THE UNIVERSITY OF MAINE

Mechanical Engineering
Fall 2023 Student Orientation

June 28, 2023

Dr. Olivier Putzeys
Senior Lecturer and
Undergraduate Coordinator
olivier.putzeys@maine.edu

These slides will be posted on our department website:
https://umaine.edu/mecheng/undergraduate-program/
(or just Google “UMaine Mechanical Engineering” and click on “Undergraduate”)

Mechanical Engineering Facilities

Ferland EEDC
MEE Offices & Teaching Labs

We are here

Crosby: MEE Research Labs

UMaine Campus Map

MEE Faculty & Staff

Full-Time Faculty & Staff


Vince Caccese


Sheila Edalatpour


Alex Friess


Andy Goupee


Babak Hejrati


Zhihe Jin


Bashir Khoda


Rich Kimball


Philip King


Justin Lapp


Sharmila Mukhopadhyay


Olivier Putzeys


Masoud Rais-Rohani


Senthil Vel


Amrit Verma


Meghan Honnell
(MEE Admin)


Stephen Abbadessa
(Crosby Lab Manager)

Whom Should You Contact?

- Academic/professional matters → Faculty Advisor
- Course-specific matters → Course Instructor
- Computer / IT matters → IT (umaine.edu/it/)
- Club membership → Club Officers / Advisor

- Crosby Lab matters → Mr. Stephen Abbadessa

- First semester registration
- Any other questions!

Ms. Meghan Honnell
meghan.honnell@maine.edu

Your Faculty Advisor:

- Will be assigned to you in late August (or early September)
- Provides academic and professional advice
- Meets with you for academic advising
- Reviews course selections & monitors your progress toward graduation

You should:

- Review your curriculum sheet (on Google Drive) each semester
- Plan your courses a semester or year ahead

MEE Curriculum

Mechanical Engineering Curriculum

MECHANICAL ENGINEERING CURRICULUM

4-Year Program (for students entering in Fall 2022)

Student: _____ ID: _____ Advisor: _____

1st Year – FALL (17 cr)		Grade
ENG 101[C]	College Composition (3 cr)	
MAT 126[C]	Calculus I (4 cr)	
MEE 101	Intro to Mech. Eng. (1 cr)	
MEE 120	Eng. Graphics & CAD (2 cr)	
PHY 121[C-]	Physics for Eng. & Sci. I (4 cr)	
	HVSC Elective (3 cr)	

1st Year – SPRING (17 cr)		Grade
MAT 127[C]	Calculus II (4 cr)	
MEE 125 or COS 220 or ECE 177	Computational Tools for MEs (3 cr)	
MEE 150[C]	Statics (3 cr)	
PHY 122	Physics for Eng. & Sci. II (4 cr)	
	HVSC Elective (3 cr)	

2nd Year – FALL (17 cr)		
CHY 121/3 or CHY 131/3	General Chemistry I/Lab (4 cr) Chemistry for Engineers/Lab (4 cr)	__/__ /
MAT 228[C]	Calculus III (4 cr)	
MEE 230[C]	Thermodynamics I (3 cr)	
MEE 251[C]	Strength of Materials (3 cr)	
	HVSC Elective (3 cr)	

2nd Year – SPRING (16 cr)		
ECE 209	Fund of Electric Circuits (3 cr)	
ENG 320	Tech. Comm. for Engineering (3 cr)	
MAT 258	Diff. Eq. & Lin. Algebra (4 cr)	
MEE 231	Thermodynamics II (3 cr)	
MEE 270[C]	Dynamics (3 cr)	

3rd Year – FALL (15 cr)		
MEE 320 or MEE 370	Materials (3 cr) Controls (3 cr)	____
MEE 330 or MEE 360	Manufacturing Engineering (3 cr) Fluid Mechanics (3 cr)	____
MEE 341 or MEE 380	Mechanical Lab I (3 cr) Design I (3 cr)	____
MEE 381 or MEE 456	Design II (3 cr) Finite Element Method (3 cr)	____
STS 332 or	Statistics for Engineers (3 cr) Engineering Elective (3 cr)	____

3rd Year – SPRING (15 cr)		
MEE 320 or MEE 370	Materials (3 cr) Controls (3 cr)	____
MEE 330 or MEE 360	Manufacturing Engineering (3 cr) Fluid Mechanics (3 cr)	____
MEE 341 or MEE 380	Mechanical Lab I (3 cr) Design I (3 cr)	____
MEE 381 or MEE 456	Design II (3 cr) Finite Element Method (3 cr)	____
STS 332 or	Statistics for Engineers (3 cr) Engineering Elective (3 cr)	____

4th Year – FALL (15 cr)		
MEE 432 or MEE 471	Heat Transfer (3 cr) Mechanical Vibrations (3 cr)	____
MEE 442	Mechanical Lab II (2 cr)	
MEE 487	Capstone Design I (4 cr)	
	MEE Technical Elective (3 cr)	
	MEE Technical Elective (3 cr)	

4th Year – SPRING (17 cr)		
MEE 432 or MEE 471	Heat Transfer (3 cr) Mechanical Vibrations (3 cr)	____
MEE 443	Mechanical Lab III (2 cr)	
MEE 488	Capstone Design II (3 cr)	
	MEE Technical Elective (3 cr)	
	HVSC Elective (3 cr)	
	HVSC Elective (3 cr)	

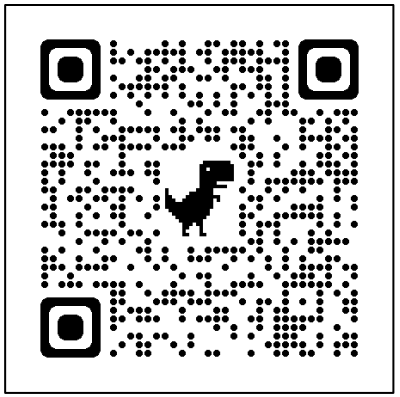
[C] and [C-] indicate the minimum grade required in that course.

Engineering Elective (3 cr)	
Course	Grade

MEE Technical Electives (9 cr)	
Course	Grade

	Course	HVSC credits	Grade	**Human Values and Social Context (HVSC) areas (18 cr)** Western Cultural Tradition	Social Contexts & Institutions	Cultural Diversity & International Perspectives	Population & Environment	Artistic & Creative Expression	**Ethics** (not part of HVSC)
1.	ENG 320	3			X				
2.									
3.									
4.									
5.									
6.									
(if needed) 7.									
(if needed) 8.									

Students must complete 18 credits in the HVSC areas, and each of the 5 HVSC areas must be satisfied at least once. Students must also take a course that satisfies the Ethics requirement. Note that some courses satisfy more than one category (e.g. Ethics and an HVSC area).



MEE Curriculum Sheet

Mechanical Engineering Curriculum

MECHANICAL ENGINEERING CURRICULUM

4-Year Program (for students entering in Fall 2022)

Student: _____ ID: _____ Advisor: _____

1st Year – FALL (17 cr)		Grade
ENG 101[C]	College Composition (3 cr)	
MAT 126[C]	Calculus I (4 cr)	
MEE 101	Intro to Mech. Eng. (1 cr)	
MEE 120	Eng. Graphics & CAD (2 cr)	
PHY 121[C-]	Physics for Eng. & Sci. I (4 cr)	
	HVSC Elective (3 cr)	

1st Year – SPRING (17 cr)		Grade
MAT 127[C]	Calculus II (4 cr)	
MEE 125 or COS 220 or ECE 177	Computational Tools for MEs (3 cr)	
MEE 150[C]	Statics (3 cr)	
PHY 122	Physics for Eng. & Sci. II (4 cr)	
	HVSC Elective (3 cr)	

2nd Year – FALL (17 cr)		
CHY 121/3 or CHY 131/3	General Chemistry I/Lab (4 cr) Chemistry for Engineers/Lab (4 cr)	__/__ /
MAT 228[C]	Calculus III (4 cr)	
MEE 230[C]	Thermodynamics I (3 cr)	
MEE 251[C]	Strength of Materials (3 cr)	
	HVSC Elective (3 cr)	

2nd Year – SPRING (16 cr)		
ECE 209	Fund of Electric Circuits (3 cr)	
ENG 320	Tech. Comm. for Engineering (3 cr)	
MAT 258	Diff. Eq. & Lin. Algebra (4 cr)	
MEE 231	Thermodynamics II (3 cr)	
MEE 270[C]	Dynamics (3 cr)	

3rd Year – FALL (15 cr)		
MEE 320 or MEE 370	Materials (3 cr) Controls (3 cr)	____
MEE 330 or MEE 360	Manufacturing Engineering (3 cr) Fluid Mechanics (3 cr)	____
MEE 341 or MEE 380	Mechanical Lab I (3 cr) Design I (3 cr)	____
MEE 381 or MEE 456	Design II (3 cr) Finite Element Method (3 cr)	____
STS 332 or	Statistics for Engineers (3 cr) Engineering Elective (3 cr)	____

3rd Year – SPRING (15 cr)		
MEE 320 or MEE 370	Materials (3 cr) Controls (3 cr)	____
MEE 330 or MEE 360	Manufacturing Engineering (3 cr) Fluid Mechanics (3 cr)	____
MEE 341 or MEE 380	Mechanical Lab I (3 cr) Design I (3 cr)	____
MEE 381 or MEE 456	Design II (3 cr) Finite Element Method (3 cr)	____
STS 332 or	Statistics for Engineers (3 cr) Engineering Elective (3 cr)	____

4th Year – FALL (15 cr)		
MEE 432 or MEE 471	Heat Transfer (3 cr) Mechanical Vibrations (3 cr)	____
MEE 442	Mechanical Lab II (2 cr)	
MEE 487	Capstone Design I (4 cr)	
	MEE Technical Elective (3 cr)	
	MEE Technical Elective (3 cr)	

4th Year – SPRING (17 cr)		
MEE 432 or MEE 471	Heat Transfer (3 cr) Mechanical Vibrations (3 cr)	____
MEE 443	Mechanical Lab III (2 cr)	
MEE 488	Capstone Design II (3 cr)	
	MEE Technical Elective (3 cr)	
	HVSC Elective (3 cr)	
	HVSC Elective (3 cr)	

[C] and [C-] indicate the minimum grade required in that course.

Engineering Elective (3 cr)	
Course	Grade

MEE Technical Electives (9 cr)	
Course	Grade

	Course	HVSC credits	Grade	Human Values and Social Context (HVSC) areas (18 cr): Western Cultural Tradition	Social Contexts & Institutions	Cultural Diversity & International Perspectives	Population & Environment	Artistic & Creative Expression	Ethics (not part of HVSC)
1.	ENG 320	3			X				
2.									
3.									
4.									
5.									
6.									
(if needed) 7.									
(if needed) 8.									

Students must complete 18 credits in the HVSC areas, and each of the 5 HVSC areas must be satisfied at least once. Students must also take a course that satisfies the Ethics requirement. Note that some courses satisfy more than one category (e.g. Ethics and an HVSC area).

Summary

Credit (cr)	Subject
56	MEE General Courses & Labs
12	Tech & Engineering Electives
19	Mathematics & Statistics
12	Physics & Chemistry
18	Humanities & Social Contexts
6	Comp Programming & Circuits
6	Writing Intensive

129 Total Credits for a BS Degree

15-17 cr. / semester
→ Graduate in 4 years!

Mechanical Engineering Curriculum

MECHANICAL ENGINEERING CURRICULUM

4-Year Program (for students entering in Fall 2022)

Student: _____ ID: _____ Advisor: _____

1st Year – FALL (17 cr)		Grade
ENG 101[C]	College Composition (3 cr)	
MAT 126[C]	Calculus I (4 cr)	
MEE 101	Intro to Mech. Eng. (1 cr)	
MEE 120	Eng. Graphics & CAD (2 cr)	
PHY 121[C-]	Physics for Eng. & Sci. I (4 cr)	
	HVSC Elective (3 cr)	

1st Year – SPRING (17 cr)		Grade
MAT 127[C]	Calculus II (4 cr)	
MEE 125 or COS 220 or ECE 177	Computational Tools for MEs (3 cr)	
MEE 150[C]	Statics (3 cr)	
PHY 122	Physics for Eng. & Sci. II (4 cr)	
	HVSC Elective (3 cr)	

2nd Year – FALL (17 cr)		
CHY 121/3 or CHY 131/3	General Chemistry I/Lab (4 cr) Chemistry for Engineers/Lab (4 cr)	__/__ /
MAT 228[C]	Calculus III (4 cr)	
MEE 230[C]	Thermodynamics I (3 cr)	
MEE 251[C]	Strength of Materials (3 cr)	
	HVSC Elective (3 cr)	

2nd Year – SPRING (16 cr)		
ECE 209	Fund of Electric Circuits (3 cr)	
ENG 320	Tech. Comm. for Engineering (3 cr)	
MAT 258	Diff. Eq. & Lin. Algebra (4 cr)	
MEE 231	Thermodynamics II (3 cr)	
MEE 270[C]	Dynamics (3 cr)	

3rd Year – FALL (15 cr)		
MEE 320 or MEE 370	Materials (3 cr) Controls (3 cr)	____
MEE 330 or MEE 360	Manufacturing Engineering (3 cr) Fluid Mechanics (3 cr)	____
MEE 341 or MEE 380	Mechanical Lab I (3 cr) Design I (3 cr)	____
MEE 381 or MEE 456	Design II (3 cr) Finite Element Method (3 cr)	____
STS 332 or	Statistics for Engineers (3 cr) Engineering Elective (3 cr)	____

3rd Year – SPRING (15 cr)		
MEE 320 or MEE 370	Materials (3 cr) Controls (3 cr)	____
MEE 330 or MEE 360	Manufacturing Engineering (3 cr) Fluid Mechanics (3 cr)	____
MEE 341 or MEE 380	Mechanical Lab I (3 cr) Design I (3 cr)	____
MEE 381 or MEE 456	Design II (3 cr) Finite Element Method (3 cr)	____
STS 332 or	Statistics for Engineers (3 cr) Engineering Elective (3 cr)	____

4th Year – FALL (15 cr)		
MEE 432 or MEE 471	Heat Transfer (3 cr) Mechanical Vibrations (3 cr)	____
MEE 442	Mechanical Lab II (2 cr)	
MEE 487	Capstone Design I (4 cr)	
	MEE Technical Elective (3 cr)	
	MEE Technical Elective (3 cr)	

4th Year – SPRING (17 cr)		
MEE 432 or MEE 471	Heat Transfer (3 cr) Mechanical Vibrations (3 cr)	____
MEE 443	Mechanical Lab III (2 cr)	
MEE 488	Capstone Design II (3 cr)	
	MEE Technical Elective (3 cr)	
	HVSC Elective (3 cr)	
	HVSC Elective (3 cr)	

[C] and [C-] indicate the minimum grade required in that course.

Engineering Elective (3 cr)	
Course	Grade

MEE Technical Electives (9 cr)	
Course	Grade

	Course	HVSC credits	Grade	Human Values and Social Context (HVSC) areas (18 cr) Western Cultural Tradition	Social Contexts & Institutions	Cultural Diversity & International Perspectives	Population & Environment	Artistic & Creative Expression	Ethics (not part of HVSC)
1.	ENG 320	3			X				
2.									
3.									
4.									
5.									
6.									
(if needed) 7.									
(if needed) 8.									

Students must complete 18 credits in the HVSC areas, and each of the 5 HVSC areas must be satisfied at least once. Students must also take a course that satisfies the Ethics requirement. Note that some courses satisfy more than one category (e.g. Ethics and an HVSC area).

Human Values and Social Context (HVSC) Electives

General Education including HVSC Courses

Human Values and Social Context (HVSC) Electives

- You must complete **18 credits** (typically 6 courses) in the HVSC areas.
- Each of the 5 HVSC categories must be satisfied at least once
- **The required ENG 320 course already satisfies 3 HVSC credits**
- Some courses satisfy more than one category
- You must also take one course that satisfies the Ethics requirement.

Example:

General Education Requirements

Course	HVSC credits	Grade	Human Values and Social Context (HVSC) areas (18 cr.)					Ethics (not part of HVSC)
			Western Cultural Tradition	Social Contexts & Institutions	Cultural Diversity & International Perspectives	Population & Environment	Artistic & Creative Expression	
ENG 320	3			X				
HTY 103	3		X	X				
ANT 101	3			X	X			
ART 120	3						X	
NAS 101	3		X	X				
PHI 232	3			X		X		X

Students must complete 18 credits in the HVSC areas, and each of the five HVSC areas must be satisfied at least once. Students must also take a course that satisfies the Ethics requirement. Note that some courses satisfy more than one category (e.g. Ethics and one of the HVSC areas).

MEE Undergraduate Curriculum

MECHANICAL ENGINEERING CURRICULUM

4-Year Program (for students entering in Fall 2023)

Student: _____ ID: _____ Advisor: _____

1st Year – FALL (17 cr)		Grade
ENG 101[C]	College Composition (3 cr)	
MAT 126[C]	Calculus I (4 cr)	
MEE 101	Intro to Mech. Eng. (1 cr)	
MEE 120	Eng. Graphics & CAD (2 cr)	
PHY 121[C-]	Physics for Eng. & Sci. I (4 cr)	
	HVSC Elective (3 cr)	

1st Year – SPRING (17 cr)		Grade
MAT 127[C]	Calculus II (4 cr)	
MEE 125 or COS 220 or ECE 177	Computational Tools for MEs (3 cr)	
MEE 150[C]	Statics (3 cr)	
PHY 122	Physics for Eng. & Sci. II (4 cr)	
	HVSC Elective (3 cr)	

2nd Year – FALL (17 cr)		
CHY 121/3 or CHY 131/3	General Chemistry I/Lab (4 cr) / Chemistry for Engineers/Lab (4 cr)	__/__ /
MAT 228[C]	Calculus III (4 cr)	
MEE 230[C]	Thermodynamics I (3 cr)	
MEE 251[C]	Strength of Materials (3 cr)	
	HVSC Elective (3 cr)	

2nd Year – SPRING (16 cr)		
ECE 209	Fund of Electric Circuits (3 cr)	
ENG 320	Tech. Comm. for Engineering (3 cr)	
MAT 258	Diff. Eq. & Lin. Algebra (4 cr)	
MEE 231	Thermodynamics II (3 cr)	
MEE 270[C]	Dynamics (3 cr)	

3rd Year – FALL (15 cr)		
MEE 320 or MEE 370	Materials (3 cr) Controls (3 cr)	____
MEE 330 or MEE 360	Manufacturing Engineering (3 cr) Fluid Mechanics (3 cr)	____
MEE 341 or MEE 380	Mechanical Lab I (3 cr) Design I (3 cr)	____
MEE 381 or MEE 456	Design II (3 cr) Finite Element Method (3 cr)	____
STS 332 or	Statistics for Engineers (3 cr) Engineering Elective (3 cr)	____

3rd Year – SPRING (15 cr)		
MEE 320 or MEE 370	Materials (3 cr) Controls (3 cr)	____
MEE 330 or MEE 360	Manufacturing Engineering (3 cr) Fluid Mechanics (3 cr)	____
MEE 341 or MEE 380	Mechanical Lab I (3 cr) Design I (3 cr)	____
MEE 381 or MEE 456	Design II (3 cr) Finite Element Method (3 cr)	____
STS 332 or	Statistics for Engineers (3 cr) Engineering Elective (3 cr)	____

4th Year – FALL (15 cr)		
MEE 432 or MEE 471	Heat Transfer (3 cr) Mechanical Vibrations (3 cr)	____
MEE 442	Mechanical Lab II (2 cr)	
MEE 487	Capstone Design I (4 cr)	
	MEE Technical Elective (3 cr)	
	MEE Technical Elective (3 cr)	

4th Year – SPRING (17 cr)		
MEE 432 or MEE 471	Heat Transfer (3 cr) Mechanical Vibrations (3 cr)	____
MEE 443	Mechanical Lab III (2 cr)	
MEE 488	Capstone Design II (3 cr)	
	MEE Technical Elective (3 cr)	
	HVSC Elective (3 cr)	
	HVSC Elective (3 cr)	

[C] and [C-] indicate the minimum grade required in that course.

Engineering Elective (3 cr)	
Course	Grade

MEE Technical Electives (9 cr)	
Course	Grade

	Course	HVSC credits	Grade	Human Values and Social Context (HVSC) areas (18 cr): Western Cultural Tradition	Social Contexts & Institutions	Cultural Diversity & International Perspectives	Population & Environment	Artistic & Creative Expression	Ethics (not part of HVSC)
1.	ENG 320	3			X				
2.									
3.									
4.									
5.									
6.									
(if needed) 7.									
(if needed) 8.									

Students must complete 18 credits in the HVSC areas, and each of the 5 HVSC areas must be satisfied at least once. Students must also take a course that satisfies the Ethics requirement. Note that some courses satisfy more than one category (e.g. Ethics and an HVSC area).

Pick 1 Engineering Elective

Course	Course Name
MEE 348	Introduction to Flight
MEE 394	Mechanical Engineering Practice
MEE 4xx	Any MEE Technical Elective
CHE 350	Statistical Process Control and Analysis
CHE 461	Combustion and Fuel Processing

Can satisfy the Engineering Elective requirement through a Summer Internship or Semester Co-Op!

ECE 457	Nanoscience
ECE 462	Intro. to Basic Semiconductor Devices and Assoc. Circuit Models
ECE 464	Microelectronics Science and Engineering
ECE 465	Introduction to Sensors
ECE 467	Solar Cells and Their Applications
EET 386	Project Management
EET 460	Renewable Energy and Electricity Production
INV 392	Commercialize: Innovation Engineering II
MET 321	Industrial Vibrations
MET 391	Heating, Ventilating and Air Conditioning (not allowed if MEE 486 "Refrig. and A.C. System Design" is used as MEE Tech. Elective)
MET 440	Lean Six Sigma
PPA 466	Paper Technology
SVT 475	Small Business Management

umaine.edu/mecheng/ugcurriculum/

MEE Undergraduate Curriculum

MECHANICAL ENGINEERING CURRICULUM

4-Year Program (for students entering in Fall 2023)

Student: _____ ID: _____ Advisor: _____

1st Year – FALL (17 cr)		Grade
ENG 101[C]	College Composition (3 cr)	
MAT 126[C]	Calculus I (4 cr)	
MEE 101	Intro to Mech. Eng. (1 cr)	
MEE 120	Eng. Graphics & CAD (2 cr)	
PHY 121[C-]	Physics for Eng. & Sci. I (4 cr)	
	HVSC Elective (3 cr)	

1st Year – SPRING (17 cr)		Grade
MAT 127[C]	Calculus II (4 cr)	
MEE 125 or COS 220 or ECE 177	Computational Tools for MEs (3 cr)	
MEE 150[C]	Statics (3 cr)	
PHY 122	Physics for Eng. & Sci. II (4 cr)	
	HVSC Elective (3 cr)	

2nd Year – FALL (17 cr)		
CHY 121/3 or CHY 131/3	General Chemistry I/Lab (4 cr) Chemistry for Engineers/Lab (4 cr)	__/__ /
MAT 228[C]	Calculus III (4 cr)	
MEE 230[C]	Thermodynamics I (3 cr)	
MEE 251[C]	Strength of Materials (3 cr)	
	HVSC Elective (3 cr)	

2nd Year – SPRING (16 cr)		
ECE 209	Fund of Electric Circuits (3 cr)	
ENG 320	Tech. Comm. for Engineering (3 cr)	
MAT 258	Diff. Eq. & Lin. Algebra (4 cr)	
MEE 231	Thermodynamics II (3 cr)	
MEE 270[C]	Dynamics (3 cr)	

3rd Year – FALL (15 cr)		
MEE 320 or MEE 370	Materials (3 cr) Controls (3 cr)	____
MEE 330 or MEE 360	Manufacturing Engineering (3 cr) Fluid Mechanics (3 cr)	____
MEE 341 or MEE 380	Mechanical Lab I (3 cr) Design I (3 cr)	____
MEE 381 or MEE 456	Design II (3 cr) Finite Element Method (3 cr)	____
STS 332 or	Statistics for Engineers (3 cr) Engineering Elective (3 cr)	____

3rd Year – SPRING (15 cr)		
MEE 320 or MEE 370	Materials (3 cr) Controls (3 cr)	____
MEE 330 or MEE 360	Manufacturing Engineering (3 cr) Fluid Mechanics (3 cr)	____
MEE 341 or MEE 380	Mechanical Lab I (3 cr) Design I (3 cr)	____
MEE 381 or MEE 456	Design II (3 cr) Finite Element Method (3 cr)	____
STS 332 or	Statistics for Engineers (3 cr) Engineering Elective (3 cr)	____

4th Year – FALL (15 cr)		
MEE 432 or MEE 471	Heat Transfer (3 cr) Mechanical Vibrations (3 cr)	____
MEE 442	Mechanical Lab II (2 cr)	
MEE 487	Capstone Design I (4 cr)	
	MEE Technical Elective (3 cr)	
	MEE Technical Elective (3 cr)	

4th Year – SPRING (17 cr)		
MEE 432 or MEE 471	Heat Transfer (3 cr) Mechanical Vibrations (3 cr)	____
MEE 443	Mechanical Lab III (2 cr)	
MEE 488	Capstone Design II (3 cr)	
	MEE Technical Elective (3 cr)	
	HVSC Elective (3 cr)	
	HVSC Elective (3 cr)	

[C] and [C-] indicate the minimum grade required in that course.

Engineering Elective (3 cr)	
Course	Grade

MEE Technical Electives (9 cr)	
Course	Grade

	Course	HVSC credits	Grade	Human Values and Social Context (HVSC) areas (18 cr): Western Cultural Tradition	Social Contexts & Institutions	Cultural Diversity & International Perspectives	Population & Environment	Artistic & Creative Expression	Ethics (not part of HVSC)
1.	ENG 320	3			X				
2.									
3.									
4.									
5.									
6.									
(if needed) 7.									
(if needed) 8.									

Students must complete 18 credits in the HVSC areas, and each of the 5 HVSC areas must be satisfied at least once. Students must also take a course that satisfies the Ethics requirement. Note that some courses satisfy more than one category (e.g. Ethics and an HVSC area).

Pick 3 MEE Technical Electives

MEE 430	Digital Manufacturing
MEE 433	Solar-Thermal Engineering
MEE 434	Thermodynamic Design of Engines
MEE 441	Manufacturing and Testing of Composites
MEE 444	Robot Dynamics and Control
MEE 448	Aircraft Design
MEE 449	Aircraft Performance
MEE 450	Mechanics of Composite Materials
MEE 452	Aircraft and Automobile Structures
MEE 453	Experimental Mechanics
MEE 455	Advanced Strength of Materials
MEE 459	Engineering Optimization
MEE 462	Dynamics of Fluid Flows
MEE 463	Applied Computational Fluid Dynamics
MEE 475	Fuel Cell Science and Technology
MEE 477	Introduction to Structural Dynamics
MEE 480	Wind Energy Engineering
MEE 484	Power Plant Design and Engineering
MEE 486	Refrig. and Air Cond. System Design
MEE 489	Offshore Floating System Design
MEE 490	Modern Control Theory and Applications
MEE 491	Offshore Wind Farm Engineering

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First Semester Registration

You must first:

1. Complete your **Financial Terms and Conditions (FTC)** form on MaineStreet. https://mycampus.maine.edu

2. Take your **Math Placement Exam (MPE)** (this determines if you can start in Calculus I) https://umaine.edu/clasadvisingcenter/math-placement-exam/
   - You are exempted if you scored:
     - 670 or higher on math portion of SAT
     - or 29 or higher on math portion of ACT

3. Complete the HVSC Elective preference Google Form (here), which was also emailed to you (unless you're in Honors program)

- If you have any AP credits, **you** must have them sent to the UMaine Office of Student Records via collegeboard.com

- Transfer students: Must transfer courses through the **Office of Student Records**

  Even if prior courses were taken within the University of Maine System (UMS), you must still request a transfer credit evaluation from Office of Student Records

First Semester Registration

MECHANICAL ENGINEERING CURRICULUM

4-Year Program (for students entering in Fall 2022)

Student: _____ ID: _____ Advisor: _____

1st Year – FALL (17 cr)		Grade
ENG 101[C]	College Composition (3 cr)	
MAT 126[C]	Calculus I (4 cr)	
MEE 101	Intro to Mech. Eng. (1 cr)	
MEE 120	Eng. Graphics & CAD (2 cr)	
PHY 121[C-]	Physics for Eng. & Sci. I (4 cr)	
	HVSC Elective (3 cr)	

1st Year – SPRING (17 cr)		Grade
MAT 127[C]	Calculus II (4 cr)	
MEE 125 or COS 220 or ECE 177	Computational Tools for MEs (3 cr)	
MEE 150[C]	Statics (3 cr)	
PHY 122	Physics for Eng. & Sci. II (4 cr)	
	HVSC Elective (3 cr)	

2nd Year – FALL (17 cr)		
CHY 121/3 or CHY 131/3	General Chemistry I/Lab (4 cr) Chemistry for Engineers/Lab (4 cr)	__/__ /
MAT 228[C]	Calculus III (4 cr)	
MEE 230[C]	Thermodynamics I (3 cr)	
MEE 251[C]	Strength of Materials (3 cr)	
	HVSC Elective (3 cr)	

2nd Year – SPRING (16 cr)		
ECE 209	Fund of Electric Circuits (3 cr)	
ENG 320	Tech. Comm. for Engineering (3 cr)	
MAT 258	Diff. Eq. & Lin. Algebra (4 cr)	
MEE 231	Thermodynamics II (3 cr)	
MEE 270[C]	Dynamics (3 cr)	

3rd Year – FALL (15 cr)		
MEE 320 or MEE 370	Materials (3 cr) Controls (3 cr)	____
MEE 330 or MEE 360	Manufacturing Engineering (3 cr) Fluid Mechanics (3 cr)	____
MEE 341 or MEE 380	Mechanical Lab I (3 cr) Design I (3 cr)	____
MEE 381 or MEE 456	Design II (3 cr) Finite Element Method (3 cr)	____
STS 332 or	Statistics for Engineers (3 cr) Engineering Elective (3 cr)	____

3rd Year – SPRING (15 cr)		
MEE 320 or MEE 370	Materials (3 cr) Controls (3 cr)	____
MEE 330 or MEE 360	Manufacturing Engineering (3 cr) Fluid Mechanics (3 cr)	____
MEE 341 or MEE 380	Mechanical Lab I (3 cr) Design I (3 cr)	____
MEE 381 or MEE 456	Design II (3 cr) Finite Element Method (3 cr)	____
STS 332 or	Statistics for Engineers (3 cr) Engineering Elective (3 cr)	____

4th Year – FALL (15 cr)		
MEE 432 or MEE 471	Heat Transfer (3 cr) Mechanical Vibrations (3 cr)	____
MEE 442	Mechanical Lab II (2 cr)	
MEE 487	Capstone Design I (4 cr)	
	MEE Technical Elective (3 cr)	
	MEE Technical Elective (3 cr)	

4th Year – SPRING (17 cr)		
MEE 432 or MEE 471	Heat Transfer (3 cr) Mechanical Vibrations (3 cr)	____
MEE 443	Mechanical Lab III (2 cr)	
MEE 488	Capstone Design II (3 cr)	
	MEE Technical Elective (3 cr)	
	HVSC Elective (3 cr)	
	HVSC Elective (3 cr)	

[C] and [C-] indicate the minimum grade required in that course.

Engineering Elective (3 cr)	
Course	Grade

MEE Technical Electives (9 cr)	
Course	Grade

	Course	HVSC credits	Grade	Human Values and Social Context (HVSC) areas (18 cr): Western Cultural Tradition	Social Contexts & Institutions	Cultural Diversity & International Perspectives	Population & Environment	Artistic & Creative Expression	Ethics (not part of HVSC)
1.	ENG 320	3			X				
2.									
3.									
4.									
5.									
6.									
(if needed) 7.									
(if needed) 8.									

Students must complete 18 credits in the HVSC areas, and each of the 5 HVSC areas must be satisfied at least once. Students must also take a course that satisfies the Ethics requirement. Note that some courses satisfy more than one category (e.g. Ethics and an HVSC area).

Fall Semester 2023

1st Year – FALL (17 cr)		Grade
ENG 101[C]	College Composition (3 cr)	
MAT 126[C]	Calculus I (4 cr)	
MEE 101	Intro to Mech. Eng. (1 cr)	
MEE 120	Eng. Graphics & CAD (2 cr)	
PHY 121[C-]	Physics for Eng. & Sci. I (4 cr)	
	HVSC Elective (3 cr)	

We will enroll you in all courses for your first semester.

For questions, contact Ms. Honnell (meghan.honnell@maine.edu)

You need to check your @maine.edu email often!

- Go to gmail.maine.edu
- Login using your MaineStreet ID (“username”, typically FirstName.LastName) and password
- (Contact IT Help, 207-581-2506, for assistance with username/password)

Important Dates in Fall Semester 2023

Fall Semester 2023

Classes begin	Monday, August 28
Last day to add classes	Sunday, September 3
No classes Labor Day	Monday, September 4
Last day to drop classes for refund*	Monday, September 11
Classes dropped on or before this date will not appear on transcript	Friday, September 29
Application for graduation filing deadline (Dec.)	Sunday, October 1
Fall break begins	Monday, October 9
Classes resume	Wednesday, October 11
Enrollment for Spring 2024 begins	Monday, October 23
No classes Veterans Day Observed	Friday, November 10
Last day to withdraw from a class and receive 'W' grade (Withdrawn classes after this date will receive failing grade.)	Monday, November 13, 4:30 p.m.
Thanksgiving break begins	Wednesday, November 22
Classes resume	Monday, November 27
Classes end	Friday, December 8
Final exams begin	Monday, December 11
Final exams end	Friday, December 15
Final grades due	Friday, December 22

You can add a class within the first week, and drop a class (for a refund) within the first two weeks.

Laptop Requirement

- The MEE Dept requires that you own a laptop computer (Windows PC)
- Minimum and recommended specs: umaine.edu/mecheng/computer-policy/
- The video card needs to be compatible with SolidWorks.
- You can purchase a laptop that is specifically configured for MEE students from the University Bookstore.

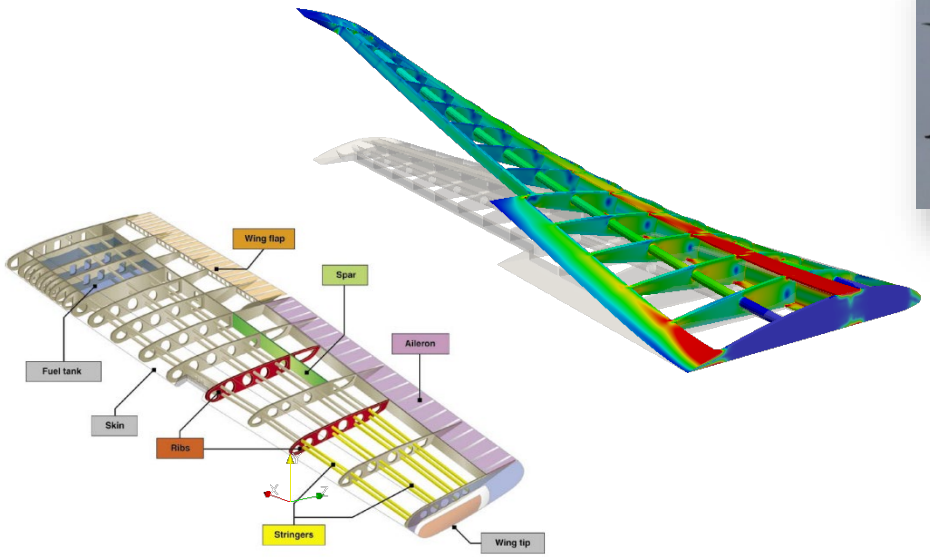
Opportunities to Enrich your Education

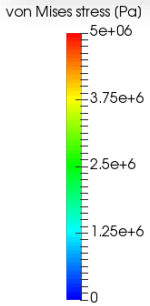
Concentration in Aerospace Engineering

Complete three aerospace courses with grade of C or better:

- MEE 348 – Introduction to Flight (Counts as Engr. Elective)
- MEE 448 – Aircraft Design
- MEE 449 – Aircraft Performance
- MEE 452 – Aircraft and Automobile Structures
- MEE 462 – Dynamics of Fluid Flows
- MEE 463 – Applied Computational Fluid Dynamics

Count as Tech Electives





(New!) Concentration in Offshore Wind Energy

Complete two Core Courses:

- MEE 480 – Wind Energy Engineering
- MEE 489 – Offshore Floating System Design
- MEE 491 – Offshore Wind Farm Engineering

ALL of these courses also count as Tech Electives!

Complete one Supporting Course:

- MEE 441 – Manufacturing and Testing of Composites
- MEE 450 – Mechanics of Composite Structures
- MEE 491 – Offshore Wind Farm Engineering
- MEE 459 – Engineering Optimization
- MEE 463 – Applied Computational Fluid Dynamics
- MEE 477 – Introduction to Structural Dynamics
- MEE 490 – Modern Control Theory & Applications

Study Abroad in Valencia, Spain

UNIVERSIDAD POLITECNICA DE VALENCIA

- MEE majors can attend *La Universidad Politècnica de València* (through USAC) in Fall semester of sophomore year
- Classes taught in English
- >20 MEE students since 2019
- Application deadlines in Feb/March

- https://umaine.edu/mecheng/study-abroad-in-valencia-spain/
- https://umaine.edu/studyabroad/
- https://umaine.abroadoffice.net/getting-started.html
- https://usac.edu/study-abroad-programs/spain/valencia
- https://blog.usac.edu/university-makes-it-easy-for-stem-students-to-study-abroad/

4-Year Program with Study Abroad in Valencia

MECHANICAL ENGINEERING CURRICULUM

4-Year Program (for students starting in Fall 2022 with 2nd Year – FALL in Valencia, Spain)

Student: _____ ID: _____ Advisor: _____

1st Year – FALL (17 cr)		Grade
ENG 101[C]	College Composition (3 cr)	
MAT 126[C]	Calculus I (4 cr)	
MEE 101	Intro to Mech. Eng. (1 cr)	
MEE 120	Eng. Graphics & CAD (2 cr)	
PHY 121[C-]	Physics for Eng. & Sci. I (4 cr)	
	HVSC Elective (3 cr)	

1st Year – SPRING (17 cr)		Grade
MAT 127[C]	Calculus II (4 cr)	
MEE 125 or COS 220 or ECE 177	Computational Tools for MEs (3 cr)	
MEE 150[C]	Statics (3 cr)	
PHY 122	Physics for Eng. & Sci. II (4 cr)	
	HVSC Elective (3 cr)	

2nd Year – FALL (17 cr)		
CHY 121/3 or CHY 131/3	General Chemistry I/Lab (4 cr) Chemistry for Engineers/Lab (4 cr)	__/__ /
MAT 228[C]	Calculus III (4 cr)	
MEE 230[C]	Thermodynamics I (3 cr)	
MEE 270[C]	Dynamics (3 cr)	
	HVSC Elective (3 cr)	

2nd Year – SPRING (16 cr)		
~~ECE 209~~	~~Fund of Electric Circuits (3 cr)~~	
ENG 320	Tech. Comm. for Engineering (3 cr)	
MAT 258	Diff. Eq. & Lin. Algebra (4 cr)	
MEE 231	Thermodynamics II (3 cr)	
MEE 251[C]	Strength of Materials(3 cr)	

3rd Year – FALL (15 cr)		
MEE 320 or MEE 370	Materials (3 cr) Controls (3 cr)	____
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4th Year – FALL (15 cr)		
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MEE 442	Mechanical Lab II (2 cr)	
MEE 487	Capstone Design I (4 cr)	
	MEE Technical Elective (3 cr)	
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4th Year – SPRING (17 cr)		
MEE 432 or MEE 471	Heat Transfer (3 cr) Mechanical Vibrations (3 cr)	____
MEE 443	Mechanical Lab III (2 cr)	
MEE 488	Capstone Design II (3 cr)	
	MEE Technical Elective (3 cr)	
	HVSC Elective (3 cr)	
	HVSC Elective (3 cr)	

[C] and [C-] indicate the minimum grade required in that course.

Engineering Elective (3 cr)	
Course	Grade

MEE Technical Electives (9 cr)	
Course	Grade

	Course	HVSC credits	Grade	Human Values and Social Context (HVSC) areas (18 cr): Western Cultural Tradition	Social Contexts & Institutions	Cultural Diversity & International Perspectives	Population & Environment	Artistic & Creative Expression	Ethics (not part of HVSC)
1.	ENG 320	3			X				
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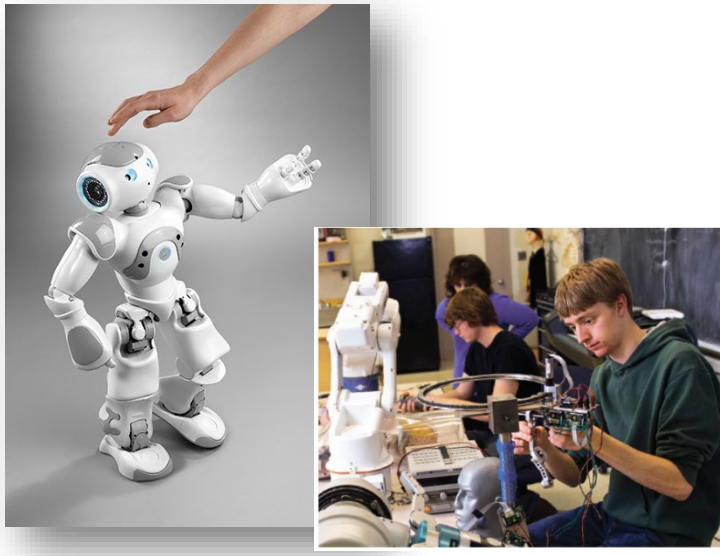
UNIVERSIDAD POLITECNICA DE VALENCIA

2nd Year – FALL (17 cr)		
CHY 121/3 or CHY 131/3	General Chemistry I/Lab (4 cr) Chemistry for Engineers/Lab (4 cr)	__/__ /
MAT 228[C]	Calculus III (4 cr)	
MEE 230[C]	Thermodynamics I (3 cr)	
MEE 270[C]	Dynamics (3 cr)	
	HVSC Elective (3 cr)	

Expand your skills through a Minor!

- A Minor can be selected in addition to a Major (MEE)
- It requires 18 to 24 credit hours (6 – 8 courses)
- Some courses overlap with required or elective courses
- Examples include:
  - Mathematics
  - Innovation Engineering
  - Biomedical Engineering
  - Ocean & Marine Engineering
  - Robotics
  - Renewable Energy



- Earning a Minor can improve your career opportunities

Composite Materials & Structures Certificate

- Requires completion of 12 Credits (4 Courses)
- Two Required Courses (6 credits)
  - MEE 441/541 Manufacturing and Testing of Composites
  - MEE 450 Mechanics of Composite Materials or CIE 543 Intro to Composite Materials in Civil Engineering
- Two Elective Courses (any 2 for 6 credits)
  - MEE 550 Mechanics of Laminated Composite Structures
  - CIE 644 Advanced Composite Materials in Civil Engineering
  - SFR 531 Mechanics of Wood and Wood Composites
  - SFR 545 Adhesion and Adhesives Technology
  - SFR 550 Wood-Polymer Hybrid Composites
  - SFR 570 Cellulose Nanomaterials and Their Composites
- **All the engineering courses can also be used as Tech Electives**

https://dll.umaine.edu/composite-materials-and-structures-certificate/

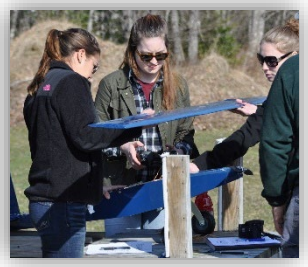
Student Organizations & Clubs

- American Society of Mechanical Engineers (ASME)

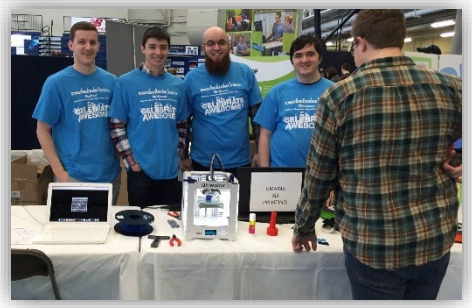


- American Institute of Aeronautics and Astronautics (AIAA)





- Society of Automotive Engineers (SAE)
- 3D Printing Club
- Engineers Without Borders
- Society of Women Engineers
- Black Bear Robotics




Where to Find Help

Engineering Tutoring Center

- Available to all engineering students
- Monday – Thursday (4 to 8 pm), room 219 Boardman Hall
- Courses covered by tutors:
  - 100- and 200-level MEE courses (MEE 150, 230, 251, 252, 270)
  - Calculus I & II (MAT 126 & 127)
  - Physics I & II (PHY 121 & 122)

Counseling Center

- Support available in person or via Zoom

Worried about...


Anxiety?


Depression?


Gender & Sexual Identity?


Eating?


A Friend?

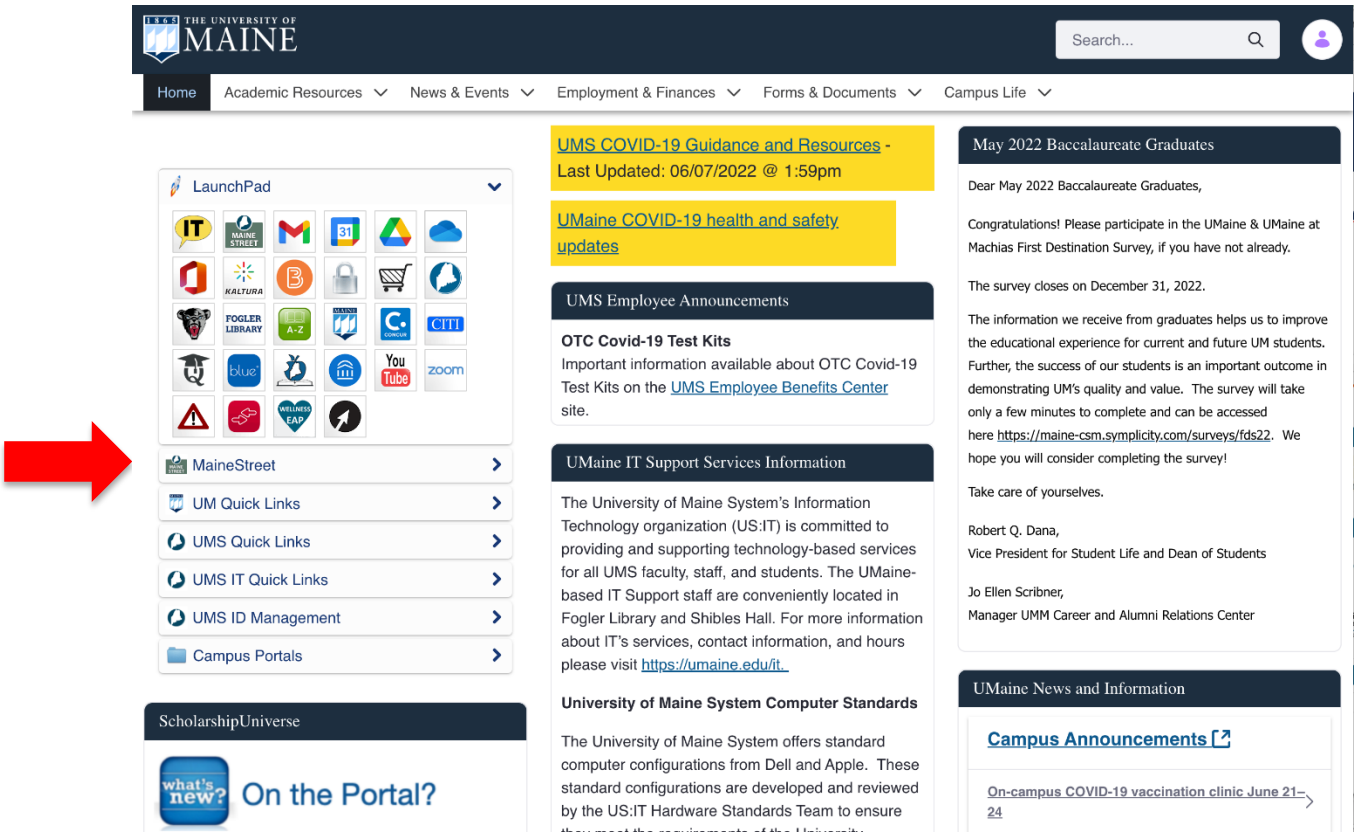
Stress?

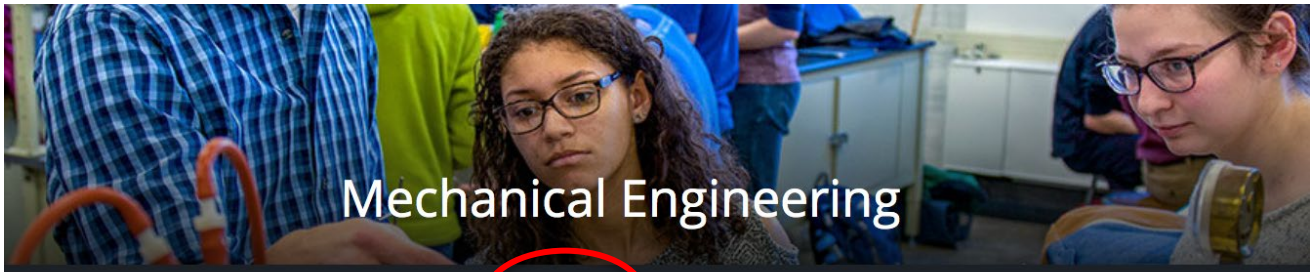
- For additional information:

Important Websites

Logging into Campus Portal and MaineStreet

- To see your course schedule, transfer credit report, etc.
- mycampus.maine.edu/
- Username is typically “FirstName.LastName”





News

New model developed for predicting adsorption of PFAS by microplastics
Published: May 12, 2023

Belding featured on Maine International Trade Center panel
Published: May 12, 2023

'The Maine Question' asks how nature-inspired engineering can improve human health
Published: May 4, 2023

UMaine 2023 commencement ceremonies are May 5–6
Published: May 2, 2023

WABI reports on UMaine launching Maine College of Engineering and Computing

Celebrating our Students' Achievements

We are proud to announce that UMaine 2023 Valedictorian is Lara Chern, a graduating senior in mechanical engineering (Read more). She is joined by McKayla Leary as the Outstanding Senior in MEE and Ata Turgut as the Hovey award recipient. Also, Min Wang, a PhD student in mechanical engineering, was recently recognized as the outstanding Graduate Research Assistant in the college.

Expanding Research on Wearable Robotics

Through a $432,000 grant from the National Institute on Aging of NIH, Dr. Babak Hejrati and his research team will continue their innovative research on wearable robotics for gait training of older adults. Read more

Advancing in Faculty Ranks

We are delighted to announce that the following three faculty have received tenure and/or promotion in mechanical engineering:

Dr. Alex Friess: Promoted to Professor

Dr. Babak Hejrati: Promoted to Associate Professor with tenure

Dr. Yingchao Yang: Promoted to Associate Professor with tenure

Read more

Chair's Message
Mission & Goals
Opportunities for Researchers and Students
Virtual Tour of Engineering Laboratories
Student Chapters & Clubs
Sponsor a Capstone Project
Scholarships
Campus Resources
FE & PE Exams
Alumni & Friends

News

Reuters notes UMaine role in offshore wind development

Published: June 22, 2023

TIDC to host 2023 Transportation Infrastructure Durability Conference Aug. 8–10

Published: June 15, 2023

Maine Monitor interviews MacRae about PFAS elimination technologies for op-ed

Published: June 12, 2023

Four UMaine Ph.D. students win top awards in 2023

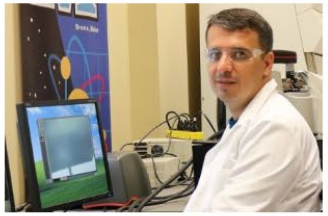
Undergraduate Program

The Mechanical Engineering Program is accredited by the Engineering Accreditation Commission of ABET. This program leads to a Bachelor of Science degree in mechanical engineering.

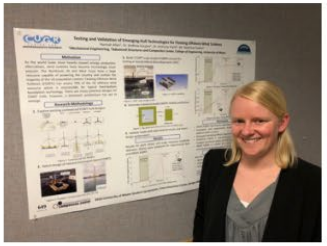
- Program Educational Objectives and Student Outcomes

- **Undergraduate Curriculum**
- Undergraduate Catalog – MEE courses
- Engineering Electives
- Technical Electives
- Schedule of Technical Electives
- List of General Education Courses and Categories
- Mechanical Engineering Enrollment and Degrees Awarded

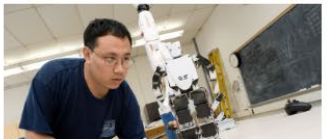
Educational Opportunities Beyond a BS Degree



Master's and PhD Degrees in MEE



MS Degree in MEE – Accelerated Track, Application



Published: June 12, 2023

Four UMaine Ph.D. students win top awards in 2023 BioME showcase

Published: June 8, 2023

Concord Monitor highlights offshore wind workforce training at UMaine

Published: June 8, 2023

Daily Bulldog notes UMaine supporting RSU 74 high altitude balloon project

Published: June 8, 2023

Scholarships

Concentration in Aerospace

Experiential Learning

- Study Abroad in Valencia, Spain (All Classes Taught in English)
- Job, Co-Op and Internship Opportunities

Academic Resources

- Engineering Tutoring Center
- Tutorials

Prospective Undergraduate Students

In addition to pursuing an ABET-accredited program in mechanical engineering, our students can also select a **Concentration in Aerospace Engineering** or pursue a minor in Robotics, Biomedical Engineering, or Ocean and Marine Engineering among many minor options at UMaine.

- **What Do Our Students Say?**
- General Admission Guidelines for Engineering
- **Apply for Admission to UMaine**
- Computer Policy
- Fall 2022 Orientation

Professional Science Master's Degree in Engineering and Business

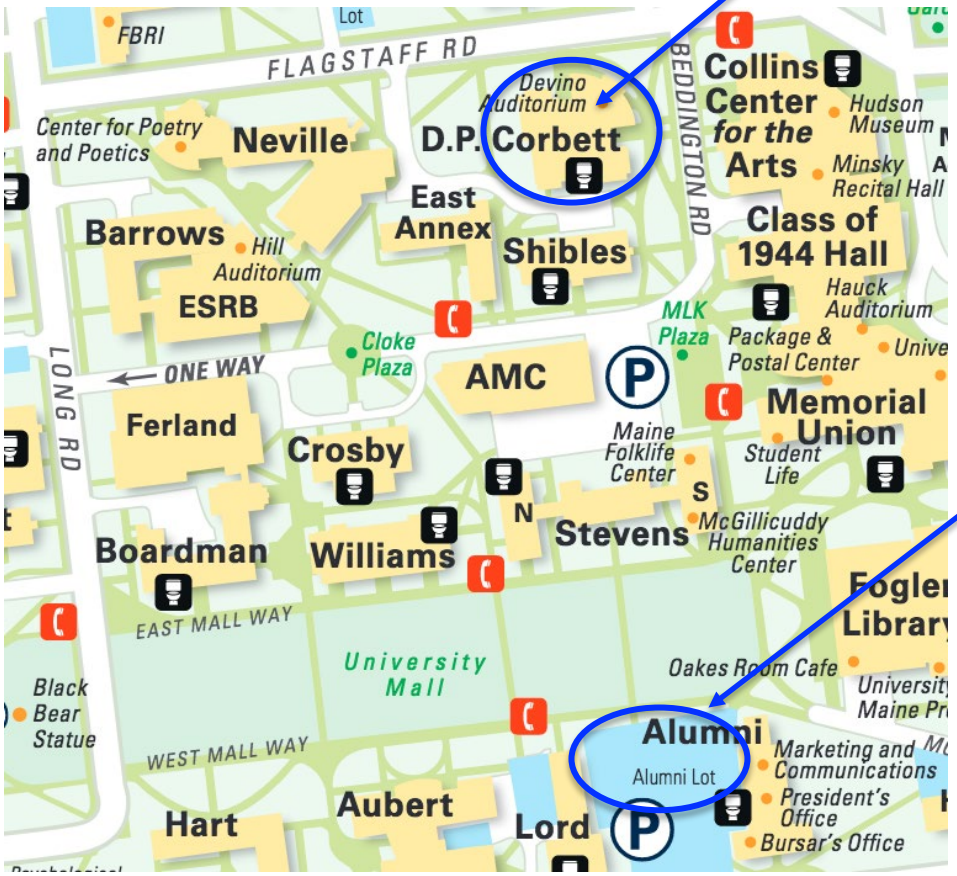
Undergraduate Composites Certificate

5-Year MBA

Questions?

What's next? Lunch for all students

UMaine Campus Map



But before you leave for lunch, we will hand out your individual course schedules (also available on MaineStreet: mycampus.maine.edu/)

- There may be a written note indicating anything you still need to do (MPE, FTC form, HVSC elective preference Google Form, etc.)

Additional slides

Email Communication

- Always begins with proper salutation → Dr./Prof./Ms./Mr. Smith,
- Email is not a text message → Proper English is important!
- Email is not a text message → Do not expect an immediate response!
- Specify action requested → I would like to set up a time to meet with you for advising. I am contacting you to ask about …
- Relatively short, easy to read and understand
- Respectful language

Student Accessibility Services

- You can request different accommodations
- If approved, accommodation can be used for any academic work, including exams and assignments
- You need to notify your instructor in each course
- For additional information: https://umaine.edu/studentaccessibility/

Honors College

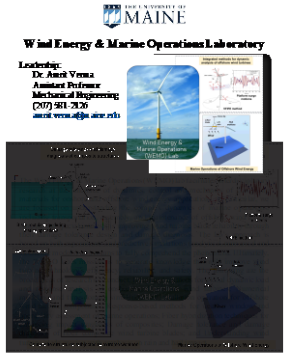
- To graduate with Honors, a student must successfully
  - complete Honors Civilizations four-semester sequence (HON 111, 112, 211, 212)
  - complete one Honors Tutorial (HON 308-347) or Tutorial Alternative (HON 349)
  - complete HON 170: Currents & Contexts
  - complete HON 180: A Cultural Odyssey or HON 188: Cultural Connections
  - complete the Honors Thesis: HON 498 and HON 499 including the thesis defense
  - attain an overall cumulative GPA of 3.30 or greater at the time of graduation.
- The Honors curriculum satisfies the HVSC and ENG 101 requirements.
- Note: You will need to do an Honors thesis in your senior year in addition to your Mechanical Engineering Capstone Design project.
- For additional information: honors.umaine.edu/

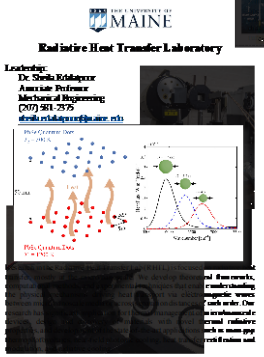
Undergraduate Research Experience

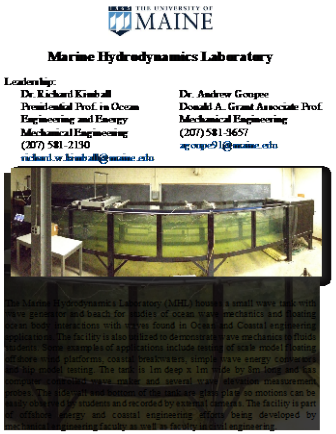
- Study faculty profiles at (umaine.edu/mecheng/mee-faculty-staff)
- Contact faculty who work in your area(s) of interest
- Study their research, meet and ask questions
- Get engaged to improve your future career opportunities

MEE Research Labs in Crosby Hall

- Additive & Digital Manufacturing Lab
- Aerospace Lab
- Biorobotics & Biomechanics Lab
- Marine Hydrodynamics Lab
- Nanomaterials Innovation Lab
- Radiative Heat Transfer Lab
- Solar Thermal Energy Lab
- Vibrations & Impact Testing Lab
- Wind Energy & Marine Operations Lab



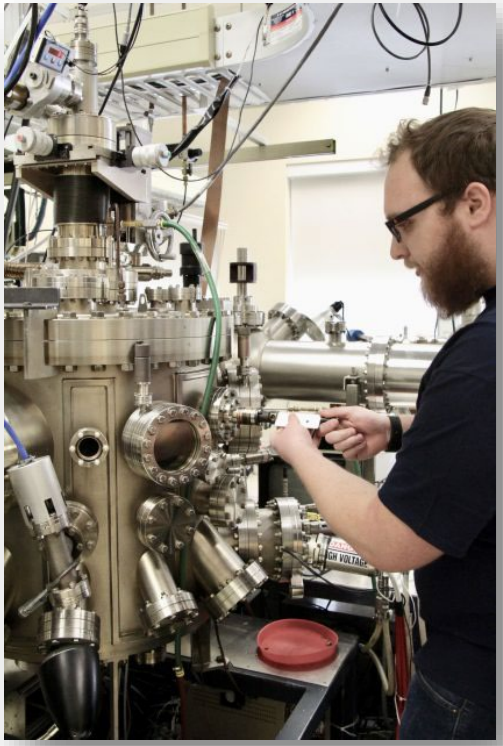




Access to Exceptional Research Laboratories

Advanced Structures and Composites Center

Frontier Institute for Research in Sensor Technologies



Advanced Manufacturing Center

Accelerated Master's Degree in MEE

- Eligibility Requirements
  - Engineering or engineering physics major
  - Can start the program in junior year
  - Must have completed 60 to 100 credits toward BS degree
  - A cumulative GPA ≥ 3.3 in BS degree for final admission to grad school

- Key Advantages
  - **Take up to 3 grad-level courses (9 credits) and double count them for both BS (tech electives) and MS degrees**
  - Reduce time to MS degree by at least one semester
  - Pursue MS degree with thesis or non-thesis option
  - Identify graduate advisor and start research early (thesis option)

Prepare to Succeed in MEE

- Keep a positive attitude
- Be respectful and professional with all around you
- Take ownership of your college education
- Never miss class
- Do your assignments in full and submit them on time
- Don’t be satisfied with shallow understanding of course materials
- Don’t be shy about asking questions or for help in general
- Don’t be tempted to cheat in any shape or form
- Don’t be deterred by challenges

Test Your Knowledge

1. On average, U.S. workers earn nearly $62,000 annually. According to the Bureau of Labor Statistics, mechanical engineers earn more than the average. **What is the median annual wage of MEs?**

   a) $72,700
   b) $85,560
   ✓ c) $96,310
   d) $106,520

2. This state not only has the largest number of working mechanical engineers in the nation, but also tops the list of number of MEs per 1,000 people employed. **Which state has nearly 32,000 working MEs within its borders?**

   ✓ a) Michigan, due to the automotive industry
   b) California, because of infrastructure needs
   c) Georgia, since MEs graduate from Georgia Institute of Technology and stay
   d) Texas, as a result of jobs in oil and gas

Source: ASME

Test Your Knowledge

3. According to the most recent information from the Bureau of Labor Statistics, **in which state do mechanical engineers earn the most?**

   a) Maryland at $104,000
   b) California at $108,000
   c) New York at $118,000
   ✓ d) New Mexico at $128,000

4. According to the latest government data, despite losing population, **the most mechanical engineers work in this city**?

   a) Philadelphia at 8,500
   b) Los Angeles at 8,400
   ✓ c) Detroit at 21,000
   d) Chicago at 8,300

Source: ASME

Test Your Knowledge

5. More mechanical engineers work within federal, state, and local governments than any other sector. But when it comes to paying top dollar, **which three industries pay MEs the most?**

a) Natural Gas Distribution, Utilities, and Manufacturing Petroleum Products
✓ b) Oil and Gas Extraction, Natural Gas Distribution, and Pipeline Transport
c) Electric Generation, Nuclear Power, and Oil and Gas Extraction
d) Chemical Manufacturing, Oil and Gas Extraction, and Nuclear Power

Source: ASME