# CornellEngineering

## Sibley School of Mechanical and Aerospace Engineering

### UNDERGRADUATE DEGREE PROGRAM

**Do your interests lie in the areas of aircraft and space vehicles, diesel engines, the mechanics and control of musculoskeletal systems, or solar and other renewable energy conversion devices? If you understand the essential need for discovering and applying new knowledge and developing new tools for the practice of engineering, then the B.S. degree in mechanical engineering at Cornell may be right for you.**

Cornell's mechanical engineers are trained in both of the following broad areas:

- *Mechanical Systems and Materials Processing* is concerned with the design, analysis, testing, and manufacture of machinery, vehicles, devices, and systems. Particular areas of emphasis include biomechanics, computer-aided design, control systems, dynamic systems, materials processing, mechanical stress analysis, precision engineering, and vehicle engineering.
- *Engineering of Fluids, Energy, and Heat-Transfer Systems* is concerned with the experimental and theoretical aspects of fluid flow and heat transfer, and the sciences of combustion and thermodynamics. Specific areas of concentration include fluids/aerospace engineering; thermal systems engineering; and vehicle engineering.

**BREAK THE RULES to CHALLENGE CONVENTIONAL THOUGHT**

The undergraduate major program is a coordinated sequence of general courses you begin in your second year. You are then well equipped to take upper-level electives in aerospace engineering, biomechanics, energy and the environment, engineering materials, mechanical systems and design, thermo-fluids engineering, or vehicle engineering. You may also participate in an independent project either within a student project team or in conjunction with a faculty member.

### UNDERGRADUATE RESEARCH PROJECT OPPORTUNITIES

Mechanical and Aerospace Engineering (MAE) faculty members are experts in aerospace, biomechanical, and thermal systems engineering, as well as fluid mechanics, mechanics of materials, and robotics. They contribute their wealth of knowledge and expertise to students who can choose from a variety of exciting research and design projects, such as:

- designing robotics for planetary exploration, disaster relief, and environmental monitoring
- designing and building a Baja car (an off-road race car), an unmanned vehicle capable of long-duration flight, or a race car
- designing a miniature mechanism with flapping wings (a miniornithopter)
- designing a system for effective growth of artificial cartilage tissue
- designing a walking robot that can set a new world distance record

### MAE REQUIRED COURSES

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|---|---|
| **ENGRD 2020** | Statics and Mechanics of Solids |
| **ENGRD 2210** | Thermodynamics |
| **MAE 2030** | Dynamics |
| **MAE 2250** | Mechanical Synthesis |
| **MAE 3230** | Introductory Fluid Mechanics |
| **MAE 3240** | Heat Transfer |
| **MAE 3260** | System Dynamics |
| **MAE 3270** | Mechanics of Engineering Materials |
| **MAE 3780** | Mechatronics |
| **MAE 4272** | Fluids/Heat Transfer Laboratory |
| **MAE 4291** | Supervised Senior Design Experience |
| **MAE 4300** | Professional Practice in Mechanical Engineering |

MECHANICAL ENGINEERING

## SOME AREAS OF FACULTY RESEARCH

aerodynamics & aeroacoustics

bioenergy

biomaterials

biomass combustion

combustion dynamics of biofuels

computational fluid mechanics

geotextiles

immunotherapy & cell engineering

microfluidic device desgin

mechanics of biological materials

nano- and micro-scale engineering

robotics & computer controlled machinery

satellite systems

self-assembling chemical reactors

solar & renewable energy

thermofluids

turbulence

turbines

- designing software for multi-material 3D printing
- designing, building, launching, and operating a highly maneuverable, 50K nanosatellite
- exploring new machine learning algorithms to control a robot constructed of struts and cables
- designing a wind farm layout using two-year wind data and redesigning wind turbine blades
- developing artificial intelligence in computer-aided design
- modeling the impact of clean diesel technologies on air quality
- studying how vibrating bodies in the wind may yield a source of energy
- developing methods to determine the strength of musculoskeletal tissues
- investigating aircraft wing tip vortex wakes
- designing evolutionary computation to model and forecast earthquakes
- designing a system to track the dispersion of particulates emitted by vehicles
- designing and wind-tunnel testing a body for a race car

### MAE By the Numbers

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|---|---|
| MAE undergraduate students | 290 |
| MAE graduate students | 230 |

Starting salaries of B.S. Mechanical Engineering graduates (for 2018)

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|---|---|
| Low | $37,292 |
| Median | $72,960 |
| High | $125,000 |

### MAE SAMPLE ELECTIVE COURSES

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|---|---|
| **MAE 1170** | Introduction to Mechanical Engineering |
| **MAE 2270** | Introduction to Entrepreneurship for Engineers |
| **MAE 3050** | Introduction to Aeronautics |
| **MAE 3130** | Atomic and Molecular Structure of Matter |
| **MAE 4020** | Wind Power |
| **MAE 4060** | Introduction to Spaceflight Mechanics |
| **MAE 4120** | Community Wind Energy Research |
| **MAE 4150** | GPS: Theory and Design |
| **MAE 4160** | Spacecraft Technology and Systems Architecture |
| **MAE 4180** | Autonomous Mobile Robots |
| **MAE 4250** | FSAE Automotive Design Project |
| **MAE 4340** | Innovative Product Design via Digital Manufacturing |
| **MAE 4510** | Aerospace Propulsion |
| **MAE 4580** | Introduction to Nuclear Science and Engineering |
| **MAE 4590** | Introduction to Controlled Fusion: Principles and Technology |
| **MAE 4610** | Entrepreneurship for Engineers |
| **MAE 4640** | Orthopaedic Tissue Mechanics |
| **MAE 4650** | Biofluid Mechanics |
| **MAE 4700** | Finite Element Analysis for Mechanical and Aerospace Design |
| **MAE 4730** | Intermediate Dynamics and Vibrations |
| **MAE 4780** | Feedback Control Systems |
| **MAE 4860** | Automotive Engineering |
| **MAE 4900** | Independent Research and Engineering Project Teams |
| **MAE 5010** | Future Energy Systems |
| **MAE 5070** | Dynamics of Flight Vehicles |

## MASTER OF ENGINEERING DEGREE PROGRAM

The Master of Engineering (M.Eng.) degree program in mechanical engineering, aerospace engineering, or engineering mechanics is a one-year professional course of study that allows students to develop a high level of competence in engineering science, current technology, and engineering design. It is interdisciplinary in nature and allows flexibility in tailoring a program to fit individual needs and interests. Typical M.Eng. graduates enter the work force with greater opportunities and at significantly higher salaries than those entering with a B.S. degree, and many are offered earlier chances of advancement. Although the majority of M.Eng. students start the program immediately following the completion of their B.S. degrees, some are industrial employees who have enrolled through their companies' continuing education programs.

**mae.cornell.edu**