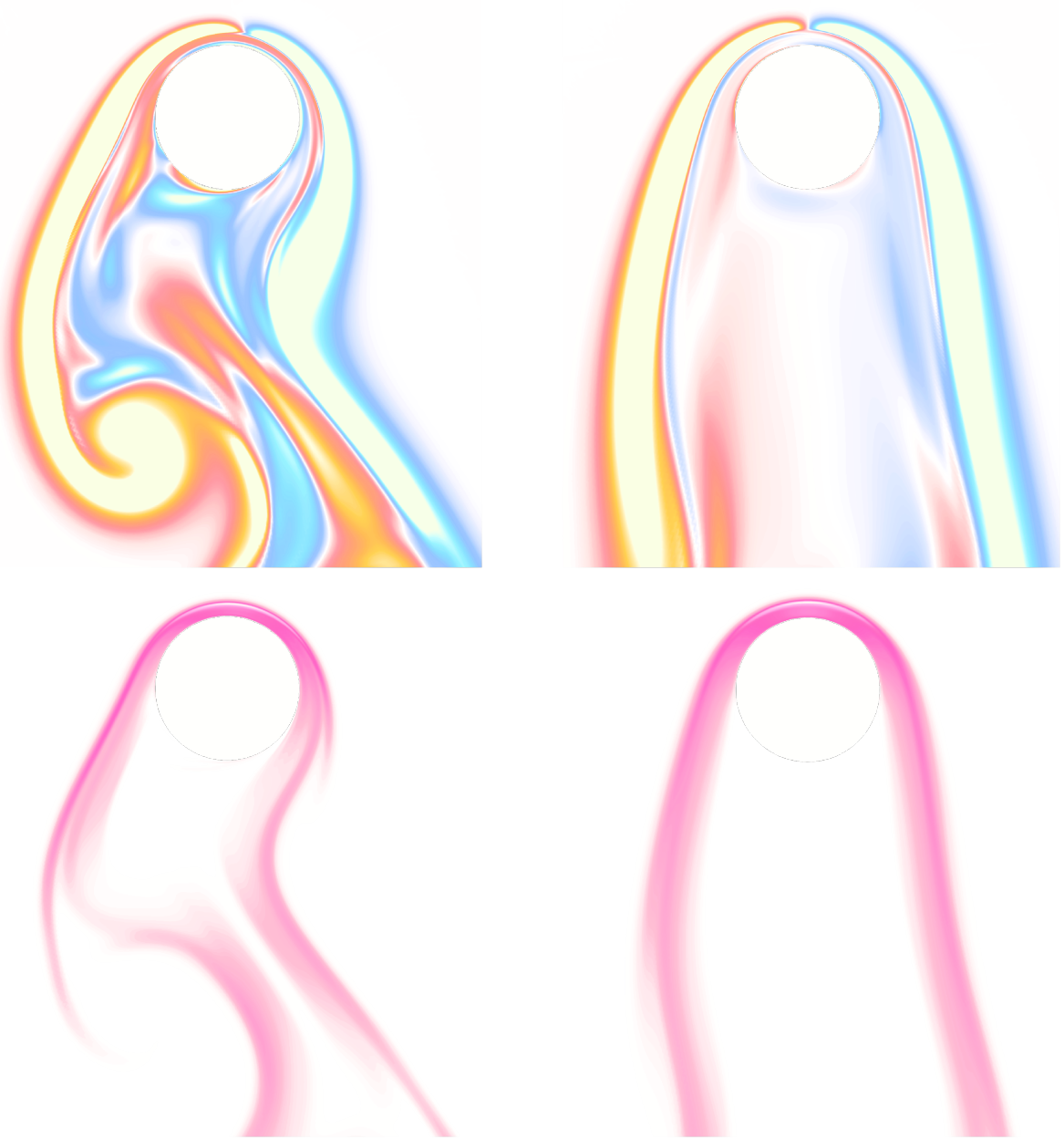


Image: Contribution to the Graduate Gallery Competition (2024)
by Umang Patel (Advisors: Professor Yahya Modarres-Sadeghi, Prof. Jonathan Rothstein)

3 ACADEMIC HONESTY

All students MUST read the Academic Honesty Guide for Students:

Examples for Plagiarism & Academic Dishonesty
from the "Academic Honesty Guide for Students":

- Copying 4+ words consecutively without using quotation marks or citing the source
- Summarizing or paraphrasing ideas or opinions without giving credit to the source
- Turning in the same work for more than one course without the consent of both instructors
- Purchasing, downloading, borrowing, reusing or hiring someone to do your work
- Using unauthorized materials or copying from another person during an exam
- Collaborating on work when you have been instructed to work independently
- Facilitating the academic dishonesty of another person

Good practices
from the "Academic Honesty Guide for Students":

- Read your syllabus carefully
- Ask for help or clarification if you have any questions or concerns
- Be clear on what is acceptable collaboration and what is not
- Do your own work and cite all your sources (this includes ChatGPT, Bard, & any AI tools)
- Protect your work

Read the complete document here.

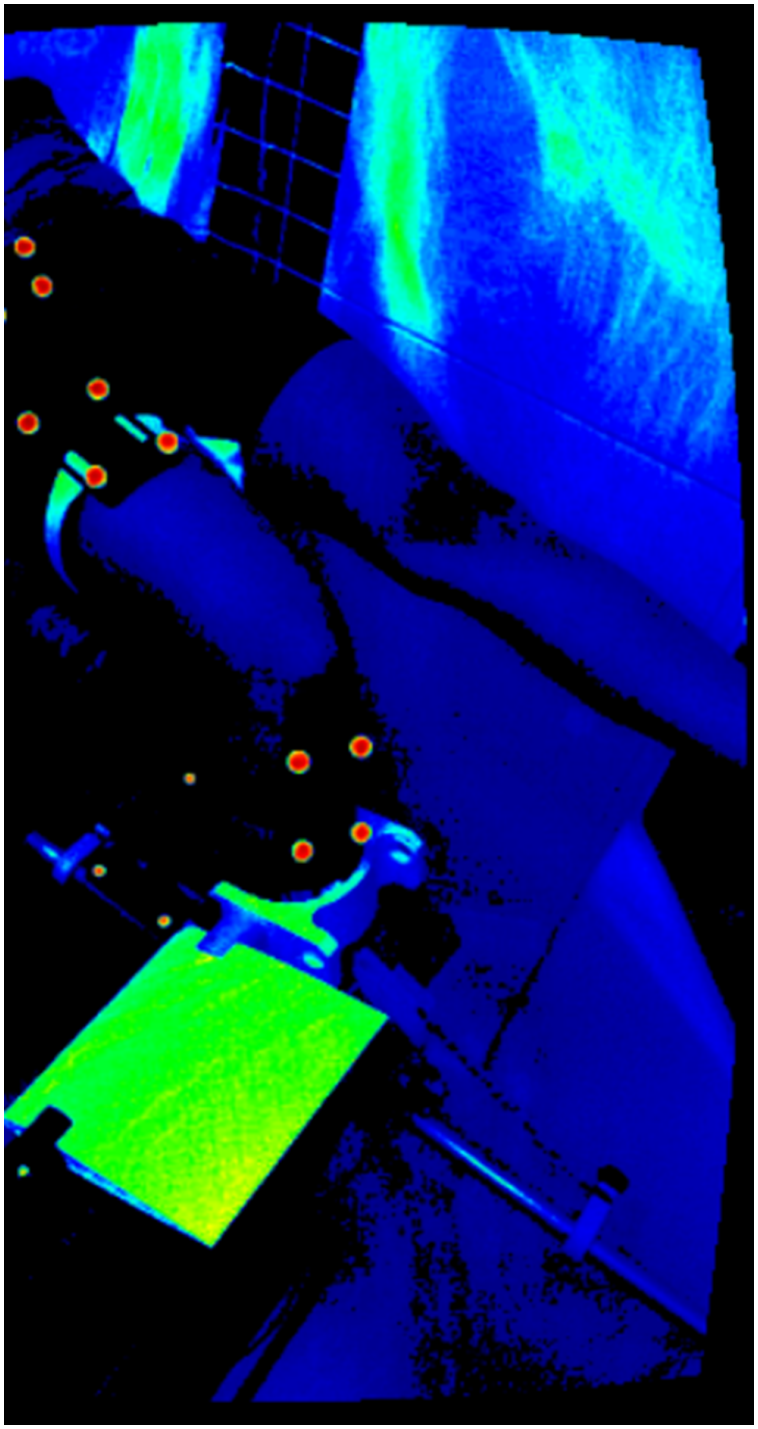


Image: Contribution to the Graduate Gallery Competition (2024)
by Rishiraj Bose (Advisor: Professor Frank Sup)

4 THE MASTERS PROGRAMS

4.1 Entrance Requirements

M.S. Degree Programs may be entered directly by qualified students with B.S. degrees from any engineering discipline, or materials, PHYS, or mathematics. Students with degrees in other disciplines should consult the Graduate Program Director for advice on preparing for graduate courses.

4.2 Course Requirements for a Master of Science in Mechanical Engineering

In addition to the Graduate School requirements stated in the Graduate School Catalog, all M.S. students in the Mechanical Engineering program are required to take a minimum of four (4) Mechanical Engineering courses at the 600 or higher level (if Thesis-Option) or seven (7) 600-level courses if Coursework-Only. Overall at least 21 credits at the 600-level are required. All MS-Thesis and PhD students must also register for the **ME Graduate Seminar Course: MIE 689** (*not required of coursework-only students*). *MIE courses; external courses; click on any of the **5 topic headings** for course names and details.

Mechanical and Industrial Engineering MS-ME Course Options				
Grad Courses (Choose 4 (Thesis-Option; 21 CR) or 10 (Coursework-Only; 30 CR)				
Thermofluids/Wind	**Bioengineering**	**Dynamics/Controls**	**Materials**	**Manufacturing**
click any link above for elective courses by topic area				

Coursework-Only	**Thesis-Option**
10 Classes Total (30 CR)	7 Classes Total (21 CR)
600-level (min 7; 21 CR); X first table, 3 second table	600-level (min 4; 12 CR); X first table; 3 second table
500-level (max 9 CR of 30 allowed); first table	500-level (max 9 CR of 21 allowed); first table
Independent Study (600-level; max 6 CR allowed); Optional	Thesis (9 CR); Required

Note Students may only take a maximum of *three* (3) **Industrial Engineering Courses** (coded in cyan) to count towards an MS-ME degree. See **Graduate Certificate Options**.

4.3 Course Requirements for a Master of Science Degree in Industrial Engineering and Operations Research

The MS in IEOR is a 30-credit program. The coursework only option consists of 10 courses, whereas the thesis option requires 7 courses and a 9-credit thesis. In addition to the Graduate School requirements stated in the Graduate School catalog, all master's students in the Industrial Engineering and Operations Research program are required to take the following seven courses:

Mandatory Courses	
MIE 620	Linear Programming
MIE 622	Predictive Analytics and Statistical Learning
MIE 684	Stochastic Processes in Industrial Engineering
Human Factors Track (Choose One)	
MIE 627	Research Methods
MIE 657	Human Factors Design Engineering
Decision Making Track (Choose One)	
MIE 654 or 754	Economic Decision Making for Engineers
MIE 686X	Multicriteria Decision Making and Analysis

Additional Courses (Choose Two)	
Optimization Track	
MIE 532	Network Optimization
MIE 624	Machine Learning for Dynamic Decision-Making
MIE 724	Non-Linear Programming
SCH-MGMT 752	Business Process Optimization
SCH-MGMT 797AE	Stochastic Models
Human Factors Track	
MIE 627	Research Methods
MIE 657	Human Factors Design Engineering
Production Track	
MIE 578	Supply Chain Logistics
MIE 651	Advanced Production Planning
MIE 553/653	Industrial Automation
MIE 659	Intelligent Manufacturing Systems
MIE 697Q	Logistics
SCH-MGMT 758	Supply Chain Management
Decision Making Track	
MIE 654 or 754	Economic Decision Making for Engineers
MIE 686X	Multicriteria Decision Making and Analysis
Analytics Track	
MIE 621	Descriptive Analytics
MIE 623	Prescriptive Analytics
MIE 524/624	Machine Learning for Dynamic Decision-Making
MIE 659	Intelligent Manufacturing Systems

All entering MS students who are planning to enroll in the Industrial Engineering and Operations Research program are expected to have successfully completed courses in linear algebra and probability and statistics. Entering MS students who have not taken a course at the undergraduate level covering these topics must get permission from the instructor of a required course to enroll. The instructor, at his or her discretion, may require that the student take a pre-requisite (e.g., Linear Algebra may be required as a pre-requisite for Linear Programming). This pre-requisite will not count for credit towards the graduate program requirements if it is an undergraduate level course. Those students who need make up courses should expect to take at least one additional semester to complete their graduate degree.

The remaining elective courses can be chosen from that list as well as a large array of courses offered across the university in consultation with a program advisor. Coursework only students can work on independent studies with faculty for up to 6 credits towards the MS IEOR degree. Finally, to complete all Graduate School and departmental requirements, at least 21 credits must be within the MIE Department and at least 21 credits (i.e., either 7 courses or thesis plus 4 courses) must be at the 600 level or higher. Pass/fail credits will not count towards degree completion.

4.4 Course Requirements for a Master of Science Degree in Engineering Management

The MS in Engineering Management is a 30-credit, 10-course program. In addition to the Graduate School requirements stated in the Graduate School Catalog, all M.S. in Engineering Management students are required to take the following courses:

Mandatory Courses	
MIE 622	Predictive Analytics and Statistical Learning
MIE 645	Project Budgeting and Finance for Engineers
MIE 670	Technical Project Management

Management Depth (Choose 2 courses at minimum)	
MIE 664	Engineering Leadership and Entrepreneurship
MIE 671	Product Management
MIE 672	Strategy-Driven Engineering Innovation
SCH-MGMT 636	Negotiations Theory and Practice
SCH-MGMT 783 / MIE 585	Business Law / Engineering Law and Ethics
Engineering/Analytics Depth (Choose 3 courses at minimum)	
MIE 532	Network Optimization
MIE 578	Supply Chain Logistics
MIE 621	Descriptive Analytics
MIE 623	Prescriptive Analytics
MIE 646	Introduction to Systems Engineering
MIE 651	Advanced Production Planning
MIE 654	Economic Decision Making I
MIE 754	Economic Decision Making II
MIE 657	Human Factors Design Engineering
MIE 686X	Multicriteria Decision Making and Decision Analysis
SCH-MGMT 602	Business Intelligence and Analytics

***Electives* (6 total credits)**

- Additional courses from the lists above
- Independent study guided by faculty advisor (*up to 6 credits*)
- Courses at the 500-level or higher within the student's STEM field
- or any of the following classes:

Mechanical & Industrial Engineering Courses	
MIE 524/624	Machine Learning for Dynamic Decision-Making
MIE 550/650	Vehicle Automation
MIE 553/653	Industrial Automation
MIE 565	Operations Research in Healthcare
MIE 573	Engineering Windpower Systems
MIE 620	Linear Programming
MIE 627	Research Methods
MIE 659	Intelligent Manufacturing Systems
MIE 684	Stochastic Processes
MIE 724	Non-Linear Programming
Isenberg School of Management Courses	
SCH-MGMT 601	Data Management for Business Leaders
SCH-MGMT 655	Data Mining
SCH-MGMT 660	Marketing Strategy
SCH-MGMT 670	Operations Management
SCH-MGMT 680	Leadership and Organizational Behavior
SCH-MGMT 697CA	Supply Chain Analytics
SCH-MGMT 752	Business Process Optimization
SCH-MGMT 758	Supply Chain Management

To complete the full program requirements, students must take at least five program courses from the MIE Department, and no more than three courses outside MIE and ISOM. Finally, the department requires 21 credits at the 600 level or higher and will not count any pass/fail credits towards the degree. Please contact Mr. Nauman Tazeem, Assistant Director of the MS-EM Program, with any questions.

4.4.1 Graduate Certificate Options

Within the 30 credits of MSEM studies, students can get certificate credentials along the way by choosing the appropriate sets of courses.

PML: Project Management and Leadership Certificate → 3 courses	
MIE 645	Project Budgeting and Finance for Engineers
MIE 664	Engineering Leadership and Entrepreneurship
MIE 670	Technical Project Management
DAN: Decision Analytics Certificate → 3 courses	
MIE 621	Descriptive Analytics
MIE 622	Predictive Analytics and Statistical Learning
MIE 623	Prescriptive Analytics

4.5 Course Requirements for a Master of Science Degree in Manufacturing Engineering

The MS in Manufacturing Engineering is a 30-credit, 10-course coursework only program. In addition to the Graduate School requirements stated in the Graduate School Catalog, all M.S. Manufacturing Engineering students are required to take the following courses:

Core Courses (12 CR)	
Industrial Engineering	
MIE 578	Supply Chain Logistics
MIE 651	Advanced Production Planning
Materials Science & Engineering	
MIE 608	Adv. Polymer Manufacturing
MIE 618	Additive Manufacturing
Industry 4.0	
MIE 553/653	Industrial Automation
MIE 643	Mechatronics
MIE 659	Intelligent Manufacturing
Elective Courses (18 CR)	
Mechatronics	
MIE 615	Robotics
MIE 685	Biorobotics
MIE 640	Introduction to MEMS & Microscience
MIE 690STB	Industrial 4.0 Technology & Systems
Materials Science & Engineering	
MIE 609	Mechanical Properties of Materials
MIE 611	Advanced Materials Characterization
MIE 614	Optical Engineering & Photonics
MIE 617	Computational Materials Science
Industrial Engineering	
MIE 556	Augmented and Virtual Reality Design
MIE 657	Human Factors Engineering
MIE 686X	Multicriteria Decision Making and Analysis
Engineering Management	
MIE 664	Engineering Leadership and Entrepreneurship
MIE 670	Technical Project Management
MIE 672	Strategy-Driven Engineering Innovation
Practicum (max 6 cr)	
MIE 698	Co-op/Practicum

Program Requirements Summary
10 Classes Total (30 CR)
600-level (min 7; 21 CR); X first table, 3 second table
500-level (max 9 CR of 30 allowed); first table
Independent Study (600-level; max 6 CR allowed); Optional

Note Students may only take a maximum of *three* (3) courses external to MIE to count towards an MS-Mfg degree. See **Graduate Certificate Options**.

4.6 Thesis Option or Coursework Only Option

Incoming students may choose one of the two options for earning their Master's of Science in Mechanical Engineering or Master's of Science in Industrial Engineering and Operations Research: (1) The Thesis option or the (2) Coursework Only option. Students must declare which option they are pursuing when applying to UMass. Students are not generally permitted to switch from one option to the other; they may only switch options with the permission of the MIE Graduate Program Director.

4.6.1 Thesis Option for both ME and IEOR

All M.S. students who choose the Thesis Option are required to plan and carry out a research, design, or development thesis (MIE 699) of nine credits, and 21 course credits.

M.S. - Thesis students in Mechanical Engineering must also enroll in the **1-cr 689 Graduate Seminar**.

As M.S. - Thesis students conduct research through MIE 699, independent studies do not count towards their remaining 7 courses (21 CR), rather can be taken in addition to coursework/thesis.

4.6.2 Master of Science in Mechanical Engineering, Coursework Only Option

The requirements of the Coursework option are:

1. The student must complete at least 30 graduate (500 level or above) credits. Thesis or project credits do not count towards this total.
2. At least 21 credits must be at the 600 level or above.
3. At least 21 credits must be Mechanical and Industrial Engineering courses.
4. A maximum of 6 credits can be for independent study. Find the form **here**.
5. The student must take at least four of the ME (not IE) courses at the 600-level or higher.

MS-coursework only students will NOT be considered for assistantships or tuition waivers.

4.6.3 Master of Science in Industrial Engineering & Operations Research, Coursework Only Option

The requirements of the Coursework Only option are:

1. The student must successfully complete at least 30 graduate (500 level or above) credits. Thesis or project credits do not count towards this total.
2. At least 21 credits must be at the 600 level or above.
3. At least 18 credits must be Mechanical and Industrial Engineering courses.
4. A maximum of 6 credits can be for independent study. Find the form **here**.
5. The student must take the seven named IEOR core courses required for the MS Thesis option.

Master's students who select the Coursework Only option will NOT be considered for assistantships or tuition waivers.

4.7 Minimum Required GPA

All students must maintain a minimum cumulative GPA of 3.0 or above to graduate.

4.8 Academic Dismissal

Per the **Graduate School Handbook**, "A graduate student who in any two semesters, consecutive or otherwise, has a GPA below 2.8 is subject to academic dismissal upon recommendation of the Graduate Program Director and approval by the Dean of the Graduate School."

4.9 M.S. Thesis

An M.S. Thesis may be a research, design or development project. A copy of the Thesis outline must be approved by the student's committee and put on file with the GPD and forwarded to the Graduate School at least four months prior to the defense. The thesis guidelines prepared by the **Graduate School Handbook** must be followed.

4.10 Thesis Defense

- Thesis Advisor: Students must connect with their research advisor in the first semester.
- Thesis Committee: The student and advisor select the graduate faculty committee for the thesis defense. These names and departmental info are sent to Nauman Tazeem to submit to the Dean of the Graduate School for approval. The thesis committee comprises:
  - at least two MIE faculty members
  - at least one "outside member", which are not in the MIE Department
  - more than 3 members are encouraged for optimal support and insights.
- Thesis Proposal: A thesis outline & proposal must be presented to the committee.
  - An oral presentation performed before the committee a min of 4 months prior to defense.
  - The committee must unanimously approve the proposal.
- Thesis Defense
  - Thesis Date: See the **Graduate School Handbook** for scheduling regulations.
  - Thesis Draft: The committee must receive the draft 14 days prior to the defense.
  - Oral Defense Notification: **Notice must be provided 7 days prior to the defense**.
  - Oral Defense: the defense must be held before the entire committee.
    - only a unanimous vote results in a pass

4.11 M.S. Thesis Timeline

A suggested timeline for M.S. Thesis. Some deadlines are firm; others are more flexible.

1. First Semester: Select Permanent Advisor
2. First Semester: Prepare Program of Study
3. End of First Year: Register for Thesis Credit
4. End of First Year: Select Thesis Committee
5. End of Second Year: Complete Required Courses
6. Four Months Prior to Defense: Thesis Proposal
7. Set the Date of Defense.
8. Two Weeks Prior to Defense: Deliver Thesis to Committee
9. Seven days before the defense, send Nauman Tazeem the defense details and abstract.

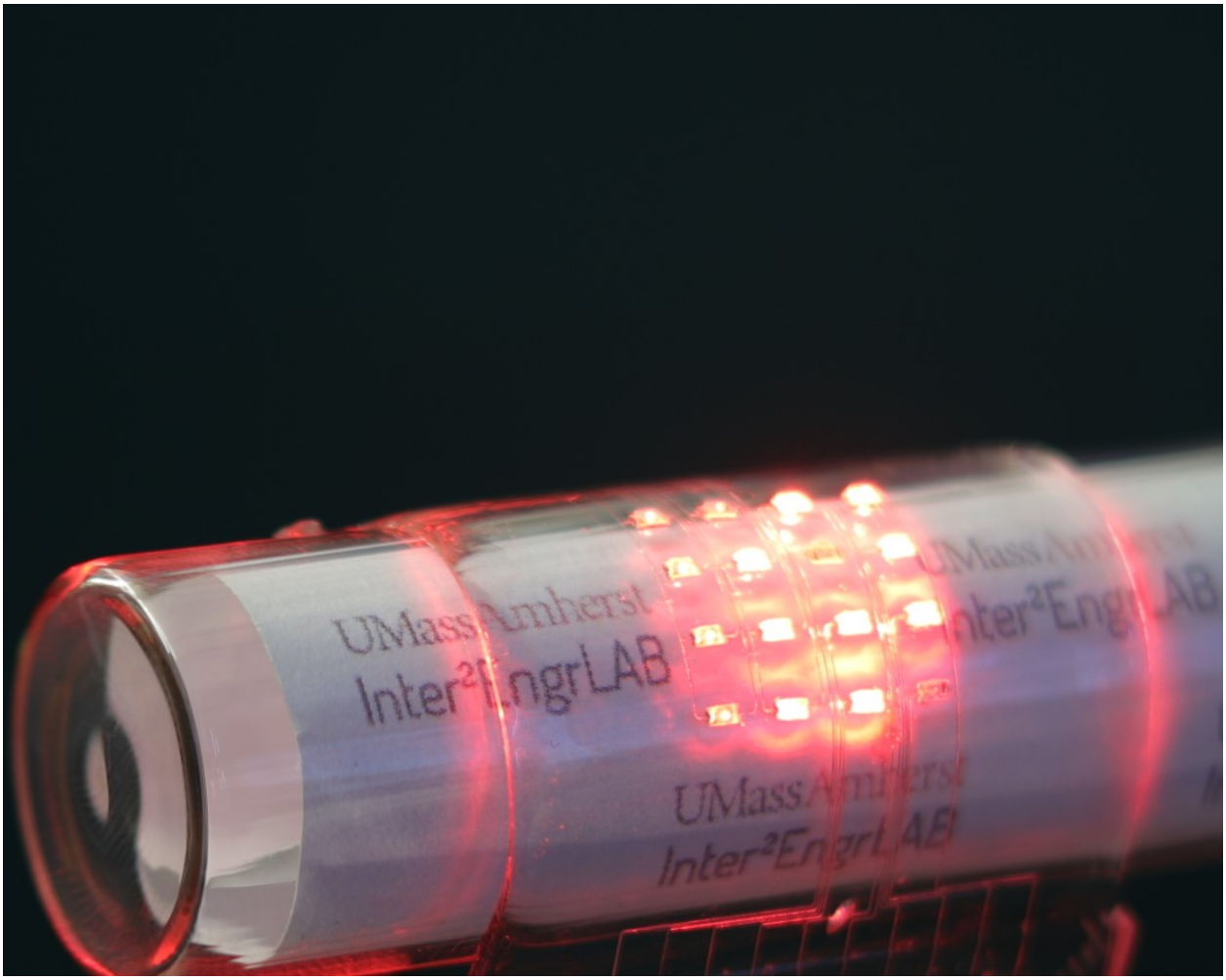


Image: A contribution to the Graduate Gallery Competition (2024)
by Kaushal Sumaria (Advisor: Professor Tingyi Leo Liu)

5 THE PH.D. PROGRAM

5.1 General Requirements

The Ph.D. program is intended to prepare the student for a research career in industry, academia or national laboratories. A dissertation, presenting significant new information, is the primary requirement of the degree. Other requirements for the Ph.D. degree include:

- A minimum of one academic year in residency. Residency is defined as one continuous academic year of full-time graduate work (9 credits per semester).
- A certification by the candidate's Guidance Committee that the candidate is qualified to pursue the Ph.D. degree.
- Successful completion of a preliminary comprehensive examination.
- An approved dissertation proposal.
- Completion of an approved course curriculum
- A Ph.D. dissertation.
- A final oral examination.

Additional University requirements are listed in the **Graduate School Handbook**.

Students considering a doctoral degree are strongly encouraged to obtain an M.S. degree in Mechanical or Industrial Engineering before attempting to establish candidacy in the Ph.D. program. Although this is not a requirement, experience indicates that previous research experience provides better preparation for Ph.D. dissertation work.

5.2 Graduate School Enrollment (Full-Time) Status

Full-time status as a graduate student is defined by the **Graduate School Policy** as:

- a graduate student is enrolled for nine (9) or more credits.
- candidates working full-time (20 hr/wk) GRA/GTA on contract (as certified by the GPD).
- candidates in continuous enrollment working *full-time* on their doctoral dissertation research, *regardless of their funding status.*
- a candidate defending their thesis/dissertation in their final semester.

5.3 Graduate School Residency Requirement

"A doctoral candidate must spend the equivalent of at least one continuous academic year of full-time graduate work (nine credits per semester) in residence at the University. The residency year must be either in a Fall/Spring or Spring/Fall sequence. During this year, the student must spend some part of each week physically on campus."

5.4 Curricular Components for Ph.D. Degree

The minimum course requirement for the Ph.D. degree is enrollment in 18 credits of MIE 899 (Doctoral Dissertation). Ph.D. students must also formulate a complete and coherent program of coursework approved by the student's Dissertation Committee and the GPD.

5.4.1 Ph.D. in ME

Approved programs must include at least 9 course credits beyond the requirements of M.S. Degree. All of the required courses must be at the 600 level. Students who do not hold a Masters degree will take a total of 30 credits which include the 9 PhD course credits. Students must also enroll in the **1-credit 689 Graduate Seminar**. Independent studies do not count towards 600-level course requirements for doctoral students.

5.4.2 Ph.D. in IEOR

Approved programs must include courses which have covered the material equivalent to that covered in the seven required courses for the M.S. degree in I.E.O.R. Normally, students receiving a master's degree in IE will have completed all required courses. To get program approval, all PhD students must draft a program proposal in consultation with the faculty advisor, who will get approval by the IE graduate program director. Syllabi and grades received for the courses taken must be provided. Independent studies do not count towards 600-level course requirements for doctoral students.

5.5 The MIE Ph.D. Qualifying (Preliminary Comprehensive) Exam

Each Student enrolled in the Ph.D. program must pass a qualifying exam prior to their fourth semester as a Ph.D. student. The purpose of the qualifying exam is to ensure that the student is qualified in both knowledge and critical thinking skills to pursue a Ph.D. in their field of study.

5.5.1 Format and Scope

See the **Qualifying Exam Section** for descriptions of the four possible formats of the qualifying exam. The format is established by the candidate's examining committee and the GPD to test general knowledge and critical thinking skills in their field of study.

5.5.2 Outcomes

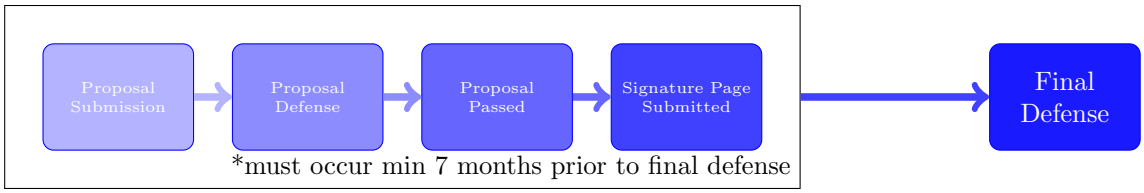
The three possible outcomes of the exam are:

- Pass: The committee confirms the student holds the skills requisite of doctoral studies.
- Conditional Pass: The student qualifies if they address areas of weakness found in the exam.
- Fail: The committee finds multiple areas of weakness; doctoral studies are not recommended.

Remediation plans may include coursework, independent study projects, and subsequent focused examination. A Conditional Pass converts to Pass upon completion of the remediation plan within the specified time. Otherwise, a Conditional Pass are converted to Fail. Students who fail their first exam attempt may petition the Graduate Program Committee to retake the exam.

5.6 MIE Ph.D. Dissertation

- Dissertation Committee: After passing the Qualifying Exam, the candidate and advisor select the graduate faculty committee for the dissertation defense. These names and departmental info are sent to Nauman Tazeem to submit to the Dean of the Graduate School for approval. The dissertation committee comprises:
  - at least two MIE faculty members
  - at least one "outside member" who is not in the MIE Department
  - more than 3 members are encouraged for optimal support and insights.



- Dissertation Proposal
- Written Proposal: A written proposal is submitted to the dissertation committee.
- Oral Presentation: The candidate presents their proposal before the committee.
  - The committee must unanimously approve the proposal.
  - The committee must all sign the proposal.
  - The signed proposal is submitted to Nauman Tazeem.
  - A request for formal appointment of the dissertation committee follows the proposal.
- These actions must take place seven (7 months) prior to the final oral examination.

- Dissertation Defense
- Dissertation Date: This **form** must be sent to Nauman Tazeem 30 days prior to defense.
- Dissertation Draft: The committee must receive the draft 14 days prior to the defense.
- Oral Defense Notification: Notice must be provided 7 days prior to the defense.
- Oral Defense: the defense must be held before the entire committee.
  - only a unanimous vote results in a pass
  - one negative vote results in the degree held in abeyance.
  - two negative votes results in a fail.

See the **Graduate School Handbook**. for detailed regulations on preparation and submission of the dissertation copies, payments of fees, etc.

5.7 Other Requirements and Procedures applicable to all PhD students

- New Ph.D. students without a GRA or research advisor will be assigned the GPD as a Temporary Advisor until a Dissertation Committee Chairperson has been determined. Students are urged to immediately explore dissertation research topics with the faculty.
- All ME doctoral students must register for the Graduate Seminar Course (689) and attend the Departmental Seminar Series and M.S./Ph.D. defenses regularly.
- Fellowship and Assistantship holders are expected to commit to their studies full-time and not hold other part-time jobs or be enrolled in another degree program. Students not supported by the Department are required to notify the Department of any part-time employment.
- A final copy of the dissertation must be given to the Department for the internal records.
- Students must send defense date details to Mr. Nauman Tazeem with at least 7 days notice so a public announcement is sent to the Department community. Any delays in this announcement will postpone the defense, as a strict 7 days notice is required.

5.8 Ph.D. Timeline

The following is the suggested timeline.

1. First Semester: Select Permanent Advisor
2. First Semester: Prepare Program of Study
3. End of First Year: Register for Dissertation Credits
4. End of First Year: Select Dissertation Committee
5. End of Second Year: Take Comprehensive Exam
6. AT LEAST Seven Months Prior to Defense: Dissertation Outline (2 years after the start for students without MSc, 1.5 years after the start for students with MSc)
7. Notify Graduate Program Office of Defense Date
8. Seven days before the defense, students must send Nauman Tazeem defense details and abstract.

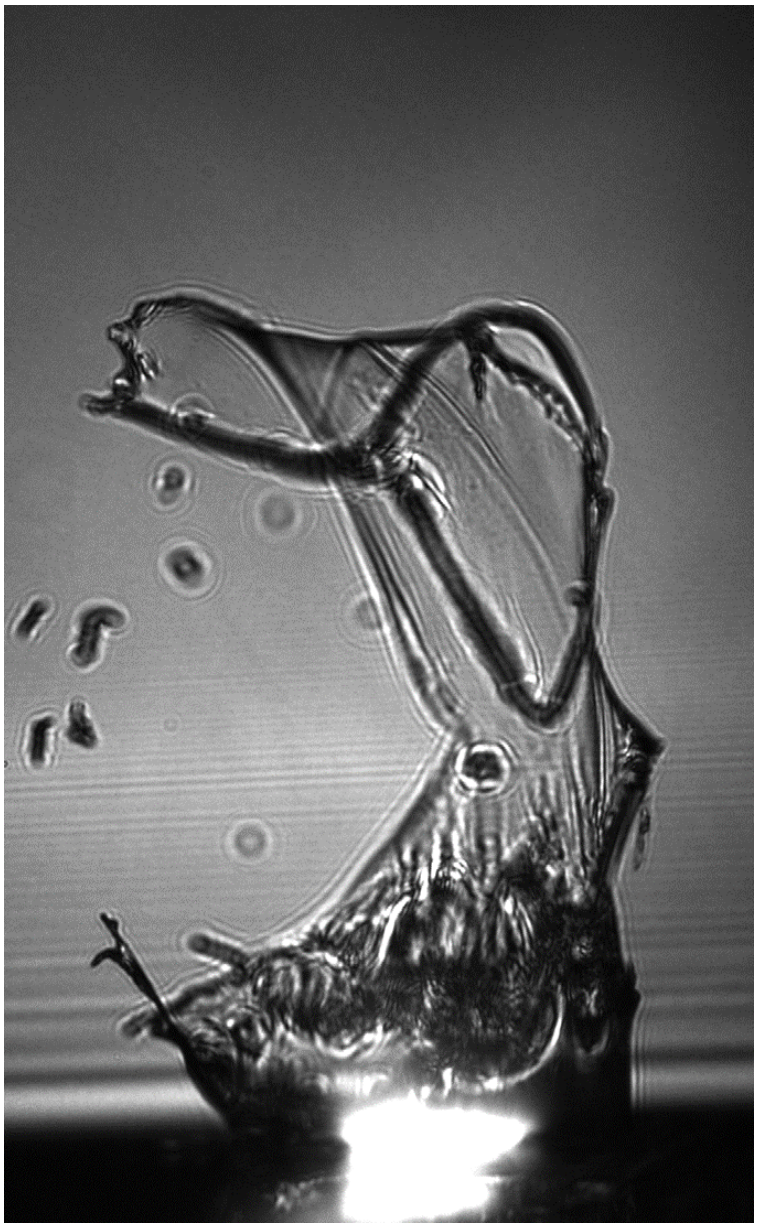


Image: Winner of the Graduate Gallery Competition (2024)
by Sacchita Tiwari (Advisor: Professor Jae-Hwang Lee)

6 GENERAL INFORMATION FOR THESIS-OPTION MS AND ALL PHD STUDENTS

6.1 Other Requirements and Procedures

1. Students must ideally select a permanent thesis advisor before registering for classes for the first time. A student arriving with support in the form of a research assistantship will have their project director as their thesis committee chairperson and also their advisor. Other students with fellowship support or teaching assistantship or non-supported students should find a permanent thesis advisor within two months and in no case later than the end of their first semester. The GPD may act as a temporary advisor for new students who have not yet found a permanent advisor before first time registration. Registration must always have the approval of the student's advisor.

   General information about the faculty and their research interests can be found on the Department's website.
2. Students are expected to prepare a coherent program of study during the first semester and before pre-registration for the second semester. This program of study should be approved by the student's advisor in consultation with the members of their M.S. committee. Curriculum programs which deviate from requirements specified herein must be approved in writing by the GPD and recorded on the student's curriculum form. The M.S. Thesis Committee members are selected by the student with advice and approval of the Committee Chairperson and the GPD. The Committees shall consist of three members of the Graduate Faculty, at least two of whom must be regular MIE faculty and at least one of whom must be outside the immediate area of specialization of the thesis. Thesis committee members must agree to serve before they are appointed to the committee.
3. Advisors will normally require that students register for three credits of Thesis in their first or second semester. Teaching Assistants may not register for more than a total of thirteen credits per semester.
4. A copy of a thesis outline must be approved by the student's committee and must be put on file in the Department office at least four months prior to the Thesis defense. The thesis outline must also be put on file in the Graduate School Office (see the Graduate School Handbook).
5. ASSISTANTSHIP AND FELLOWSHIP HOLDERS ARE NOT PERMITTED TO HOLD OTHER PART-TIME JOBS OR TO BE SIMULTANEOUSLY ENROLLED IN ANOTHER DEGREE PROGRAM WITHOUT THE WRITTEN PERMISSION OF THEIR ACADEMIC ADVISOR AND THE GPD. Students not supported by the Department or University are required to notify their advisors and the GPD of any part-time employment.

6.2 Role of the Graduate Committees

The MIE Graduate Committee, chaired by the GPD, administers all MIE Graduate Degree Programs. Subject to final approval by the Department Head, the Graduate Committee is responsible for all aspects of the graduate programs and approves plans of study, Dissertation Committee appointments, recommendations for degrees, etc. Advisors and Dissertation Committees are subordinate to the Graduate Committee though it is rare that the recommendations of the Advisor and Dissertation Committee are not accepted.

6.3 Graduate Teaching Assistants

Subject to the availability of qualified applicants, all graduate teaching assistantships (GTAs) are offered to Ph.D. students only. Graduate teaching assistantships are offered not only to fulfill immediate departmental needs, but also to advance the degree programs of graduate students and the teaching needs of the Department. Students who have appointments as GTAs will be assigned duties by the Department Head. This work will normally require between 10 and 20 hours of work each week. It is the policy of this Department not to renew teaching assistantships beyond the time period stated in the initial contract. All additional financial support is generally provided by a student's academic advisor, or through fellowships.

6.4 Graduate Research Assistants

All applicants for admission to the graduate program in MIE are automatically considered for teaching and research assistantships in the Department. Each applicant's qualifications are first reviewed by the Graduate Committee. The Graduate Committee then submits the application forms for the top candidates for further review by individual faculty members whose interests most closely parallel those of the applicants. The decision to offer a research assistantship is made by individual faculty members and is based upon the availability of funds and the qualifications of each applicant. The stipends received for this work vary with the type of work, the amount of time involved and the availability of funds. These details are normally worked out between the student and their advisor, and generally exclude the possibility of the student taking any part-time or full-time consulting jobs.

The topic or program of the GRA work will usually coincide with that of the student's thesis or dissertation, so the project's Principal Investigator will automatically assume the role of the student's advisor as well.

Continuation of the research assistantship is based upon the continued availability of funds and satisfactory performance by the student in both research and course work.

Graduate students who are already in the program and who do not have a research assistantship are encouraged to contact individual faculty members whose interests closely parallel those of the student and inform them of their interests and availability. The decision to offer an assistantship to a student always rests with the faculty member.

For timely completion of degrees, it is essential to follow the Graduate School's policies and deadlines. The table below outlines the required actions, timelines, and deadlines:

Action	**Timeline**	**Deadline**
Sign forms in black ink	—	Before submission to the Graduate School
GPD & Graduate School approves committee	—	Before the committee is official
Submit approved thesis/dissertation outline to the Graduate School	At least 7 months prior to final PhD oral exam	—
Submit approved thesis/dissertation outline to the Graduate School	At least 4 months prior to MS thesis defense	—

It is the student's responsibility to ensure that all memos and forms are sent to both the department and the Graduate School website.

M.S. Programs

For M.S. programs, follow these steps:

- Obtain a Masters Graduation Eligibility Form from the Graduate School website.
- Complete the form and submit it to the Graduate Program Office (ELAB 208F) for approval.
- Note that the form will only be accepted upon approval of the original M.S. thesis by all committee members.

Ph.D Program

For Ph.D. programs, follow the steps outlined for M.S. programs above. Additionally, complete any additional forms required by the Graduate School. These forms can be found at the Graduate School's website.

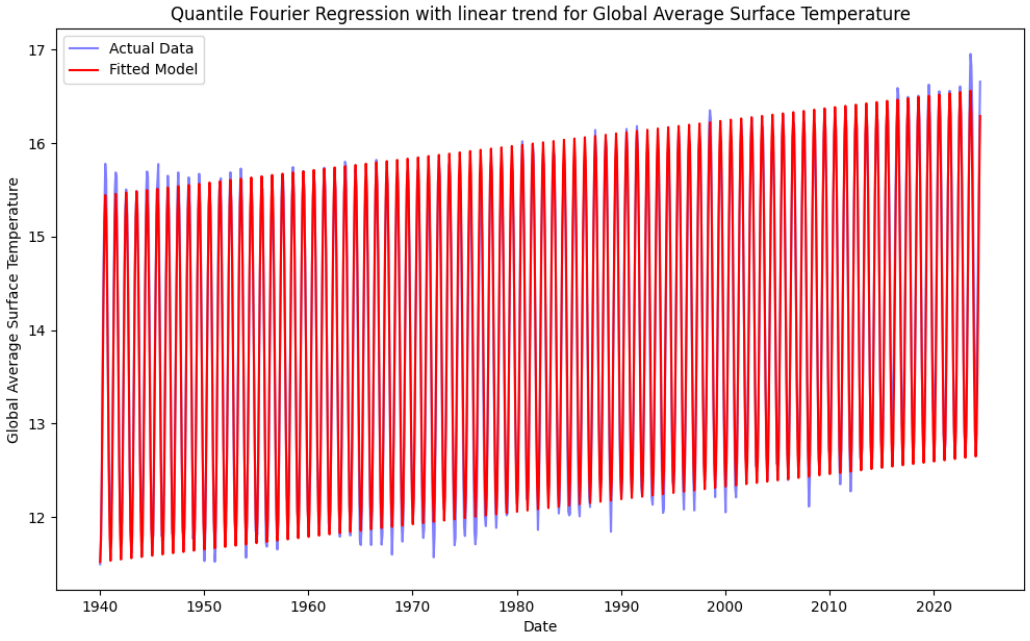


Image: Winner of the Graduate Gallery Competition (2024)
by Arash Khojaste (Advisor: Professor Golbon Zakeri)

7 PHD QUALIFYING EXAM

Exam Timing

Entry Pathway	Exam Deadline
Direct Entry into the PhD Program	Within two calendar years of program entry
Entry with a UMASS MS Degree	Within one and a half calendar years of program entry
Entry with a non-UMASS MS Degree	Within one and a half calendar years of program entry
Part-Time Students	After 18 credits or in two years, whichever occurs first
Transferred Students	May petition to waive or defer the exam

Exam Format

The MIE doctoral qualifying exam ***MUST*** contain a written and an oral component to satisfy candidacy at the Graduate School. Choose one of each below.

Written Component Options (Select One)	Timing
Questions in major interest area (take-home) *A detailed exam in your primary field of study taken at your own pace.*	1 week
Questions in major interest area (live) *An abridged, technical exam taken in a conventional manner.*	3 hours
Critical review (report) of two peer-reviewed journal articles *Analyze articles adjacent to field for strength/weakness & importance.*	2 weeks
Oral Component Options (Select One)	**Timing**
Open-ended questions *Committee asks broad, exploratory questions about your field.*	1 hour
Rounds of technical questions *Committee asks a series of questions to test general MIE knowledge.*	1 hour
Oral presentation (journal critical review) *Present critical review of articles, followed by committee discussion*	30 minutes + Q/A

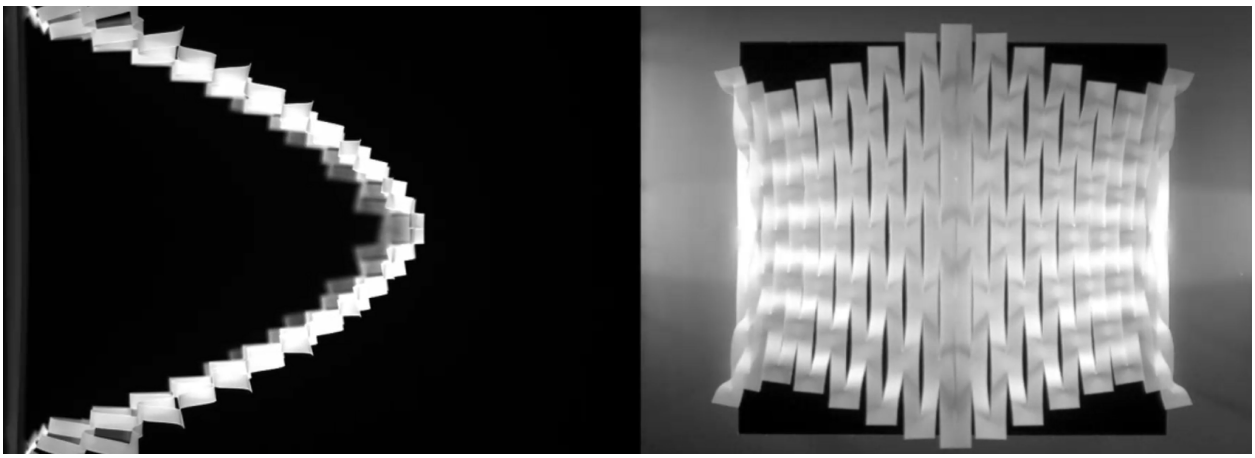


Image: Contribution to the Graduate Gallery Competition (2024)
by Adrian Carleton (Advisor: Professor Yahya Modarres-Sadeghi)

8 DISCRIMINATION AND SEXUAL MISCONDUCT RESOURCES

The Policy Against Discrimination, Harassment, and Related Interpersonal Violence at the University of Massachusetts, Amherst provides comprehensive protection against unlawful discrimination, including sexual harassment and assault, as well as related forms of misconduct. It prohibits acts that deny or limit the educational, employment, residential, and social access, benefits, and opportunities of any member of the campus community based on protected characteristics. This includes race, color, religion, caste, creed, sex, age, marital status, national origin, disability, political belief or affiliation, pregnancy, veteran status, sexual orientation, gender identity and expression, genetic information, natural and protective hairstyle, and other legally protected classes. The policy explicitly addresses sexual harassment under Title IX, sexual assault, intimate partner violence, stalking, complicity, and retaliation. Violators may face disciplinary action, up to and including expulsion or termination. The University maintains specific procedures for reporting, investigating, and adjudicating violations of this policy, which are publicly available on the Office of Equal Opportunity and Access website.

Affirmative Action and Nondiscrimination Policy

Prohibits discrimination based on protected characteristics in all aspects of university programs, activities, and employment. Office of Equal Opportunity administers the policy. (More information)

Code of Student Conduct

Defines expected student behavior, disciplinary procedures, and sanctions for misconduct. Administered by the Dean of Students Office. (More information)

Disabilities - Rights and Responsibilities

People with disabilities have the right to equal access, reasonable accommodations, and confidentiality. They should meet qualifications, identify as individuals with disabilities, and follow procedures for obtaining accommodations. (More information)

Diversity Mission Statement

UMass Amherst is committed to providing access, opportunities, and inclusiveness for all, valuing diversity in its students, faculty, and staff. Promotes social justice and respect for all. (More information)

Graffiti Policy

UMass Physical Plant removes graffiti promptly but preserves it for investigations involving potential civil rights violations. (More information)

Grievance Resolution

Comprehensive grievance systems are in place. Office of Equal Opportunity investigates discrimination grievances, and the Ombuds Office provides additional avenues for resolution. Union contracts may also have applicable procedures. (More information)

Hate Crimes

UMass Police Department treats hate crimes seriously, safeguarding the rights of individuals and taking vigorous enforcement action. (More information)

Native American Graves Protection and Repatriation Act (NAGPRA)

UMass Amherst consults with tribes and commits to repatriate human remains, funerary objects, and cultural artifacts. Aims to build respectful relationships with Native American tribes. (More information)

Policy Against Intolerance

Denounces intolerance that interferes with rights guaranteed by law or policy, while protecting the rights of free inquiry and expression. (More information)

Policy Against Discrimination, Harassment, & Related Interpersonal Violence

Maintains an environment that prohibits discriminatory behavior, provides equal opportunity, and fosters mutual respect and appreciation of divergent views. Office of Equal Opportunity administers the policy. (More information)

Religious Symbols, Decorations and Displays

Protects individuals' rights to freedom of religion and expression, while preventing the endorsement or favoritism of any religion. Individuals can celebrate religious holidays in personal spaces, but not promote religious observance on public property. (More information)

Restroom Policy

Promotes a supportive environment by providing safe and accessible restroom facilities. Individuals should use facilities corresponding to their sex or gender identity, or utilize designated gender-inclusive restrooms. (More information)

Trans Resource Guide

Includes gender identity and expression in the nondiscrimination policy. Provides comprehensive information on campus policies for transgender students. (More information)

9 MIE GRADUATE GALLERY COMPETITION

You are invited to participate in the Department's Annual Graduate Gallery Competition. Showcase your ongoing research by submitting either an image or a video. This is a fantastic opportunity to highlight your work and learn about other research happening in the Department.

Rules for Still Image Contribution:

- Submit one image that focuses on the main finding of your research.
- Limit the text to 75 words, including the title.
- Image resolution should be at least 400 dpi.
- Posters will be printed on 11" by 17" paper.

Rules for Video Contribution:

- Videos should be limited to 1 minute.
- No limitations on the number of images or length of text in the video.

Include the following information separately in the email:

- Contributor(s) name(s)
- Advisor(s) name(s)
- Acknowledgements
- References

You can make multiple contributions, but each should be on a separate topic or scientific paper.
Email your contributions to Ms. Jennifer Blake (`jblake@umass.edu`).

All contributions will be displayed during a ceremony where contributors and visitors can discuss their research projects. Judges from both the Department and non-Engineering Departments will evaluate the contributions based on the ability to communicate scientific ideas and aesthetic appeal. The winners will be announced and receive prizes at the end of the ceremony. The exact date will be announced during the academic year.

Don't miss this opportunity to showcase your research and be recognized for your hard work!

10 MECHANICAL ENGINEERING GRADUATE SEMINAR COURSE - MIE 689

The goal of this seminar is to introduce research active graduate students to various dynamic research projects taking place in our department and other institutions. It aims to promote interdisciplinary research collaboration and encourages students to attend departmental seminars and thesis defenses.

As part of the program, MS and PhD students have required attendance expectations.

Student Level	Minimum Defenses	Minimum Seminars
Thesis-based MS	4	6
PhD	6	10

Important Information

- The seminar is a ***mandatory 1-credit non-graded course***.
- Attendance will be recorded by Mr. Nauman Tazeem.
- Sign-up sheets will be provided during seminars and defenses.
- Attendance for Zoom sessions will be automatically recorded.
- Students receive a SAT (satisfactory) grade after meeting attendance requirements.
- Register for the course during the first semester as it is a one-time registration.
- Substituting seminars for defenses or vice versa is **not** allowed.
- All MS-Thesis and PhD students in Mechanical Engineering must take this course.

11 LIST OF COURSES

M.S. Degree Students

11.1 Mechanical Engineering Topic Area: Fluid Dynamics and Wind Energy

Course Offerings - Fluid Dynamics and Wind Energy

Courses Offered Every Year

Course Code	Course Title	Semester
MIE 551	Thermal Environmental Engineering	Fall
MIE 573	Engineering Windpower Systems	Fall
MIE 601	Advanced Thermodynamics	Fall
MIE 603	Advanced Numerical Analysis	Fall
MIE 607	Advanced Fluid Mechanics *currently not offered*	Fall
MIE 666	Fluid-Structure Interactions *currently not offered*	Fall
MIE 570	Solar and Direct Energy Conversion	Spring
MIE 605	Finite Element Analysis	Spring

Courses Offered Every Two Years

Course Code	Course Title	Semester
MIE 604	Computational Fluid Dynamics	Spring
MIE 649	Ocean and Coastal Waves	Spring
MIE 652	Ocean Renewable Energy	Spring
MIE 673	Wind Turbine Design	Spring
MIE 674	Offshore Wind Energy Systems	Spring
MIE 701	Advanced Thermodynamics	Spring
MIE 707	Viscous Fluids	Spring
MIE 821	Turbulence	Spring

External Courses

Course Code	Course Title	Semester
ChE 633	Transport Process	-
CEE 670	Transport Processes in Environmental and Water Resources	-
PHYS 850	Soft Condensed Matter PHYS	-
CEE 662	Water Resource Systems Analysis	-
CEE 561	Open Channel Flow	-
CEE 560	Hydrology	-
PHYS 553	Optics-With Lab	-

Mechanical Engineering Courses (Typical, 21 CR Thesis-Only; 30 CR Coursework)
External, ME-adjacent Courses (Max 9 CR substituted allowed)
Industrial Engineering Courses (Max 9 CR substituted allowed)
External, IE-adjacent Courses (0 CR substituted allowed)

Return to Degree Requirements Table

11.2 Mechanical Engineering Topic Area: Bioengineering

Courses Offered Every Year

Course Code	Course Title	Semester
MIE 609	Mechanical Behavior of Materials	Fall
MIE 630	Advanced Solid Mechanics	Fall
MIE 658	Connections in Medicine, Biology and Engineering	Fall
MIE 686	Practical Medical Device Design	Fall
ChE 575	Tissue Engineering	Fall
BME 605	Biotransport	Fall
MIE 605	Finite Element Analysis	Spring
ChE 535	Microfluidics and Microscale Analysis in Materials and Biology	Spring
KIN 535	Muscle Mechanics	Spring

Courses Offered Every Two Years

Course Code	Course Title	Semester
BME 606	Biomedical Microfluidics	Fall
BME 675	Nature's Materials	Fall
MIE 640	Introduction to MEMS and Microsciences	Spring
MIE 667	Advanced Cell and Tissue Biomanufacturing	Spring
MIE 668	Molecular, Cellular and Tissue Biomechanics	Spring

Mechanical Engineering Courses (Typical, 21 CR Thesis-Only; 30 CR Coursework)
External, ME-adjacent Courses (Max 9 CR substituted allowed)
Industrial Engineering Courses (Max 9 CR substituted allowed)
External, IE-adjacent Courses (0 CR substituted allowed)

Return to Degree Requirements Table

11.3 Mechanical Engineering Topic Area: Dynamics and Controls

Courses Offered Every Year

Course Code	Course Title	Semester
MIE 605	Introduction to Finite Element Analysis *currently not offered*	Spring
CMPSCI 603	Robotics	Spring
CEE 541	Structural Dynamics	Spring

Courses Offered Every Two Years

Course Code	Course Title	Semester
MIE 610	Nonlinear Dynamics	Fall
MIE 615	Robotics	Fall
MIE 666	Fluid-Structure Interactions *currently not offered*	Fall
MIE 697S	Simulation-Based Optimization	Fall
CEE 615	Probabilistic Methods in Structural Mechanics	Fall
MATH 532H	Nonlinear Dynamics and Chaos with Applications	Fall
MIE 510	Feedback Control Systems	Fall
MIE 642	Advanced Design Feedback Systems	Fall
PHYS 860C	Monte Carlo Techniques	Fall
MIE 597ST	Introduction to MEMS and Microsciences	Spring
MIE 641	Advanced Vibrations	Spring
MIE 643	Mechatronics	Spring
MIE 644	Applied Data Analysis	Spring
MIE 597W	Adaptive and Nonlinear Control	Spring
MIE 685	Biorobotics	Spring

Mechanical Engineering Courses (Typical, 21 CR Thesis-Only; 30 CR Coursework)
External, ME-adjacent Courses (Max 9 CR substituted allowed)
Industrial Engineering Courses (Max 9 CR substituted allowed)
External, IE-adjacent Courses (0 CR substituted allowed)

Return to Degree Requirements Table

11.4 Mechanical Engineering Topic Area: Materials Engineering

Courses Offered Every Year

Course Code	Course Title	Semester
MIE 605	Introduction to Finite Element Analysis *currently not offered*	Fall
MIE 609	Mechanical Properties of Materials	Fall
MIE 617	Computational Materials Science	Fall
MIE 619	Nanomaterials & Sensors	Fall
MIE 630	Advanced Solid Mechanics	Fall
ChE 621	Thermodynamics I	Fall
MSE 601	Thermodynamics and Kinetics of Materials	Fall
MSE 690S	Introduction to Interdisciplinary Materials Science Research	Fall
Polymer 797EM	Electron Microscopy	Fall
Polymer 897F	Surface & Interfacial Mechanics	Fall
ChE 597D	Nanostructured Biomaterials	Spring
ChE 622	Thermodynamics II	Spring
MSE 690A	Materials and Additive Manufacturing: From Concept to Application	Spring
Phy 588	Solid State PHYS	Spring
Polymer 501	Introduction to PSE	Spring

Courses Offered Every Two Years

Course Code	Course Title	Semester
MIE 603	Adv. Numerical Analysis	Fall
MIE 571	Phys. & Chem. Processing of Mater.	Spring
MIE 579	Advanced Materials Engineering	Spring
MIE 668	Molecular, Cellular, & Tissues Biomech.	Spring
MIE 611	Advanced Materials Characterization	Spring
MIE 612	Metamaterials	Spring
MIE 614	Optical Engineering & Photonics	Spring

Mechanical Engineering Courses (Typical, 21 CR Thesis-Only; 30 CR Coursework)
External, ME-adjacent Courses (Max 9 CR substituted allowed)
Industrial Engineering Courses (Max 9 CR substituted allowed)
External, IE-adjacent Courses (0 CR substituted allowed)

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11.5 Mechanical Engineering Topic Area: Manufacturing

Courses Offered Every Year

Course Code	Course Title	Semester
MIE 601	Advanced Thermodynamics	Fall
MIE 605	Introduction to Finite Element Analysis *currently not offered*	Fall
MIE 609	Mechanical Properties of Materials	Fall
MIE 617	Computational Materials Science	Fall
MIE 619	Nanomaterials & Sensors	Fall
MIE 630	Advanced Solid Mechanics	Fall
ECE 597NE	Nanoelectronics	Fall
CMPSCI 603	Robotics	Spring

Courses Offered Every Two Years

Course Code	Course Title	Semester
MIE 615	Robotics	Fall
MIE 618	Additive Manufacturing	Fall
MIE 659	Intelligent Manufacturing	Fall
MIE 608	Adv. Polymer Manufacturing	Spring
MIE 614	Optical Engineering & Photonics	Spring
MIE 579	Advanced Materials Engineering	Spring
MIE 611	Advanced Materials Characterization	Spring
MIE 640	Introduction to MEMS & Microscience	Spring
MIE 643	Mechatronics	Spring
MIE 685	Biorobotics	Spring
CMPSCI 589	Machine Learning	Spring
ECE 597TN	Photonics	Spring

Mechanical Engineering Courses (Typical, 21 CR Thesis-Only; 30 CR Coursework)
External, ME-adjacent Courses (Max 9 CR substituted allowed)
Industrial Engineering Courses (Max 9 CR substituted allowed)
External, IE-adjacent Courses (0 CR substituted allowed)

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11.6 Topic Area: Industrial Engineering and Operations Research

Courses Offered Every Year

Course Code	Course Title	Semester
MIE 620	Linear Programming	Fall
MIE 621	Descriptive Analytics	Fall
MIE 657	Human Factors Engineering	Fall
MIE 664	Engineering Leadership and Entrepreneurship	Fall
MIE 670	Technical Project Management	Fall
SCH-MGMT 752x	Deterministic Models	Fall
SCH-MGMT 670	Operations Management	Fall
MIE 622	Predictive Analytics and Statistical Learning	Spring
MIE 623	Prescriptive Analytics	Spring
MIE 645	Project Budgeting and Finance for Engineers	Spring
MIE 646	Introduction to Systems Engineering	Spring
MIE 654	Economic Decision Making for Engineers	Spring
MIE 664	Engineering Leadership and Entrepreneurship	Spring
MIE 684	Stochastic Processes in Industrial Engineering	Spring
SCH-MGMT 797AE	Stochastic Models	Spring

Courses Offered Every Two Years

Course Code	Course Title	Semester
MIE 624	Machine Learning for Dynamic Decision-Making	Fall
MIE 686	Multiple Criteria Decision Making & Decision Analysis	Fall
MIE 724	Nonlinear Programming	Fall
SCH-MGMT 758	Supply Chain Management	Fall
SCH-MGMT 670	Operations Management	Fall
MIE 565	Operations Research in Healthcare	Spring
SCH-MGMT 597LG	Humanitarian Logistics and Healthcare	Spring
MIE 532	Network Optimization	—
MIE 651	Production Planning I	—

Mechanical Engineering Courses (Max 9 CR substituted allowed)
External, ME-adjacent Courses (0 CR substituted allowed)
Industrial Engineering Courses (Typical, 21 CR Thesis-Only; 30 CR Coursework)
External, IE-adjacent Courses (9 CR substituted allowed)

Return to Degree Requirements Table

Image: Winner of the Graduate Gallery Competition (2024)
by Joe Joseph, advisor Professor Jonathan Rothstein)