



COLUMBIA | ENGINEERING

The Fu Foundation School of Engineering and Applied Science

MECHANICAL ENGINEERING

The Master of Science degree in Mechanical Engineering allows a student to develop a course of study tailored to his or her interests and objectives. Students may construct their own sequence of courses (referred to as the Standard Track), or choose courses from predefined elective concentrations, such as the Energy Systems, Micro/Nanoscale Engineering, or Robotics and Control elective concentrations. In general, attainment of the degree requires two to three semesters of full-time study, although it may also be undertaken on a part-time basis over a correspondingly longer period.

M.S Degree in Mechanical Engineering

The program leading to the Master of Science degree in mechanical engineering requires completion of a minimum of 30 points of approved coursework consisting of no fewer than ten courses. A thesis based on either experimental, computational, or analytical research is optional and may be counted in lieu of up to 6 points of coursework. In general, attainment of the degree requires one academic year of full-time study, although it may also be undertaken on a part-time basis over a correspondingly longer period.

The Master of Science concentrations are:

- Energy Systems Engineering Mechanics
- Micro/Nanoscale Engineering
- Mechanical Engineering with Specialization in Robotics and Control

M.S. in Mechanical Engineering with Specialization in Energy Systems

The specialization in energy systems provides the M.S. candidate with a global understanding of current energy challenges. Advanced thermofluidic knowledge is provided to design and optimize energy systems, with a strong emphasis on renewable energies. Courses related to energy and environmental policy, two strong areas of Columbia as a global university, can be integrated into the course sequence. This specialization is a suitable preparation for careers in energy production and energy consultation.

- MECE E4210:** Energy infrastructure planning
- MECE E4211:** Energy: sources and conversion
- MECE E4302:** Advanced thermodynamics
- MECE E4304:** Turbomachinery
- MECE E4305:** Mechanics and thermodynamics propulsion
- MECE E4312:** Solar thermal engineering
- MECE E4314:** Energy dynamics of green buildings
- MECE E4320:** Intro to combustion
- MECE E4330:** Thermofluid systems design
- MECE E6100:** Advanced mechanics of fluids

M.S. in Mechanical Engineering with Specialization in Micro/Nanoscale Engineering

The elective specialization in micro/nanoscale engineering provides the M.S. candidate with an understanding of engineering challenges and opportunities in micro- and nanoscale systems. The curriculum addresses fundamental issues of mechanics, fluid mechanics, optics, heat transfer, and manufacturing at small-size scales. Application areas include MEMS, bio-MEMS, microfluidics, thermal systems, and carbon nanostructures.

- MECE E4212:** Microelectromechanical systems

MECE E4213: BioMEMS

MECE E6105: Transport phenomena in the presence of interfaces

MECE E6700: Carbon nanotubes

MECE E6710: Nanofabrication laboratory

MECE E6720: Nano/microscale thermal transport processes

MECE E8990: Small scale mechanical behavior

ELEN E4503: Sensors, actuators, and electromechanical systems

ELEN E6945: Device nanofabrication

BMEN E4590: BioMEMS: cellular and molecular **M.S. in**

Mechanical Engineering with Specialization in Robotics and Control

The field of robotics is seeing unprecedented growth, in areas as diverse as manufacturing, logistics, transportation, health care, space exploration, and more. This program prepares students for a career in robotics and its many applications in society. Students perform in-depth study of topics such as robotic manipulation, navigation, perception, human interaction, medical robotics, assistance and rehabilitation.

MEBM E4439: Modeling & id of dynamic system

MECE E4058: Mechanics and embedded microcomputer control

MECE E4510: Geometrical modeling

MECE E4601: Digital control systems

MECE E4602: Intro to robotics

MECE E4603: Applied robotics: algorithm & software

MECE E4606: Digital manufacturing

MECE E6400: Advanced machine dynamics

MECE E6601: Intro to control theory



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Mechanical Engineering Faculty



Jeffrey Kysar
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Professor



Matei Ciocarlie
Associate Professor



Kristin Myers
Associate Professor



Arvind Narayanaswamy
Associate Professor



Y. Lawrence Yao
Professor



Sinisa Vukelic
Lecturer in Discipline



Fred Stolfi
Senior Lecturer



P. James Schuck
Associate Professor



Mike Massimino
Professor of Professional Practice