MITMECHE

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G A M E D

GETTING AROUND THE MECHANICAL ENGINEERING DEPARTMENT

Keep this guide to the ME Undergraduate Program throughout your education. It has content useful to sophomores, juniors and seniors alike.

Massachusetts Institute of Technology
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Contents

MechE Undergraduate Office

The mission of the MechE Undergraduate Office is to support the department's undergraduate programs and to help serve the academic needs of MechE undergraduate students. At our office you can get information, forms, and advice. The UG office is staffed by:

MechE Undergraduate Administrator
Mr. Jared Embelton – jarede@mit.edu
MechE Undergraduate Administrative Support
Ms. Ellen Parilla – ellenf@mit.edu
Ms. Heather Theberge – htheberg@mit.edu
MechE Undergraduate Officer
Professor Rohit Karnik – karnik@mit.edu
Course 2-A Coordinator
Professor Seth Lloyd – slloyd@mit.edu

Mechanical Engineering Undergraduate Office
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What is MechE about?

Mechanical engineering is concerned with the responsible development of products, processes, and power, whether at the molecular scale or at the scale of large, complex systems. Mechanical engineering principles and skills are needed at some stage during the conception, design, development, and manufacture of every human-made object with moving parts. Many innovations crucial to our future will have their roots in the world of mass, motion, forces, and energy—the world of mechanical engineers.

Mechanical engineering is one of the broadest and most versatile of the engineering professions. This is reflected in the portfolio of current activities in the department, one that has widened rapidly in the past decade. Today, our faculty are involved in projects ranging from, for example, the use of nanoparticles to tailor the properties of polymers, to the use of active control to optimize combustion processes; from the design of miniature robots for extraterrestrial exploration, to the creation of needle-free drug injectors; from the design and fabrication of low-cost radio-frequency identification chips, to the development of efficient methods for robust design; from the development of unmanned underwater vehicles, to the creation of optimization methods that autonomously generate decision-making strategies; from the invention of cost-effective photovoltaic cells, to the prevention of material degradation in proton-exchange membrane fuel cells; from the use of acoustics to explore the ocean of one of Jupiter's moons, to the biomimetics of swimming fish; from the development of physiological models for the human liver, to the development of novel ways for detecting precancerous events; and from the use of nanoscale antennas for manipulating large molecules, to the fabrication of 3-D nanostructures out of 2-D substrates.

Our graduates go on to a vast array of careers in product design, research, management, medicine, government, teaching, public service, and entrepreneurship.

Undergraduate Study in MechE

The Department of Mechanical Engineering offers three programs of undergraduate study. The first of these, the traditional program that leads to the bachelor's degree in mechanical engineering, is a more structured program that prepares students for a broad range of career choices in the field of mechanical engineering. The second program leads to a bachelor's degree in engineering and is intended for students whose career objectives require greater flexibility. It allows them to combine the essential elements of the traditional mechanical engineering program with study in another, complementary field. The third program, in mechanical and ocean engineering, is also a structured program for students interested in mechanical engineering as it applies to the engineering aspects of ocean science, exploration, and utilization, and of marine transportation.

All of the educational programs in the department prepare students for professional practice in an era of rapidly advancing technology. They combine a strong base in the engineering sciences (mechanics, materials, fluid and thermal sciences, systems and control) with project-based laboratory and design experiences. All strive to develop independence, creative talent, and leadership, as well as the capability for continuing professional growth.

In addition to the three MechE major programs, the Department also offers a minor program for those students who wish to acquire a basic knowledge of our field.

Bachelor of Science in Mechanical Engineering/Course 2

The program in mechanical engineering provides a broad intellectual foundation in the field of mechanical engineering. The program develops the relevant engineering fundamentals, includes various experiences in their application, and introduces the important methods and techniques of engineering practice.

This program has been accredited by the Accreditation Commission of ABET, http://www.abet.org, as a mechanical engineering degree.

The educational objectives of the program leading to the degree Bachelor of Science in Mechanical Engineering are that:

Within a few years of graduation, a majority of our graduates will have completed or be progressing through top graduate programs; advancing in leadership tracks in industry, non-profit organizations, or the public sector; or pursuing entrepreneurial ventures. In these roles they will:

1. Apply a deep working knowledge of technical fundamentals in areas related to mechanical, electromechanical, and thermal systems to address needs of the customer and society;
2. Develop innovative technologies and find solutions to engineering problems.
3. Communicate effectively as members of multidisciplinary teams;
4. Be sensitive to professional and societal contexts and committed to ethical action;
5. Lead in the conception, design, and implementation of new products, processes, services, and systems.

Students are urged to contact the ME Undergraduate Office (Room 1-110) as soon as they have decided to enter mechanical engineering, so that a faculty advisor may be assigned. Students, together with their faculty advisors, plan a program that best utilizes the departmental electives and the 48 units of unrestricted electives available in the Course 2 degree program.

Requirements (class of 2018 and later)

Bachelor of Science in Mechanical Engineering/Course 2

General Institute Requirements (GIRs)	**Subjects**
Science Requirement (Calculus I & II, Physics I & II, Chemistry, Biology)	6
Humanities, Arts, and Social Sciences Requirement	8
Restricted Electives in Science and Technology (REST) Requirement [can be satisfied by 2.001 and 18.03 in the Departmental Program]	2
Laboratory Requirement [can be satisfied by 2.671 in the Departmental Program]	1
Total GIR Subjects Required for SB Degree	**17**

Communication Requirement

The program includes a Communication Requirement of 4 subjects:
2 subjects designated as Communication Intensive in Humanities, Arts, and Social Sciences (CI-H); and 2 subjects designated as Communication Intensive in the Major (CI-M) [satisfied by 2.009 and 2.671 in the Departmental Program].

PLUS Departmental Program **Units**

Subject names are followed by units, and prerequisites if any (corequisites in italics).

Required Departmental Core Subjects **153**

2.001 Mechanics and Materials I, 12, REST; Calculus II, Physics I, *18.03* (3)
2.002 Mechanics and Materials II, 12; Chemistry, 2.001
2.003J Dynamics and Control I, 12, REST; Physics I, *18.03** (3)
2.004 Dynamics and Control II, 12; Physics II, 2.003J
2.005 Thermal-Fluids Engineering I, 12; Calculus II, Physics II, 2.086* (3)
2.006 Thermal-Fluids Engineering II, 12; 2.005
2.008 Design and Manufacturing II, 12, 1/2 LAB; *2.005*; 2.007 or *2.017J*
2.009 The Product Engineering Process, 12, CI-M; 2.001, 2.003J, 2.005; 2.670, 2.00B or 2.678; senior standing or permission of instructor*
2.086 Numerical Computation for Mechanical Engineers, 12, REST; Calculus II, Physics I, *18.03** (3)
2.670 Mechanical Engineering Tools, 3
2.671 Measurement and Instrumentation, 12, LAB, CI-M; Physics II, 2.001, 2.003J, 2.086*
18.03 Differential Equations, 12, REST; *Calculus II** (3)
2.ThU Undergraduate Thesis, 6(1)
and
2.007 Design and Manufacturing I, 12; 2.001, 2.670, *2.086* (3)
or
2.017J Design of Electromechanical Robotic Systems, 12, 1/2 LAB; 2.003J; *2.005* or *2.016*; *2.671*

Restricted Elective Subjects **24**

Students are required to take two of the following elective subjects (substitutions may be requested by petition to the ME Undergraduate Office, 1-110):

2.016 Hydrodynamics, 12; Physics II, 18.03

2.017J Design of Electromechanical Robotic Systems, 12, 1/2 LAB; 2.003J; *2.005* or *2.016*; *2.671*

2.019 Design of Ocean Systems, 12, CI-M; 2.001; 2.003J; 2.005 or 2.016; senior standing or permission of instructor

2.050J Nonlinear Dynamics I: Chaos, 12; Physics II; 18.03 or 18.04

2.092 Computer Methods in Dynamics, 12; 2.001, 2.003J

2.12 Introduction to Robotics, 12; 2.004

2.14 Analysis and Design of Feedback Control Systems, 12; 2.004

2.184 Biomechanics and Neural Control of Movement, 12; 2.004 or permission of instructor

2.370 Fundamentals of Nanoengineering, 12; Chemistry, 2.001

2.51 Intermediate Heat and Mass Transfer, 12; 2.006*

2.60J Fundamentals of Advanced Energy Conversion, 12; 2.006*

2.676 Micro/Nano Engineering Laboratory,12; 2.001, 2.003, 2.671; *2.005, or 2.051 and 2.06*

2.71 Optics, 12; Physics II, 18.03, 2.004*

2.72 Elements of Mechanical Design, 12; 2.005, 2.008, *2.671*

2.797J Molecular, Cellular, and Tissue Biomechanics, 12; 18.03 or 3.016; 7.012, 7.013, 7.014, or 7.105; 2.370 or 2.772J

2.813 Environmentally Benign Design and Manufacturing, 12; 2.008 or permission of instructor

2.96 Management in Engineering, 12

See **Allowed Substitutions** for more options (by petition).

Departmental Program Units That Also Satisfy the GIRs **(36)**

Unrestricted Electives[(2)] **48**

Total Units Beyond the GIRs Required for SB Degree **189**

No subject can be counted *both* as part of the 17-subject GIRs *and* as part of the 195 units required beyond the GIRs. *Every* subject in the student's departmental program will count toward one or the other, *but not both.*

Notes

*Alternate prerequisites are listed in the subject description.

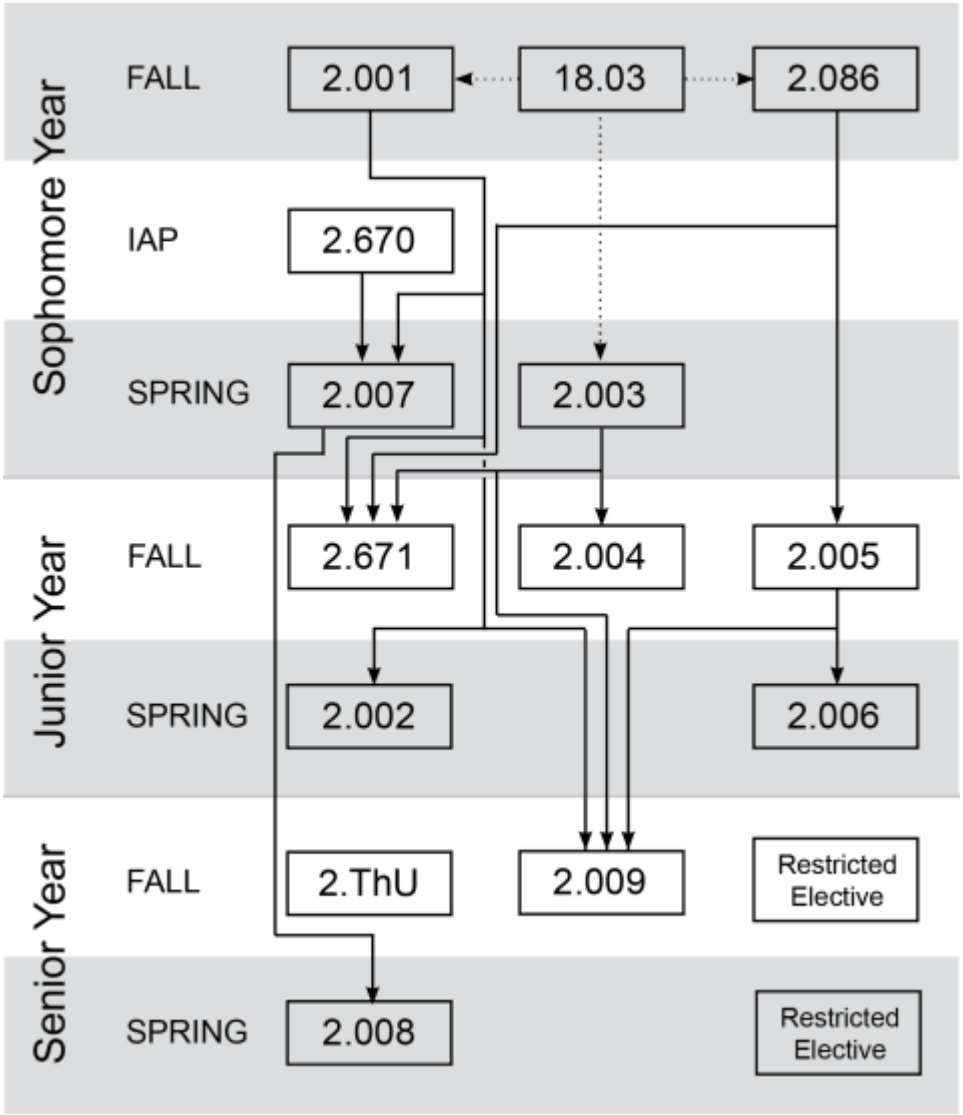
(1) To encourage more substantial research, design, or independent study, the department permits up to 15 units of 2.ThU credit, subject to approval of the student's thesis advisor.

(2) The department suggests that students elect a basic electronics subject (e.g., 2.678, 6.002 or 6.071) as early as possible in their program.

(3) Starting with the class of 2019, students must pass a pre-requisite subject with a C or better in order to progress to the next level required subject.

Typical Course 2 Flow Chart

HASS subjects and the four unrestricted electives are not shown.



Scheduling Comments

2.00A* or **2.00B*** (**Not a required subject**) Optional freshman "hands-on" subjects that provide an overview of mechanical engineering. These may be taken in the second semester of the freshman year.

2.001 Fundamental M.E. subject which should be taken as early as possible (often taken in the second semester of the freshman year).

2.002 Should be taken following 2.001.

2.003 Fundamental M.E. subject which should be taken as early as possible.

2.670* Must be taken during IAP sophomore year.

2.004* Should be taken the semester following 2.003J.

2.005 Should be taken first semester junior year (unless taking junior year at Cambridge University).

2.006 Should be taken the semester following 2.005.

2.007* Important to take this second semester sophomore year, immediately following 2.670, (IAP sophomore year). Students may alternatively take 2.017J*.

2.671* Must be taken junior year (fulfills half of the CI-M requirement).

2.008* Should be taken in the junior or senior year.

2.009 Must be taken first semester of the senior year (fulfills half of CI-M requirement). Students may alternatively take 2.013*, 2.750* or 2.760*.

2.086 Should be taken Sophomore year.

2.674* (**Not a required subject**) A nanotechnology focused experimental laboratory subject – can count as a restricted elective (with a petition) if combined with another 6+ unit engineering subject.

2.678* (**Not a required subject**) Optional electronics subject; good preparation for 2.007. Does NOT substitute for 2.670.

2.ThU Students should begin their thesis by the first semester of the senior year.

* Laboratory subject in which enrollment may be limited by facilities available.

Sample Schedules for Course 2

Typical Mainstream Schedule

Freshman	Fall		IAP		Spring	
	3.091	12			8.02	12
	8.01	12			18.02	12
	18.01	12			Elective	12
	HASS	12			HASS	12
Total Units		**48**				**48**

Sophomore	Fall		IAP		Spring	
	2.001	12	2.670	3	2.003J	12
	2.086	12			2.007	12
	18.03	12			7.013/4	12
	HASS	12			HASS	12
Total Units		**48**		**3**		**48**

Junior	Fall		IAP		Spring	
	2.004	12			2.002	12
	2.005	12			2.006	12
	2.671	12			Elective	12
	HASS	12			HASS	12
Total Units		**48**				**48**

Senior	Fall		IAP		Spring	
	2.009	12	2.ThU	3-6	2.008	12
	Restricted Elective	12			Restricted Elective	12
	Elective	12			Elective	12
	HASS	12			HASS	12
					2.ThU	3-6
Total Units		**48**		**3-6**		**51-54**

Late Entry Schedule for Course 2

Freshman	Fall		IAP		Spring	
	3.091	12			8.02	12
	8.01	12			18.02	12
	18.01	12			Elective	12
	HASS	12			HASS	12
Total Units		**48**				**48**

Sophomore	Fall		IAP		Spring	
	18.03	12			2.001	12
	7.012	12			Elective	12
	Elective	12			Elective	12
	HASS	12			HASS	12
Total Units		**48**				**48**

Junior	Fall		IAP		Spring	
	2.003J	12	2.670	3	2.004	12
	2.005	12			2.006	12
	2.086	12			2.007	12
	HASS	12			HASS	12
Total Units		**48**		**3**		**48**

Senior	Fall		IAP		Spring	
	2.009	12	2.ThU	3-6	2.002	12
	2.671	12			2.008	12
	Restricted Elective	12			2.ThU	3-6
	HASS	12			Restricted Elective	12
					HASS	12
Total Units		**48**		**3-6**		**51-54**

Bachelor of Science in Engineering as Recommended by the Department of Mechanical Engineering/Course 2-A

Course 2-A is designed for students whose academic and career goals demand greater breadth and flexibility than are allowed under the mechanical engineering program, Course 2. To a large extent, the 2-A program allows students an opportunity to tailor a curriculum to their own needs, starting from a solid mechanical engineering base. The program combines a rigorous grounding in core mechanical engineering subjects with an individualized course of study focused on a second area that the student designs with the help and approval of the 2-A faculty advisor. The program leads to the degree Bachelor of Science in Engineering as recommended by the Department of Mechanical Engineering.

This program has been accredited by the Accreditation Commission of ABET, http://www.abet.org, as an engineering degree.

The educational objectives of the program leading to the degree Bachelor of Science as Recommended by the Department of Mechanical Engineering are that:

Within a few years of graduation, a majority of our graduates will have completed or be progressing through top graduate programs; advancing in leadership tracks in industry, non-profit organizations, or the public sector; or pursuing entrepreneurial ventures. In these roles they will:

1. Apply a deep working knowledge of technical fundamentals in areas related to mechanical, electromechanical, and thermal systems to address needs of the customer and society;
2. Develop innovative technologies and find solutions to engineering problems.
3. Communicate effectively as members of multidisciplinary teams;
4. Be sensitive to professional and societal contexts and committed to ethical action;
5. Lead in the conception, design, and implementation of new products, processes, services, and systems.

A significant part of the 2-A curriculum consists of electives chosen by the student to provide in-depth study of a field of the student's choosing. A wide variety of popular concentrations are possible, in which well-selected academic subjects complement a foundation in mechanical engineering and general Institute requirements.

The self-designed concentration must include at 72 units of engineering topics. While engineering topics are usually covered through engineering subjects, subjects outside the School of Engineering may provide material essential to the engineering program of some concentrations. For example, management subjects usually form an essential part of an engineering management concentration. In all cases the relationship of concentration subjects to the particular theme of the concentration must be obvious. Inclusion of non-engineering subjects may require students to take additional subjects with engineering content (extra engineering subjects may be outside the area of concentration) in order to meet the minimum engineering content requirement.

Registration for this degree program **requires approval** from the MechE Undergraduate Office. The online enrollment form *must* be submitted by the start of the term following a student's enrollment in Course 2-A.
Online Enrollment form: https://meche-res.mit.edu/resources/new2A/

2-A Concentrations

Many different concentrations are possible, and a student's particular program may be unique. To aid students in choosing their concentrations, the faculty have developed specific program recommendations in the following areas.

1. Biomechanics and Biomedical Devices
2. Control, Instrumentation and Robotics
3. Energy
4. Engineering Management
5. Entrepreneurship
6. Environmental Mechanics
7. Industrial Design
8. Manufacturing
9. Mechanics (Math/Computation)
10. Nano/Micro Engineering
11. Product Development
12. Sustainable and Global Development
13. Transportation

For more information, see track descriptions on the 2-A blog: http://course2a.wordpress.com/tracks/

Concentrations are not limited to those listed above. Students are encouraged to design and propose technically oriented concentrations that reflect their own needs and those of society.

Students concentration subjects are reviewed by the 2-A Coordinator, Professor Seth Lloyd (slloyd@mit.edu), as well as the Undergraduate Officer. A proposed course of study is developed and submitted, using the online form, for review and approval. Certain restrictions do apply, as described on the 2-A enrollment form.

In spring 2016, the 2-A concentrations chosen by students were distributed approximately as follows.

25% Control, Instrumentation, and Robotics
24% Product Development/Product Design
13% Biomedical Engineering/Pre-Med
10% Engineering Management
4% Energy
3% Sustainable and Global Development
3% Industrial Design

Resources for 2-A concentration planning:
2-A Blog: http://course2a.wordpress.com/
Choosing a concentration: http://course2a.wordpress.com/about/
2-A Enrollment Form: https://meche-res.mit.edu/resources/new2A/
Engineering Units: http://course2a.wordpress.com/engineering-units-2/
2-A Coordinator: Prof Seth Lloyd
2-A Office Hours are available via a sign up sheet outside 3-160.

Choosing a Concentration

From the 2-A blog: http://course2a.wordpress.com/

A concentration is 6-8 subjects (72 units or more) that form a topic within the field of engineering. Your concentration should make up a ***single cohesive topic*** (not a group of topics), and the relationship between your topic and subjects should be logical and obvious. Your topic should be simple enough that you can describe it easily in a short paragraph (as part of your 2-A enrollment form: https://meche-res.mit.edu/resources/new2A/).

If you aren't sure what you'd like to do for your concentration, it can be helpful to look at the Tracks section of the 2-A blog. Your concentration does not have to be in one of the listed tracks; the tracks are simply concentrations that are popular enough to have a description and track advisor. If you choose one of these tracks, you are not limited to taking the specific subjects that are listed in the description. You may include any subjects that have a logical and obvious connection to the track and are of interest to you.

Once you have a concentration, then you just need to select subjects (72 units or more) that fit within your selected topic, from any department. Guidelines for the 2A degree can be found on the main Tracks webpage (see link below). After you submit your form, the engineering content will be assessed by the 2A Coordinator. If the subjects that you have selected are not engineering subjects, then the "engineering units" associated with the subject may be zero, or a portion of the total number of units (see link below for more on engineering units). In this case, you may need to include extra engineering subjects in order to make sure that you have the required engineering content.

If you have any questions, you can email the 2-A Coordinator, Prof Seth Lloyd, at slloyd@mit.edu, or sign up for 2-A Office Hours on the sign up sheet outside 3-160. You are also welcome to talk to Jared Embelton in 1-110, jarede@mit.edu. If you already know what subjects you are going to take for your concentration, then you can simply submit the online form for review.

Requirements

Bachelor of Science in Engineering as recommended by the Department of Mechanical Engineering/Course 2-A

General Institute Requirements (GIRs)	**Subjects**
Science Requirement (Calculus I & II, Physics I & II, Chemistry, Biology)	6
Humanities, Arts, and Social Sciences Requirement	8
Restricted Electives in Science and Technology (REST) Requirement [can be satisfied by 2.086 in the Departmental Program and one subject in the Elective Subjects with Engineering Content]	2
Laboratory Requirement [satisfied by 2.671 in the Departmental Program]	1
Total GIR Subjects Required for SB Degree	**17**

Communication Requirement
2 subjects designated as Communication Intensive in Humanities, Arts, and Social Sciences (CI-H); and 2 subjects designated as Communication Intensive in the Major (CI-M) [satisfied by 2.009 and 2.671 in the Departmental Program].

PLUS Departmental Program **Units**

Subject names are followed by units, and prerequisites if any (corequisites in italics).

Required Departmental Core Subjects **96**

2.00 Introduction to Design, 6[(1)]; *meets second half of the term, Fall*
2.001 Elements of Structures, 6; Calculus II, Physics I, *2.087 or 18.03* [(3)]
2.086 Numerical Computation for Mechanical Engineers, 12, REST; Calculus II, Physics I, *2.087 or 18.03* [(3)]
2.087 Engineering Mathematics: Linear Algebra and ODEs I, 6; Calculus II, Physics I; *meets first half of the term* [(3)]
2.003J Dynamics and Control I, 12, REST; Physics I, *18.03** [(3)]
2.05 Thermodynamics, 6; 2.01; *meets first half of the term, Fall* [(3)]
2.051 Introduction to Heat Transfer, 6; 2.05; *meets second half of the term, Fall*
2.06 Fluid Dynamics, 6; 2.01; *half term subject (Fall: first half; Spring: second half)*
2.009 The Product Engineering Process, 12, CI-M; 2.01, 2.03, 2.051; 2.670, 2.678 or 2.00B; senior standing or permission of instructor*
2.671 Measurement and Instrumentation, 12, LAB, CI-M; Physics II, 2.01, 2.03, 2.086*
2.678 Electronics for Mechanical Systems, 6; Physics II
or
2.674 Micro/Nano Engineering Laboratory, 6; 2.001, 2.03, 2.671, *2.051 + 2.06*

Elective Subjects with Engineering Content [2] (must include 1 REST subject outside Course 2)	**72**
Departmental Program Units That Also Satisfy the GIRs	**(36)**
Unrestricted Electives	**48**
Total Units Beyond the GIRs Required for SB Degree	**180**

No subject can be counted *both* as part of the 17-subject GIRs *and* as part of the 180 units required beyond the GIRs. *Every* subject in the student's departmental program will count toward one or the other, *but not both.*

Notes

* Alternate prerequisites are listed in the subject description.

(1) 2.00B is an alternative to 2.00 and will fulfill this requirement. (No petition needed.)

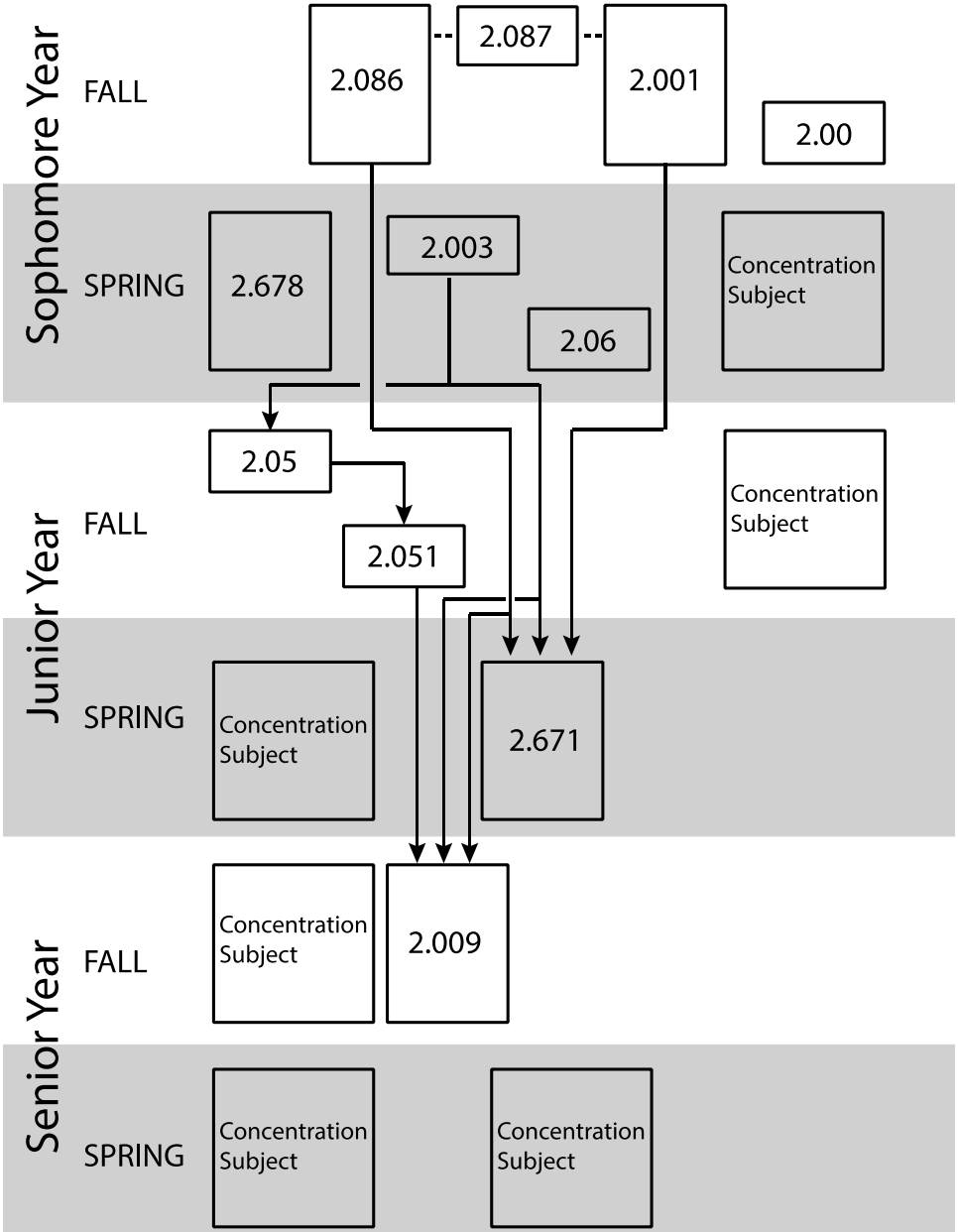
(2) These electives define a concentrated area of study and must be chosen with the approval of the ME Undergraduate Office. The 72 units of concentration electives must be engineering topics. Concentration electives must include one subject that meets the REST GIR, but not subjects that fulfill a HASS GIR. If a student is substituting 18.03 for 2.087, then 18.03 can meet the REST GIR (though 18.03 may not be included in the concentration). Engineering topics are usually obtained from engineering subjects, but in some cases, non-engineering subjects may be necessary for the particular engineering program defined by the concentration (e.g., management subjects for an engineering management concentration). In all cases, the relationship of concentration subjects to the theme of the concentration must be obvious.

(3) Starting with the class of 2019, students must pass a pre-requisite subject with a C or better in order to progress to the next level required subject.

Allowed substitutions with Course 2 subjects:
http://course2a.wordpress.com/allowed-substitutions/

Typical Course 2-A Flow Chart (New degree program)

HASS subjects and the four unrestricted electives are not shown.



Scheduling Comments

2.00* Should be taken freshman or sophomore year. 2.00B may substitute. Fall, second half of term.

2.001 Should be taken Fall sophomore year or Spring freshman year.

2.086 Should be taken sophomore year.

2.087 Fundamental M.E. subject that should be taken Freshman year or first semester sophomore year. First half of term subject. 18.03 may be taken in place of 2.087.

2.003 Should be taken sophomore year. As of Fall 2017, 2.003 will replace the 2.03 & 2.04A/B requirement.

2.05 Should be taken during Fall junior year – first half of term.

2.051 Should be taken during Fall junior year – second half of term.

2.06 Can be taken during sophomore or junior year, after 2.01. Half term subject.

2.678* Should be taken sophomore year. Full term subject.

2.009 Must be taken Fall semester senior year (fulfills half of CI-M requirement).

2.671* Must be taken junior year (fulfills half of CI-M requirement).

* Laboratory subject in which enrollment may be limited by facilities available.

Sample Schedules for Course 2-A

Typical Mainstream Schedule

Freshman	Fall		Spring	
	3.091	12	8.02	12
	8.01	12	18.02	12
	18.01	12	7.013	12
	HASS	12	HASS	12
Total Units		**48**		**48**

Sophomore	Fall			Spring		
	1st half	2nd half		1st half	2nd half	
		2.00	6	2.003		12
	2.087		6		2.06	6
	2.001		12	2.678		6
	2.086		12	Concentration Subject (REST)		12
	HASS		12	HASS		12
Total Units			**48**			**48**

Junior	Fall			Spring		
	1st half	2nd half		1st half	2nd half	
	2.05		6	2.671		12
		2.051	6	Concentration Subject		12
	Concentration subject		12	Elective		12
	Elective		12	HASS		12
	HASS		12			
Total Units			**48**			**48**

Senior	Fall		Spring	
	2.009	12	Concentration Subject	12
	Concentration subject	12	Concentration Subject	12
	Elective	12	Elective	12
	HASS	12	HASS	12
Total Units		**48**		**48**

Late Entry Schedule for Course 2-A

Freshman	Fall		Spring	
	3.091	12	8.02	12
	8.01	12	18.02	12
	18.01	12	Elective	12
	HASS	12	HASS	12
Total Units		**48**		**48**

Sophomore	Fall		Spring	
	7.012	12	18.03*	12
	Elective	12	Concentration Subject (REST)	12
	Elective	12	Elective	12
	HASS	12	HASS	12
Total Units		**48**		**48**

Junior	Fall			Spring		
	1st half	2nd half		1st half	2nd half	
	2.001		12	2.003		12
		2.00	6		2.06	6
	2.086		12	2.671		12
	HASS		12	Concentration Subject		12
				HASS		12
			42			**54**

Senior	Fall			Spring	
	1st half	2nd half		2.678	6
	2.05		6	Concentration Subject	12
		2.051	6	Concentration Subject	12
	2.009		12	Concentration Subject	12
	Concentration Subject		12	HASS	12
	HASS		12		
Total Units			**48**		**54**

*18.03 is allowed as a substitute for 2.087.

Double Majors with Course 2-A

The general requirement to obtain a bachelor's degree with two majors is to complete the GIRs and the departmental requirements of both majors. Students applying for a double major must have a grade-point average of at least 4.0. To apply for a double major, students submit a petition to the Committee on Curricula after completing at least three terms at MIT, including at least one in the department of one of the majors.

For more information:
http://web.mit.edu/registrar/subjects/cmtes/coc/petitions_doublemajor.html

In the case of Course 2-A, no more than 24 units counted in fulfillment for another major may be used to fulfill the 72 unit concentration requirement of Course 2-A. Other subjects may overlap (for example, 2.005 and 18.03 are required for both the Course 2-A and Course 22, and each would count toward both majors)

Bachelor of Science in Mechanical and Ocean Engineering/Course 2-OE

This program is intended for students who are interested in combining a firm foundation in mechanical engineering with a specialization in ocean engineering. The program includes engineering aspects of the ocean sciences, ocean exploration and utilization of the oceans for transportation, defense, and extracting resources. Theory, experiment and computation of ocean systems and flows are covered in a number of subjects, complementing a rigorous mechanical engineering program; a hands-on capstone design class allows the student to master the design of advanced marine systems, including autonomous underwater vehicles and smart sensors.

The Mechanical and Ocean Engineering Program is accredited by the Engineering Accreditation Commission of ABET, http://www.abet.org.

The educational objectives of the program leading to the degree Bachelor of Science in Mechanical and Ocean Engineering are that:

Within a few years of graduation, a majority of our graduates will have completed or be progressing through top graduate programs; advancing in leadership tracks in industry, non-profit organizations, or the public sector; or pursuing entrepreneurial ventures. In these roles they will:

1. Apply a deep working knowledge of technical fundamentals in areas related to mechanical, electromechanical, and thermal systems to address needs of the customer and society;
2. Develop innovative technologies and find solutions to engineering problems.
3. Communicate effectively as members of multidisciplinary teams;
4. Be sensitive to professional and societal contexts and committed to ethical action;
5. Lead in the conception, design, and implementation of new products, processes, services, and systems.

Graduates have exciting opportunities in the offshore and oceanographic industry, and the Navy or government, or for further study in graduate school.

Requirements

Bachelor of Science in Mechanical and Ocean Engineering/Course 2-OE

General Institute Requirements (GIRs)	**Subjects**
Science Requirement (Calculus I & II, Physics I & II, Chemistry, Biology)	6
Humanities, Arts, and Social Sciences Requirement	8
Restricted Electives in Science and Technology (REST) Requirement [can be satisfied by 2.001 and 18.03 in the Departmental Program]	2
Laboratory Requirement [can be satisfied by 2.671 in the Departmental Program]	1
Total GIR Subjects Required for SB Degree	**17**

Communication Requirement

The program includes a Communication Requirement of 4 subjects:
2 subjects designated as Communication Intensive in Humanities, Arts, and Social Sciences (CI-H); and 2 subjects designated as Communication Intensive in the Major (CI-M) [satisfied by 2.019 and 2.671 in the Departmental Program].

PLUS Departmental Program **Units**

Subject names below are followed by credit units, and by prerequisites if any (corequisites in italics).

Required Departmental Subjects **159**

2.001 Mechanics and Materials I, 12, REST; Calculus II, Physics I, *18.03** (1)
2.002 Mechanics and Materials II, 12; Chemistry, 2.001
2.003J Dynamics and Control I, 12, REST; Physics I, *18.03** (1)
2.004 Dynamics and Control II, 12; Physics II, 2.003J*
2.005 Thermal-Fluids Engineering I, 12, REST; Calculus II, Physics II, 2.086 (1)
2.016 Hydrodynamics, 12; 18.03, 2.001* (1)
2.017J Design of Electromechanical Robotic Systems, 12, 1/2 LAB; 2.003J; *2.005* or *2.016*; *2.671*
2.019 Design of Ocean Systems, 12, CI-M; 2.001; 2.003J; 2.005 or 2.016; senior standing or permission of instructor
2.086 Numerical Computation for Mechanical Engineers, 12, REST; Calculus II, Physics I, *18.03** (1)
2.065 Acoustics and Sensing, 12; 2.003J, 6.003, 8.03, or 16.03
2.612 Marine Power and Propulsion, 12; 2.005
2.670 Mechanical Engineering Tools, 3
2.671 Measurement and Instrumentation, 12, LAB, CI-M; Physics II, 2.001, 2.003J, 2.086*
18.03 Differential Equations, 12, REST; *Calculus II* (1)

Restricted Elective Subjects **12**

Students are required to take one of the following elective subjects (substitutions by petition to the ME Undergraduate Office):

2.006 Thermal Fluids Engineering II, 12; 2.005, 18.03
2.007 Design and Manufacturing I, 12; 2.001, 2.670
2.008 Design and Manufacturing II, 12, 1/2 LAB; 2.001; *2.005*; 2.007 or *2.017J*
2.092 Computer Methods in Dynamics, 12; 2.001, 2.003J
2.12 Introduction to Robotics, 12; 2.004
2.14 Analysis and Design of Feedback Control Systems, 12; 2.004
2.51 Intermediate Heat and Mass Transfer, 12; 2.006*
2.60J Fundamentals of Advanced Energy Conversion, 12; 2.006*
2.676 Micro/Nano Engineering Laboratory,12; 2.001, 2.003, 2.671; *2.005, or 2.051 and 2.06*
2.700 Principles of Naval Architecture, 12; 2.002 or 2.012J
2.72 Elements of Mechanical Design, 12; 2.005, 2.007, 2.671
2.96 Management in Engineering, 12
2.ThU Undergraduate Thesis, 12

Departmental Program Units That Also Satisfy the GIRs **(36)**

Unrestricted Electives **48**

Total Units Beyond the GIRs Required for SB Degree **183**

No subject can be counted *both* as part of the 17-subject GIRs *and* as part of the 183 units required beyond the GIRs. *Every* subject in the student's Departmental Program will count toward one or the other, *but not both.*

Notes

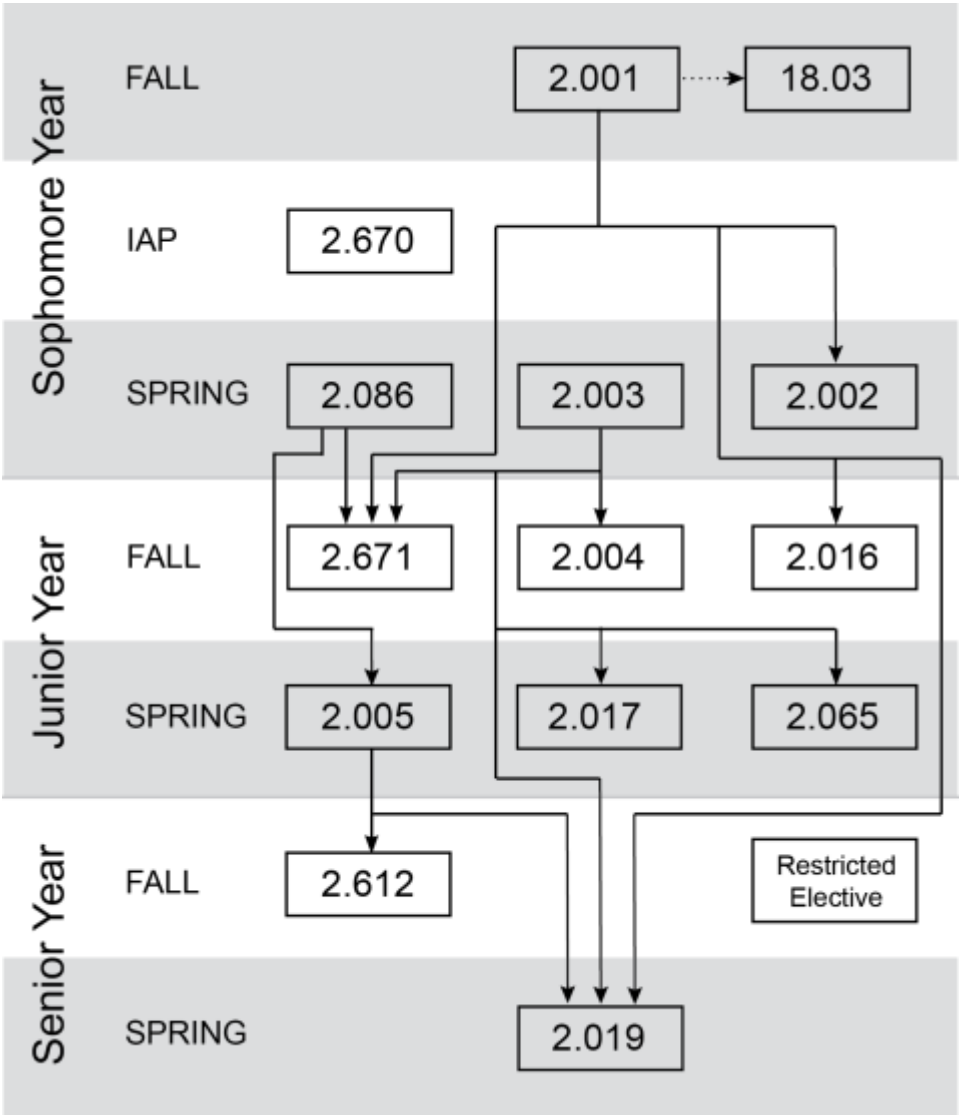
*Alternate prerequisites are listed in the subject description.

(1) Starting with the class of 2019, students must pass a pre-requisite subject with a C or better in order to progress to the next level required subject.

See the Substitutions sections for a list of pre-approved, common substitutions.

Typical Course 2-OE Flow Chart

HASS subjects and the four unrestricted electives are not shown.



Scheduling Comments

2.001 Fundamental M.O.E. subject which should be taken as early as possible.

2.002 Should be taken the semester following 2.001.

2.003 Fundamental M.O.E. subject which should be taken as early as possible.

2.670* Must be taken during IAP of the sophomore year.

2.004 Should be taken the semester following 2.003J.

2.005 Should be taken first semester junior year unless taking junior year at Cambridge University.

2.016* Should be taken the Fall semester following 2.003J. Meets with 2.06 first half of the term.

2.065 Should be taken the Spring semester of junior or senior year.

2.086 Should be taken sophomore year.

2.017* Must be taken in the Spring semester of junior year and before 2.019.

2.671* Must be taken junior year (fulfills half of the CI-M requirement).

2.612 Taken in the Fall semester of the senior year.

2.019* Must be taken spring semester of senior year (fulfills half of CI-M requirement).

* Laboratory subject in which enrollment may be limited by facilities available.

Sample Schedules for Course 2-OE

Typical Mainstream Schedule

Freshman	Fall		IAP		**Spring**	
	3.091	12			8.02	**12**
	8.01	12			18.02	**12**
	18.01	12			Elective	**12**
	HASS	12			HASS	**12**
Total Units		**48**				**48**

Sophomore	Fall		IAP		**Spring**	
	2.001	12	2.670	3	2.003J	**12**
	18.03	12			2.002	**12**
	7.012	12			2.086	**12**
	HASS	12			HASS	**12**
Total Units		**48**		**3**		**48**

Junior	Fall		IAP		**Spring**	
	2.004	12			2.005	**12**
	2.016	12			2.017	**12**
	2.671	12			2.065	**12**
	HASS	12			HASS	**12**
Total Units		**48**				**48**

Senior	Fall		IAP		**Spring**	
	2.612	12			2.019	**12**
	Elective	12			Elective	**12**
	Restricted Elective	12			Elective	**12**
	HASS	12			HASS	**12**
Total Units		**48**				**48**

Late Entry Schedule for Course 2-OE

Freshman	Fall		IAP		**Spring**	
	3.091	12			8.02	**12**
	8.01	12			18.02	**12**
	18.01	12			Elective	**12**
	HASS	12			HASS	**12**
Total Units		**48**				**48**

Sophomore	Fall		IAP		**Spring**	
	18.03	12			2.001	**12**
	7.012	12			Elective	**12**
	Elective	12			Elective	**12**
	HASS	12			HASS	**12**
Total Units		**48**				**48**

Junior	Fall		IAP		**Spring**	
	2.003J	12	2.670	3	2.005	**12**
	2.016	12			2.017	**12**
	2.086	12			2.671	**12**
	HASS	12			HASS	**12**
Total Units		**48**		**3**		**48**

Senior	Fall		IAP		**Spring**	
	2.004	12			2.002	**12**
	2.612	12			2.019	**12**
	Restricted Elective	12			2.065	**12**
	HASS	12			HASS	**12**
Total Units		**48**				**48**

Minor in Mechanical Engineering

The minor in mechanical engineering complements studies in a major field closely allied to mechanical engineering, such as materials science and engineering, aeronautics and astronautics, electrical engineering, management, and a number of other possibilities. The minor shows prospective employers and professional schools that the student has pursued these additional studies in a structured manner with the full endorsement of the faculty of the ME department.

The requirements for a Minor in Mechanical Engineering are as follows: Students pursuing a minor in the department must complete a total of six 12-unit subjects (including 18.03 as a prerequisite to departmental subjects). Subjects must be drawn from the required subjects and departmental restricted electives in the Course 2 degree program. These subjects must include a minimum of four required core subjects.

Subjects taken under the junior-senior P/D/F grading option cannot be used for a minor program. The ME Undergraduate Office (Rm. 1-110, x3-2305) is available to help students develop a minor program of study in mechanical engineering.

Students who wish to designate mechanical engineering as a minor should do so by completing the Minor Application Form in consultation with the ME Undergraduate Office by the end of the second year of registration, but no later than the Add Date of one full term preceding the one in which the S.B. degree is to be awarded. By the end of the third week of the term in which they expect to receive the S.B. degree, students must submit the Minor Completion Form, signed by the ME Undergraduate Office. A grade report should be submitted with the minor application and completion forms.

Core subjects choose at least 4:	Restricted Elective Subjects choose up to 2 (6 subjects total):	
18.03	2.016	2.72
2.001	2.017	2.797
2.002	2.019 (CI-M)	2.813
2.003	2.050	2.96
2.004	2.092	
2.005	2.12	Appropriate
2.006	2.14	12-unit
2.007	2.184	introductory
2.008	2.370	graduate
2.009 (CI-M)	2.51	subjects are
2.086	2.60	also allowed.
2.671 (CI-M)	2.71	

Minors for Mech E Students

Several minor programs at MIT have a particularly good fit with Mechanical Engineering degree programs. You can find descriptions of how these minors fit within the Mech E degrees online.

Minor in Biomedical Engineering:
http://catalog.mit.edu/interdisciplinary/undergraduate-programs/minors/biomedical-engineering/

Minor in Energy Studies:
http://web.mit.edu/catalog/inter.under.html#enem

with Course 2
http://web.mit.edu/me-ugoffice/Course2_Energy_Studies_Minor.pdf
with Course 2A
http://web.mit.edu/me-ugoffice/Course2A_Energy_Studies_Minor.pdf
with Course 2OE
http://web.mit.edu/me-ugoffice/Course2OE_Energy_Studies_Minor.pdf

Minor in Management:
http://mitsloan.mit.edu/undergrad/15-1-management/

Minor in Business Analytics:
http://mitsloan.mit.edu/undergrad/15-2-business-analytics/

Entrepreneurship & Innovation Minor:
https://innovation.mit.edu/education-practice/eiminor/

Minor in Design:
http://architecture.mit.edu/minor-design

Additional Program Information

Advising

Advising is a process, not a person.

When students enter the Department of Mechanical Engineering, they are assigned a faculty academic advisor. The principal role of the academic advisor is to help individual students plan their academic programs in ways that are consistent with the degree requirements and their career objectives. The faculty academic advisor is only one of many advising resources.

Advising Resources

- ***Faculty Academic Advisor*** (class selection, career/networking advice, grad school advice, if you are having trouble with academics or have issues affecting academics)
- ***Peer Advising*** (selecting MechE as a major, 2 vs 2-A vs 2-OE, class selection – particularly outside the dept, peer opinions & experiences)
- ***2-A Track Advisors:*** http://course2a.wordpress.com/tracks/
- ***UROP supervisors*** (research interests, grad school, career/networking advice)
- ***Instructors*** (class selection for restricted electives/engineering topics, research interests)
- ***The Undergraduate Office***, Room 1-110 (degree audits, class selection, navigating beaurocracy, difficulty with coursework, personal or medical issue referrals, or if you don't know where to go)
- ***Student Support Services*** (personal or medical issues, testing accommodations, general advice and support)

The Department strongly recommends that students reach out to all advising options available, and cultivate an advising network. Students interested in grad school will need 3 letters of recommendation. Students more interested in going into industry may find that faculty have different relationships with industry, and different perspectives regarding career advice, or different networking opportunities. Your advisor is not an expert on everything, so it is perfectly fine for you to seek advice from other faculty members as well.

It is important to speak to your assigned faculty academic advisor regarding all issues pertaining to academic performance, even if they stem from a personal or medical issue. Your faculty academic advisor is your designated advocate to the Committee on Academic Performance, and to the Department, so it is important to keep your advisor updated should you experience difficulty, even if you have reached out to another member of your advising network.

It is up to you to make the most of your advising experience. Take the initiative!

Allowed Substitutions (Course 2, 2-A, 2-OE subjects)

You can always "trade up"!

Degree	**Requirement**	**Allowed substitution**
Course 2/2-OE	18.03	2.087 + 6 units math/science (but NOT engineering!)
Course 2/2-OE	2.001	2.01 + 2.02A or 2.02B (subjects no longer offered)
Course 2/2-OE	2.003	2.03 + 2.031 (subjects no longer offered)
Course 2/2-OE	2.005	2.05 + 2.051 + 2.06
Course 2/2-A	2.009	2.013, 2.014, 2.019, 2.750, or 2.760 with a petition
Course 2-A	2.00	2.00B or 2.007
Course 2-A	2.03 (subject no longer offered)	2.003
Course 2-A	2.04A (subject no longer offered)	2.004
Course 2-A	2.05 + 2.051 + 2.06	2.005 + 2.006
Course 2-A	2.087	18.03
Course 2	Restricted Elective	2.674 + another engineering subject of 6 or more units.
Course 2	2.ThU	2.014, 2.752 Note: only ONE substitution is allowed- thesis OR restricted elective (OR 2.014 for 2.009)
Course 2/2-OE	Restricted Electives	Graduate subjects and other 12-unit subjects offered within the department are typically allowed as restricted electives with a petition.

Other substitutions are reviewed on a case-by-case basis; this list represents routine substitutions that have already been reviewed and approved.

Petitions: Room 1-110 or
http://web.mit.edu/me-ugoffice/Petition_to_Substitute_fillable.pdf

Communication Requirement

Engineering work is critically dependent upon communication skills. Engineers must be able to report their ideas and designs clearly and succinctly to their coworkers, supervisors, and customers. The format of engineering communications can vary widely, from complete written reports, to short technical memos, to oral presentations, to visual displays. The MIT Communication Requirement, as implemented in the MechE program, is intended to prepare students to work effectively in all of these formats.

Departmental subjects that involve extensive education in communication include: 2.671, taken in the sophomore or junior year; 2.009, taken in the fall of the senior year; and 2.019, taken in the spring of the senior year. Through this set of classes, students gain experience in technical reporting in written, oral, and visual formats, both as individuals making reports and as members of teams making reports. The MechE faculty regard the development of good communication skills as an essential learning outcome of our programs.

Details of the Communication Requirement follow.

The Sophomore Year

You must complete your second Communication Intensive subject by the end of your sophomore year. You may receive CI credit for only one CI-H subject per semester. Since CI-H subjects may be either part of the HASS Distribution Component (HASS-A/H/S) or HASS Electives, you should carefully consider the most appropriate subject for you. In order to enroll in a CI-H, you must pre-register for it, and use the CI-H lottery tool online, or add yourself to the waitlist and see if there is space in the class. A list of CI-H subjects is online at http://web.mit.edu/commreq/cih.html. Instructions for the CI-H lottery system can be found at: http://enrollmenttools.mit.edu/

The Junior and Senior Year

You **must** complete one Communication Intensive subject in the major (CI-M) by the end of the junior year and a second one by the end of the senior year. In Course 2 and 2A, the combination 2.671 and 2.009 together satisfy the CI-M component of the Communications Requirement. Generally, 2.671 will be the junior year CI-M and 2.009 will be the senior year CI-M (2.013, 2.019, 2.750 and 2.760 are CI-M subjects that can substitute for 2.009, but not 2.671). In Course 2-OE, the combination 2.671 and 2.019 together satisfy the CI-M requirement, with 2.671 in the junior year and 2.019 in the senior year (no substitutions).

Students who do not fulfill the CI-M requirement cannot graduate from MIT. Further details on CI-M subjects are available at http://web.mit.edu/commreq/cim.html.

Transfer Students

If you are a transfer student, you are subject to the Communication Requirement. You will need to pass a total of four CI subjects: two CI-H subjects and two CI-M subjects. Some of these subjects may be completed through transfer credit. The HASS Overview Committee is responsible for determining CI-H transfer credit and the Subcommittee on the Communication Requirement will determine CI-M transfer credit. As a transfer student, you must, during your first year at MIT, either pass a CI-H subject or receive transfer credit for one.

The first step towards fulfilling the Communication Requirement is to take the Freshman Essay Evaluation (FEE). Because you will not know until Orientation whether or not you will receive CI-H or CI-HW transfer credit, you are strongly encouraged to take the online FEE, described above. If you are unable to take the online FEE, you should plan to take the paper-and-pencil make-up test given during Orientation. The only transfer students who do not need to take the FEE are those who have received scores of 5 on either the Advanced Placement English Literature and Composition Test or the Advanced Placement English Language and Composition Test. An approved score of 5 on one of the AP English exams is the equivalent of earning a "Pass" on the FEE. If you earned a score of 5 on either of these AP tests, don't forget to request that the College Board submit your AP scores to MIT.

Double Major Candidates

You must complete two CI-H subjects and the CI-M subjects that fulfill the communication component of each major. Typically, this means that you must take four CI-M subjects, two for each program. However, if a subject is approved as a CI subject in both majors, you may use that subject to fulfill the CI-M component of both programs simultaneously, with the approval of the Subcommittee on the Communication Requirement (SOCR). Contact the Office of the Communication Requirement (35-433; commreq@mit.edu) for more information.

SB Thesis Requirement

Resources for thesis students: http://meche-thesis-resou.wix.com/thesis

The SB in Mechanical Engineering requires a thesis with a minimum of 6 units credit. The objective of this requirement is to give students an opportunity to learn about a topic in depth through independent study under the guidance of an advisor who is knowledgeable in the field.

Finding a thesis supervisor
Students have the responsibility to find their own thesis supervisor, and it is best that this be done by the beginning of the senior year. ***Students are strongly encouraged to arrange their thesis in the Fall term of Senior year, even if the majority of the work will occur during IAP or Spring term.***

Many students develop theses from UROP projects that they have had during the junior year or summer between junior and senior years. In that case, the UROP supervisor becomes the thesis supervisor. In other cases, students will contact faculty members whose research is of interest to them, and a thesis project can be developed by discussion between the student and the faculty member. In still other cases, students may have their own clear idea of the subject of their thesis, and the task will be to find a faculty member who is interested in working with the student on that topic.

Resources for finding a thesis supervisor:

- Students may continue UROP research as a thesis topic.
- Mechanical Engineering Thesis and UROP (M.E.T.U) opportunities website: https://metu.mit.edu
- MIT Faculty Cloud (to match research interests): http://meche.mit.edu/people

The thesis advisor of record must be an MIT faculty member or select members of the research staff (graduate students and postdocs are ineligible to act as thesis advisors, but MIT faculty members outside the MechE Department are allowed, as long as the thesis covers an engineering topic). Students who are looking for an appropriate thesis advisor should consult the Undergraduate Office (Room 1-110, x3-2305). Theses may be done off campus, but students are cautioned that off-campus supervisors usually are not familiar with the thesis requirements which may put the student at risk when seeking approval of the Department. Also, work done at an industrial firm may be considered proprietary by the firm which would prevent the student from submitting the thesis to the Department. In such cases, a representative of the firm must sign a release letter, a sample text of which is available at the MechE Undergraduate Office.

Thesis registration and grading
Students may elect to start and/or finish the work in the Fall Term, the Spring Term, or IAP, and they may choose to extend the work over several terms. In the latter case, a progress report is required for each term of registration. If the work in progress is judged satisfactory by the advisor, a grade of "J" will be awarded. Unsatisfactory progress will be awarded the grade "U". Students must be registered for subject 2.ThU for the term in which the thesis is submitted.

In addition to registering for thesis, students must complete the thesis proposal form (http://web.mit.edu/me-ugoffice/thesis.pdf) and attach a brief paragraph summarizing the work planned. ***The form must be signed by the thesis advisor and returned to the MechE Undergraduate Office (Room 1-110) no later than Add Date.***

Drop date is the absolute deadline for adding or dropping 2.ThU to a student's registration. Students may not register for thesis after drop date.

Students who are making satisfactory progress but fail to complete the thesis by the Thesis Due Date will receive the grade "J" indicating that at least one additional unit of registration for 2.ThU will be required to complete the Course 2 degree. Upon satisfactory completion of the thesis, the thesis advisor will assign a grade which will apply to all units of 2.ThU registration from previous terms, up to an absolute limit of 15. For thesis credit during IAP, students should register during the first week of IAP in the Undergraduate Office.

Important Notes regarding the thesis and graduation:
It is the responsibility of the student to maintain contact with the thesis advisor. In the event that thesis progress is reported as unsatisfactory, the student's name will be removed from the Degree List. Students are reminded that graduation also can be delayed by late submission of an acceptable thesis or by submission of a thesis that fails to conform to the current Thesis Specifications. Theses may not be submitted to the Undergraduate Office after 5:00 PM on the Thesis Due Date (mid-January for the February degree list, and early May for the June degree list). *Students should plan to submit the thesis to their thesis supervisor 1-2 weeks prior to the thesis due date, in order to get feedback for the final submitted thesis.*

Consult the MIT Academic Calendar for Add Date, Drop Date, and Thesis Due Dates for the semester in question: http://web.mit.edu/registrar/calendar/

Special Programs

Undergraduate Practice Opportunities Program (UPOP)

The Undergraduate Practice Opportunities Program (UPOP) is a full-year co-curricular professional development program that prepares sophomores for success in the workplace. UPOP is a School of Engineering Program that is open to all sophomores regardless of major. Over the course of the program, students receive academic training and personalized coaching to foster their short-and long-term professional goals, with ample assistance provided in finding and securing an internship for the summer following sophomore year.

UPOP students participate in professional development workshops and one-on-one coaching during the fall and spring semesters. Students also attend a one-week course over IAP focusing on foundational decision-making, team dynamics, and communication as capabilities essential to being successful in a workplace environment. The course consists of experiential modules taught by MIT faculty and coached by successful MIT alums who serve as mentor-instructors. UPOP's 2-unit curriculum serves as the foundational year of the Bernard M. Gordon-MIT Engineering Leadership Program (GEL).

Further information is available by visiting the UPOP Office in 1-123; by contacting staff at upop@mit.edu, (617) 253-0077; or visiting the website at http://upop.mit.edu/.

Gordon Engineering Leadership (GEL)

The Bernard M. Gordon-MIT Engineering Leadership Program (GEL) complements the world-class technical education you get at MIT by developing the leadership skills you need to shape the future. GEL develops next-generation technical leaders with the values, attitudes, and skills to understand and address engineering problems. The program provides to a select group of MIT engineering undergraduates a challenging and supportive environment in which they develop engineering leadership skills that will prepare them to be highly effective leaders of engineering teams. For approximately 120 MIT engineering Juniors and Seniors committed to honing their engineering leadership skills, the first year of GEL (GEL1) provides unparalleled leadership experiences and development. For an exclusive group of 25-30 students, the second year of GEL (GEL2) is an intensely personalized leadership development program featuring significant interaction with industry leaders, staff, and fellow students. As a Gordon Engineering Leader, you'll:

- Develop lasting, meaningful connections with industry leaders
- Network with GEL alumni in industry and outstanding MIT peers
- Get candid feedback on your skills and leadership abilities
- Learn how to deliver on time, on budget, to spec
- Get access to awesome internships at leading companies
- Pick up skills to be the technical entrepreneur in a start-up

For more information, visit gelp.mit.edu or contact Executive Director Leo McGonagle at lmcgon@mit.edu or 617-253-4867. GEL requirements information: http://gelp.mit.edu/student

Undergraduate Research Opportunities Program (UROP)

The Undergraduate Research Opportunities Program (UROP) cultivates and supports research partnerships between MIT undergraduates and faculty. One of the earliest programs of its kind in the United States, MIT's UROP invites undergraduates to participate in research as the junior colleagues of Institute faculty. UROP emphasizes the power of learning by doing.

UROP offers the chance to work on cutting edge research—whether you join established research projects or pursue your own ideas. As UROPers, undergraduates participate in each phase of standard research activity: developing research plans, writing proposals, conducting research, analyzing data and presenting research results in oral and written form. UROP projects take place during the academic year, as well as over the summer, and research can be done in any academic department or interdisciplinary laboratory. Projects can last for an entire semester, and many continue for a year or more. UROP students receive academic credit, pay, or work on a voluntary basis. MIT students use their UROP experiences to become familiar with the faculty, learn about potential majors, and investigate areas of interest. UROPers gain practical skills and knowledge they eventually apply to careers after graduation or as graduate students. Most importantly, they become involved in exciting research.

The MIT UROP Office maintains a list of open UROP positions. While this resource is helpful in finding out about potential research projects, not all opportunities reach the UROP Office. Professors will sometime send email announcements or post fliers regarding available UROPs; in other cases, they may "create" UROPs specifically because a student expresses interest in their research. Thus, there is no substitute for student initiative in finding a UROP position. Students should contact potential supervisors to discuss their interests. Sending email or talking to a professor after class may be a good way to explore opportunities. If you are looking for a MechE focused UROP or thesis project; go to Mechanical Engineering Thesis and UROP (M.E.T.U) opportunities (https://metu.mit.edu) to browse listings.

After the student has reached an agreement to work with a given faculty member, he or she must complete the UROP application process online. (Since UROP is an academic program, you must be a registered undergraduate in order to participate and use the on-line proposal system.) Once you have certificates installed, you can access your UROP student homepage via the following link: http://web.mit.edu/urop/research/openings.html.

In order to participate in a graded UROP, you must BOTH complete the UROP online application AND register for 2.UR or 2.URG with the Registrar's Office.

UROP Registration:
1) UROP online application: http://web.mit.edu/urop/students/index.html

2) Registering for 2.UR or 2.URG: You can pre-register, add it to your Registration Form on Registration Day, or add a UROP using an Add Form.

If you wish to add UROP credit after Add Date, the add form must be signed by the Undergraduate Administrator (Jared Embelton) as well as by your advisor and your project supervisor. For UROP proposal deadlines, see: http://web.mit.edu/urop/basicinfo/deadlines.html.

For further information, see the UROP web site: http://web.mit.edu/urop/.

International Study

Study abroad offers an opportunity for enrichment that goes beyond formal classroom education. Each semester, MIT students enroll in academic programs at foreign institutions for a one-term or full-year program. Students typically study in the period from the second semester of their sophomore year through the first semester of their senior year. With special permission, it is even possible to spend your last term as an undergraduate studying at another university. Plans for study outside MIT should be worked out by each student with his or her faculty advisor and the MIT Study Abroad Office (Room E39-305).

MIT has a number of established programs for international study. These include the Cambridge-MIT Exchange Program, ETH Zurich Exchange Program, the MISTI program, and a number of additional opportunities. Please see web site of the Study Abroad Office for further information on the various programs available: http://web.mit.edu/studyabroad/.

The Department of Mechanical Engineering participates in the following formal exchange programs:
ETH Zurich Exchange
University of Tokyo Exchange (foreign language requirement)

Other study abroad opportunities that are fairly common for MechE students:
The University of Madrid
Oxford University

For more information contact:
Heather Theberge
MechE Study Abroad Coordinator
htheberg@mit.edu, Room 1-110

Resources for MechE Students

Computer Facilities and the ME Domain

MIT Mechanical Engineering computing domain is a Windows network of the computers in the ME teaching laboratories, serving both undergraduate and graduate subjects. The domain includes the computers in the following public clusters:

The Ralph Cross Student Lounge (First floor of Building 3)
The Student Commons (1-114)

In addition the computers in the following class laboratories are also part of the domain:

The Measurement and Instrumentation Laboratory (Room 3-038; 2.671)
The Mechatronics Laboratory (Room 1-004; 2.14 and 2.737)
The Projects Laboratory (Room 3-062; 2.004 and 2.678)

The objective of the domain is to provide a unified computing environment for all class laboratories and to provide access to state-of-the-art specialized engineering software for use in our subjects. The computers in the ME domain are not really a substitute for Athena, and so they should not be considered your primary computational "home", nor should they be used for research.

To obtain access to the Ralph Cross Lounge and the MechE Student Commons, go to the Undergraduate Office (Room 1-110) and talk to Ellen Parilla.

Obtaining an Account

At the start of each academic year, all incoming Mechanical Engineering undergraduate students have an account assigned to them automatically. This account remains valid until graduation.

Undergraduate students joining the department after the start of the fall term must apply for an account in the Undergraduate Office. Your user name will be your Athena name. Your initial password will be your MIT ID number. You will be required to change your password the first time you log on to the system.

Graduate students and students from outside the department may apply for an account *if* they are taking a Mechanical Engineering subject that requires access to the software on the domain. Such accounts will last only for the duration of the term, and will be deleted at its conclusion.

For account-related problems (forgotten passwords, etc.), report to the Undergraduate Office (Room 1-110).

Student Organizations

A number of student groups are associated with the MechE Department. These include:

- Pi Tau Sigma, http://pts.mit.edu/
- The American Society of Mechanical Engineers, http://asme.scripts.mit.edu/home/
- The MIT Ocean Engineering Student's Association (13Seas), http://web.mit.edu/13seas/www/
- Tau Beta Pi, http://web.mit.edu/tbp/www/
- The Society of Women Engineers, http://swe.mit.edu/
- The National Society of Black Engineers, https://nsbe.mit.edu/
- The Society of Hispanic Professional Engineers, http://shpe.mit.edu/home/

Publications and Forms

GAMED: Getting Around the MechE Department
This guide to undergraduate study in MechE is updated annually.
http://web.mit.edu/me-ugoffice/gamed.pdf

Subject Evaluation Comments
http://web.mit.edu/subjectevaluation/results.html.

Class Registration
- Online Registration: https://registration.mit.edu/
- Add/drop forms: http://web.mit.edu/registrar/reg/add-drop.html
- CI-H lottery information: http://enrollmenttools.mit.edu/
- Check your registration at: http://student.mit.edu.
  Stellar does not accurately reflect your registration!

Program Related Forms
- Course 2-A Enrollment Form:
  https://meche-res.mit.edu/resources/new2A/
- Course 2, 2-A, and 2-OE Registration Check Sheets
  - Course 2: http://web.mit.edu/me-ugoffice/course2checksheet.pdf
  - Course 2-A: http://web.mit.edu/me-ugoffice/2achecksheet.pdf
  - Course 2-OE: http://web.mit.edu/me-ugoffice/2oechecksheet.pdf
- Petition to Substitute:
  http://web.mit.edu/me-ugoffice/Petition_to_Substitute_fillable.pdf

Minor Program Information
- Minoring in Mechanical Engineering:
  http://web.mit.edu/me-ugoffice/minor.pdf
- How to Declare a Minor in Science, Engineering, or Architecture:
  http://web.mit.edu/registrar/reg/majors-minors/minor_fields.html
- Minor Application Form
  (http://web.mit.edu/registrar/forms/reg/minor_apply.pdf)
- Minor Completion Form
  (http://web.mit.edu/registrar/forms/reg/minor_complete.pdf)

UROP Information
- UROP online application and information: http://web.mit.edu/urop/
  If taking for a grade, you must also register for 2.UR or 2.URG.

Thesis Information
- Thesis resources: http://meche-thesis-resou.wix.com/thesis
- Thesis Registration Instructions and Proposal Form:
  http://web.mit.edu/me-ugoffice/thesis.pdf
- Fillable Thesis Proposal Form (no instructions):
  http://web.mit.edu/me-ugoffice/thesis_form.pdf

- Thesis Preparation Guidelines: http://libraries.mit.edu/archives/thesis-specs/index.html

Practical Work Experience for International Students (2.990 & OPT)

- 2.990 Form: http://web.mit.edu/me-ugoffice/2990_Form.docx
- 2.990 Instructions: http://web.mit.edu/me-ugoffice/2990_Instructions.docx
- Template letter for faculty supervisors: http://web.mit.edu/me-ugoffice/CPTletter_template.docx
- OPT Pre-completion Template letter for faculty supervisors (student not graduating yet): http://web.mit.edu/me-ugoffice/OPT_template_precompletion.docx
- OPT Post-completion Template letter for faculty supervisors (student about to graduate): http://web.mit.edu/me-ugoffice/OPT_template_postcompletion.docx

MechE Optional Email Lists

Students can sign up for any of the following mailing lists by going to the appropriate URL.

- me-ugresearch: UROP and thesis topic emails will go to this list http://mailman.mit.edu/mailman/listinfo/me-ugresearch
- me-ugemployment: recruiter emails, advertisements for internships, grader openings, etc. will go to this list http://mailman.mit.edu/mailman/listinfo/me-ugemployment
- me-ugcommunity: emails from clubs, teams, and announcements regarding open final presentations, etc., will go to this list http://mailman.mit.edu/mailman/listinfo/me-ugcommunity
- meche-md: for students interested in pre-medicine, medical devices, or the intersection between medicine and mechanical engineering https://groups.mit.edu/webmoira/list/meche-md

Quick Links/Other Resources

- Peer Advising: https://adviseme.mit.edu/
- WebSIS (preregistration and other info): http://student.mit.edu/
- Registration: https://registration.mit.edu/
- Course 2-A Enrollment Form: https://meche.mit.edu/resources/2A/
- Add/Drop forms: https://studentformsandpetitions.mit.edu
- Academic Calendar: http://web.mit.edu/registrar/calendar/

After Graduation

Graduate School and Graduate Fellowships

If you plan to attend graduate school (whether for engineering, medicine, law, or business), you should begin preparations during spring term of your junior year. These include scheduling appropriate entrance examinations, identifying admissions deadlines for the graduate school(s) you hope to attend, finding several individuals who can write informed letters of recommendation, and preparing applications for graduate fellowships.

Most graduate programs have application deadlines in early fall of the year before admission is desired. The best source of information on graduate admission deadlines and requirements is, of course, the graduate office of the particular program for which you intend to apply.

Standardized Entrance Exams

The majority of graduate programs will require you to submit results from a standardized admissions exam. For engineering and science programs, this will be the GRE (Graduate Record Exam). For medical, law, and business school, this will be the MCAT (Medical College Admission Test), the LSAT (Law School Admissions Test), and the GMAT (Graduate Management Admissions Test), respectively. You should schedule this exam well before you plan to submit your applications. The exams are given every few months, and it may take a couple of months to receive the results of the exam.

Letters of Recommendation

Most graduate programs, and graduate fellowship applications, will require you to submit 2 to 5 letters of recommendation. These letters should be written by individuals who are familiar with your abilities and who are able to comment on specific accomplishments. Those who can write for you might include UROP supervisors, your academic advisor, your SB thesis supervisor, supervisors from summer jobs, professors with whom you had close interactions in classes (for example, lab or design section instructors), or professors in whose lecture-based classes you made a strong (and, one hopes, positive!) impression. Your recommenders are usually going to be busy people, so request the letters well in advance of application deadlines. It is generally helpful to provide a recommender with your resume and a summary of your accomplishments and your goals for graduate study.

Graduate Fellowships

A wide range of graduate fellowships are available from both the Federal Government and various private foundations. Fellowships provide money to cover tuition and expenses in graduate school, which provides greater freedom to choose projects and programs. *Students are often unaware that they are well qualified for these.* The application procedures are relatively similar to

those for graduate school, although a few fellowships will require your university to nominate you. A variety of fellowships are described on the following page: http://odge.mit.edu/finances/fellowships/external/.

A graduate fellowship deserving specific mention is the National Science Foundation Graduate Research Fellowship. The NSF awards approximately 1,000 graduate fellowships in this competition each year, in the general areas of science, technology, engineering, and mathematics. The Graduate Research Fellowship provides three years of support for graduate study leading to research-based master's or doctoral degrees and is intended for students who are at the early stages of their graduate study. For further information, see: http://www.nsfgrfp.org/.

Professional Registration

Some employers require that engineers obtain professional registration with the state within which they work. In the Commonwealth of Massachusetts, professional registration is administered by the Board of Registration of Professional Engineers and Land Surveyors: http://www.mass.gov/dpl/boards/en/index.htm. The Board works to insure that persons practicing in these professions are competent to practice and are not endangering the life, health, safety and welfare of the public.

Two kinds of mechanical engineers find a professional engineer's license particularly useful: (1) those who work for architectural/engineering firms, such as Stone and Webster Engineering, Inc., and Bechtel Corporation; and (2) those who work for a unit of the government, such as the Department of Environmental Protection, that must approve plant designs. Most other engineers do not need to acquire professional registration.

Registration requires a certain number of years of work experience and the successful completion of two full-day written examinations. The first of these exams, the *Fundamentals of Engineering Exam*, covers a variety of general engineering and science topics, and it is best taken around the time one completes the SB degree (while all this knowledge is still fresh!). Information on this exam is available from the National Council of Engineering Examiners: http://www.ncees.org/Exams/FE_exam.php.

Students interested in offering study sessions for the Fundamentals Exam should contact Pi Tau Sigma and/or ASME. Study materials are available in the MechE Student Commons (assuming no one has taken them home).

Career Opportunities

The job market for mechanical engineers is very strong and is expected to continue to be strong for the foreseeable future. This includes opportunities for summer employment as well as career placement. There are many resources available to assist MIT students in the job search process. Interested students should contact the MIT Career Development Center, E39-305, (617) 715-5329, http://gecd.mit.edu/ to learn more.

Each year this office publishes the *MIT Career Handbook*, https://gecd.mit.edu/resources/career-handbook which is a compact guide for all aspects of the job search process and which serves as a good starting point in a job search. Throughout the academic year, The Career Development Center holds workshops that address specific issues related to the job search process see: http://gecd.mit.edu/resources/workshops. The Career Development Center also holds walk-in hours during the academic year, which may provide quick solutions to many typical problems that arise during a job search see: http://gecd.mit.edu/services/appointment. Additional assistance can be found at https://www.myinterfase.com/mit/student/, an extensive website that works closely with The Career Development Center to help MIT students in the job market.

The MIT Alumni Association offers access to job listings, networking opportunities, and career services. The Association is a doorway to more than 100,000 talented, influential, and diverse alumni living and working from Boston to Bombay. The Association operates the Institute Career Assistance Network (ICAN), through which you may contact alumni from a database of over 2,900 advisers. Learn how to make the best of an interview, and more. They also host a job listings board posted entirely by alumni for alumni. Please refer to the Alumni Association Career Services web site for more information: https://alum.mit.edu/benefits/careerprograms.

Starting Salaries

The MIT Career Development Center collects statistics on job offers and starting salaries for graduating students. These data are revised each year, and summaries are posted here: http://gecd.mit.edu/resources/data.

For the Class of 2016, the average annual starting salary for Mechanical Engineering Bachelor's degree graduates was $ 74,054. For Mechanical Engineering Master's degree graduates, it was $111,093. These averages are for all employers, including military and public service, and individual salaries may deviate from these means by large amounts. The Career Development Center statistical reports give salary breakdown by employment sector.

Ethics and Professional Responsibility

As engineers, we have knowledge and skills well beyond those of most consumers of our work, who must trust us to produce systems that operate safely, reliably, and with minimal negative impact. Human lives can depend upon the quality of our work, and significant economic and environmental consequences can result from the things that we do. Therefore, we as engineers must always have an awareness of not only the benefits but also the dangers and limitations of systems that we design. We must never put forward results that we have not thoroughly evaluated, and we must never conceal the shortcomings of our products. This is the fundamental responsibility of our profession to our society.

The American Society of Mechanical Engineers has adopted a Code of Ethics which you may read at this link: https://www.asme.org/about-asme/advocacy-government-relations/ethics-in-engineering

In a business environment, professional integrity has serious ramifications for a company's success. A business that develops a poor reputation in this area is likely to lose customers. Moreover, a lack of professional integrity in products, services, or transactions can have legal consequences of grave significance, potentially resulting in civil or criminal penalties for the company or its employees. As a result, most businesses adopt firm standards of professional conduct for their personnel. For example, the General Electric Company provides its staff with a 60 page booklet that lays out GE's Code of Conduct and its application in various situations.

For engineering students, professional responsibility begins with ethical conduct on classroom assignments, and it extends to the careful assessment of engineering designs and analyses executed at MIT. The Mechanical Engineering Faculty expect our students to cultivate a sense of professional responsibility while at MIT and to follow standards of ethical conduct in their class work. To aid students in understanding what conduct is not ethical, the Massachusetts Institute of Technology has prepared a handbook of academic integrity which available at this link: http://web.mit.edu/academicintegrity/

We, the Mechanical Engineering Faculty, take great pride in the accomplishments of our graduates, and we encourage all of our students and graduates to uphold the highest standards of professional ethics.