

Mechanical Engineering

Dr. Parisa Saboori
Chair, Department of Mechanical Engineering

Vision Statement

The Mechanical Engineering program at Manhattan College will be distinguished by its education of engineers who are recognized locally and globally for their contributions and leadership in mechanical engineering and related professions.

Mission Statement

The mission of the Mechanical Engineering program is to provide students with an education that will prepare them for future challenges in mechanical engineering, whether they plan to practice engineering or pursue advanced/graduate studies.

Program Educational Objectives

Mechanical engineering graduates will be:

1. Technically competent in their mechanical engineering knowledge and skills in professional or advanced academic settings.
2. Committed to the engineering profession and to expanding their knowledge and skill set with increasing independence and responsibility.
3. Committed to professional conduct, ethical practices, and communicate effectively within a diverse multi-cultural environment.
4. Aware that their engineering expertise can be utilized to impact the local and global community.

Student Outcomes

The Mechanical Engineering program uses the standard set of ABET, Inc. outcomes (1) through (7) as described above under Engineering.

Mechanical Engineering

The mechanical engineer is considered the general practitioner in the engineering profession. Career opportunities exist in such fields as aerospace, automotive, computer, energy, machinery, manufacturing, and consulting firms. The curriculum is designed to provide the kind of broad education needed by "general practitioners." Juniors and seniors take course sequences in two areas: thermal/fluids/energy, and solid mechanics/machine design/manufacturing. Both areas rely extensively on computer applications. Seniors may specialize by choosing electives in: computer-aided design, computer-aided manufacturing, thermal/energy systems, or heating, ventilation and air conditioning.

Course work is complemented by comprehensive laboratories containing a wind tunnel, steam turbine, automotive engines, refrigeration systems, computer-controlled machine tools, stress and vibration analyzers, and computer-based data acquisition systems. Students also have access to PC laboratories and advanced workstations. In the senior

year, qualified students are encouraged to use this equipment in elective project courses. The curriculum prepares the student for professional employment and graduate study.

Four-Year Program in Mechanical Engineering

The curriculum for the first year is common to all branches of engineering. In order to enable a student to test their interest in mechanical engineering, the student takes designated courses from the mechanical engineering course offerings in their sophomore year. The junior and senior years allow for concentrated studies in two areas: thermal/fluids/energy, and solid mechanics/machine design/manufacturing. Both areas rely extensively on computer applications. Seniors may specialize by choosing electives in: design, manufacturing, thermal/energy systems, or heating, ventilation and air conditioning. The department offers an option in biomechanics for students interested in biomedical engineering. Please consult the option coordinator for details. A representative four-year program is shown below.

Mechanical Engineering

For Students Beginning Spring 2022 or earlier:

First Year

| Fall | Credits | Spring | Credits |
|---|-----------|---|-----------|
| ENGS 115 | | 3 ENGS 116 | 3 |
| MATH 185 ¹ | | 3 MATH 186 ¹ | 3 |
| CHEM 101/CHEM 103 ¹ or PHYS 101/PHYS 191 ¹ | | CHEM 101/CHEM 103 ¹ 4 or PHYS 101/PHYS 191 ¹ | 4 |
| ENGL 110 or RELS 110 | | 3 ENGL 110 or RELS 110 | 3 |
| General Education Elective | | 3 General Education Elective | 3 |
| | 16 | | 16 |

Second Year

| Fall | Credits | Spring | Credits |
|---|-----------|-------------------------|-----------|
| CHEM 102/CHEM 104 ¹ or PHYS 102/PHYS 192 ¹ | | ENGS 201 | 3 |
| ENGS 205 ¹ | | 4 ENGS 202 | 0 |
| ENGS 206 ¹ | | 3 ENGS 220 | 3 |
| MATH 285 ¹ | | 3 MECH 230 | 3 |
| MECH 211 | | 3 MECH 231 | 1 |
| | | 3 MATH 286 ¹ | 3 |
| | | ENGL Elective | 3 |
| | 16 | | 16 |

Third Year

| Fall | Credits | Spring | Credits |
|----------|---------|------------|---------|
| MECH 302 | | 2 MECH 312 | 3 |
| MECH 318 | | 3 MECH 319 | 2 |
| MECH 323 | | 4 MECH 325 | 4 |
| MECH 314 | | 3 MECH 332 | 3 |

| | | |
|---|----------------------------|---|
| RELS Catholic Studies or RELS Contemporary/Global Studies | 3 MECH 336 | 3 |
| Math/Science Elective ² | 3-4 MECH 337 | 0 |
| | General Education Elective | 3 |

18-19 **18**

Fourth Year

| Fall | Credits | Spring | Credits |
|--|---------|--|---------|
| MECH 401 | | 2 MECH 402 | 2 |
| MECH 405 | | 2 MECH 422 | 3 |
| MECH 411 | | 3 Mechanical Engineering Elective ² | 3 |
| MECH 414 | | 3 Mechanical Engineering Elective ² | 3 |
| Mechanical Engineering Elective ² | | 3 RELS-Ethics Elective | 3 |
| Math/Science Elective | | 3-4 General Education Elective | 3 |

16-17 **17**

Total Credits: 133-135

¹ Students must earn a grade of C (2.0) or better in calculus I, II, III, differential equations, chemistry and physics. Students must earn a grade of C (2.0) or higher in ENGS 205 Introductory Thermodynamics and ENGS 206, as required for their program of study, before enrolling in any 300-level mechanical engineering courses.

² MATH/SCI and MECH electives must be approved by the department chair.

³ A student may take an approved business course for one general education elective.

For Students Beginning Fall 2022 or Later:

First Year

| Fall | Credits | Spring | Credits |
|---|---------|---|---------|
| ENGS 115 | | 3 ENGS 116 | 3 |
| MATH 185 ¹ | | 3 MATH 186 ¹ | 3 |
| CHEM 101/CHEM 103 ¹ or PHYS 101/PHYS 191 ¹ | | CHEM 101/CHEM 103 ¹ 4 or PHYS 101/PHYS 191 ¹ | 4 |
| ENGL 110 or RELS 110 | | 3 ENGL 110 or RELS 110 | 3 |
| General Education Elective | | 3 General Education Elective | 3 |

16 **16**

Second Year

| Fall | Credits | Spring | Credits |
|---|---------|-------------------------|---------|
| CHEM 102/CHEM 104 ¹ or PHYS 102/PHYS 192 ¹ | | ENGS 201 | 3 |
| ENGS 205 ¹ | | 4 ENGS 202 | 0 |
| ENGS 206 ¹ | | 3 ENGS 220 | 3 |
| MATH 285 ¹ | | 3 MECH 230 | 3 |
| MECH 211 | | 3 MECH 240 | 2 |
| | | 3 MATH 286 ¹ | 3 |

| | | ENGL Elective | 3 |
|---|----------------|--|----------------|
| | | 16 | 17 |
| Third Year | | | |
| Fall | Credits | Spring | Credits |
| MECH 312 | | 3 MECH 314 | 3 |
| MECH 318 | | 3 MECH 319 | 2 |
| MECH 321 | | 1 MECH 325 | 4 |
| MECH 323 | | 4 MECH 330 | 2 |
| RELS Catholic Studies or RELS Contemporary/Global Studies | | 3 MECH 332 | 3 |
| Math/Science Elective ² | | 3-4 General Education Elective | 3 |
| | | 17-18 | 17 |
| Fourth Year | | | |
| Fall | Credits | Spring | Credits |
| MECH 401 | | 2 MECH 402 | 2 |
| MECH 411 | | 3 MECH 414 | 3 |
| MECH 422 | | 3 Mechanical Engineering Elective ² | 3 |
| MECH 439 | | 3 Mechanical Engineering Elective ² | 3 |
| MECH 440 | | 0 Math/Science Elective ² | 3-4 |
| Mechanical Engineering Elective ² | | 3 General Education Elective | 3 |
| RELS-Ethics Elective | | 3 | |
| | | 17 | 17-18 |

Total Credits: 133-135

Biomechanics Concentration

The Biomechanics concentration is designed to give students a competitive advantage in the biomedical industry. Biomechanical engineers combine medical and biological sciences with engineering principles to design and develop healthcare equipment, devices, computer systems, and software. The employment prospects in biomechanics is expected to be strong for the foreseeable future.

This five-course concentration covers topics in tissue engineering, the strength and structural behavior of biocompatible materials, and the application of solid and fluid mechanics to biological systems. To participate in the biomechanical concentration, students must earn an overall average GPA of 3.0 with no more than two grades lower than a B in any of the concentration courses. Incoming freshmen, transfers and current students may enroll at any time. Any Pre-Concentration student who, at any time, fails to meet all requirements concurrently will be no longer be permitted to participate in the concentration.

Concentration Requirements

Students accepted into the concentration should choose five courses. Two of the courses are selected from the following courses offered by the Biology Department:

| | | |
|----------|---|---|
| BIOL 207 | Anatomy and Physiology I ^{1,2} | 4 |
| BIOL 208 | Anatomy and Physiology II ² | 4 |
| BIOL 222 | Biology for Engineers ² | 3 |
| BIOL 441 | Cardiovascular Biology ¹ | 3 |

The other three courses are selected from the following Mechanical Engineering courses:

| | | |
|----------|--|---|
| MECH 431 | Structural Biomechanics | 3 |
| MECH 437 | Biomechanical Instrumentation | 3 |
| MECH 450 | Intro to Tissue Engineering | 3 |
| MECH 451 | An Intro to Biofluid Mechanics | 3 |
| MECG 531 | Introduction to Biomechanics | 3 |
| MECG 536 | Applied Biofluid Mechanics | 3 |
| MECG 631 | Biomechanics Modeling and Applications | 3 |

¹ Preferred courses for the concentration.

² This course has a required zero-credit laboratory course. This laboratory must also be taken in order to fulfill the concentration requirements. See the Biology Department catalog page for more information.

Aerospace Concentration

The Aerospace concentration is designed to give students an introduction to aerospace science and technology. Aerospace engineers use engineering principles to design and develop aircraft and spacecraft, both manned and unmanned. The employment prospects in aerospace is expected to be strong for the foreseeable future.

This five-course concentration covers topics in the overall design of aircraft and spacecraft, the dynamics of flight, the design of aerospace structures, and the application of fluid mechanics to aerospace systems. To participate in the aerospace concentration, students must earn an overall average GPA of 3.0 with no more than two grades lower than a B in any of the concentration courses. Incoming freshmen, transfers and current students may enroll at any time. Any Pre-Concentration student who, at any time, fails to meet all requirements concurrently will be no longer be permitted to participate in the concentration.

Concentration Requirements

Students accepted into the concentration should choose five courses. Two of the courses are selected from the following courses offered by the Mathematics Department. Another suitable course may be substituted by the Mechanical Engineering Chairperson as the need arises:

| | | |
|----------|--------------------------------|---|
| MATH 372 | Linear Algebra I | 3 |
| MATH 386 | Partial Differential Equations | 3 |
| MATH 490 | Complex Analysis | 3 |

The other three courses are selected from the following Mechanical Engineering courses. One elective course not on this list may be substituted upon approval of the Mechanical Engineering Department Chairperson:

| | | |
|----------|--------------------------------|---|
| MECG 516 | Turbomachinery | 3 |
| MECG 528 | Combustion Systems | 3 |
| MECG 605 | Flight Mechanics | 3 |
| MECG 606 | Design of Aerospace Structures | 3 |
| MECG 608 | Introduction to Aerodynamics | 3 |
| MECG 701 | Viscous Flow Theory | 3 |
| MECG 702 | Compressible Flow | 3 |
| MECG 704 | Computational Fluid Mechanics | 3 |