

Mechanical Engineering (MEC)

Major and Minor in Mechanical Engineering

Department of Mechanical Engineering, College of Engineering and Applied Sciences

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Minors of particular interest to students majoring in Mechanical Engineering: Science and Engineering (LSE)

Faculty

Daniel Attinger, *Assistant Professor, Ph.D., ETH Zurich*: Microfluidics; microscale heat transfer.

Fu-Pen Chiang, *Distinguished Professor, Ph.D., University of Florida*: Experimental stress analysis; solid mechanics; optical nondestructive evaluation.

Q. Jeffrey Ge, *Associate Professor, Ph.D., University of California, Irvine*: Mechanical design; kinematics; robotics; CAD/CAM; computer graphics.

Peisen S. Huang, *Associate Professor, Ph.D., University of Michigan*: D. Eng, *Tohoku University, Japan*: Optical measurement; precision engineering.

Imin Kao, *Associate Professor, Ph.D., Stanford University*: Robotics; control; MEMS; wafer manufacturing.

John M. Kincaid, *Professor, Ph.D., Rockefeller University*: Statistical mechanics; thermodynamics.

Chad Korac, *Assistant Professor, Ph.D., Northwestern University*: Nanotribology.

Robert V. Kukta, *Assistant Professor, Ph.D., Brown University*: Solid mechanics; thin films; crystal growth; micro-mechanics of defects in crystals.

Foluso Ladeinde, *Associate Professor, Ph.D., Cornell University*: Fluid mechanics and heat transfer; turbulence; computational fluid dynamics.

Jon P. Longtin, *Associate Professor, Ph.D., University of California, Berkeley*: Heat transfer; radiation interactions with materials; optical measurements.

Toshio Nakamura, *Professor, Ph.D., Brown University*: Solid mechanics; computational fracture mechanics.

Edward E. O'Brien, *Professor Emeritus, Ph.D., Johns Hopkins University*: Fluid mechanics; chemically reactive flows; turbulence.

Vishwanath Prasad, *Professor Emeritus, Ph.D., University of Delaware*: Heat transfer; transport processes.

Jahangir Rastegar, *Associate Professor, Ph.D., Stanford University*: Kinematics; dynamics; vibration control of high performance machinery; optimal design of mechanical systems.

Raman P. Singh, *Assistant Professor, Ph.D., University of Rhode Island*: Experimental mechanics; fracture; degradation; composite materials.

James Tasi, *Professor Emeritus, Ph.D., Columbia University*: Mechanics of solids.

Lin-Shu Wang, *Associate Professor, Ph.D., University of California, Berkeley*: Thermodynamics.

Hui Zhang, *Associate Professor, Ph.D., Polytechnic University, Brooklyn*: Materials processing, solidification and free surface problems; computational fluid dynamics.

Lili Zheng, *Assistant Professor, Ph.D., Cambridge University*: Turbulent combustion; solidification; magnetohydrodynamics; two-phase flow.

Affiliated Faculty

Robert D. Cess, *Marine Sciences Research Center*

Sheng Chang, *Visiting Assistant Professor*

John Metzger, *Research Associate Professor*

Clinton Rubin, *Biomedical Engineering*

George Stell, *Chemistry*

Adjunct Faculty

Estimated number: 5

Teaching Assistants

Estimated number: 13

Mechanical engineering is one of the core disciplines of engineering, and it encompasses a large number of subdisciplines that are at the heart of both traditional and leading-edge technologies. It is a broad profession frequently concerned with activities such as energy conversion, power generation, design, and manufacturing. The theoretical and technical bases of knowledge include the pure sciences, mathematics, and the engineering sciences, especially the mechanics of solids and fluids, thermodynamics, and kinematics. Mechanical engineering requires aptitude and interest in the physical sciences and the language of mathematics, and the ability to apply these to societal needs.

The undergraduate mechanical engineering program at Stony Brook recognizes that students have a variety of career objectives and a choice of industrial environments in which to pursue them. While the majority of our graduates are immediately employed in industry, a significant percentage pursue graduate study. Most of the students entering graduate schools continue mechanical engineering studies. However, some go to law, business, and medical schools. The undergraduate curriculum is specifically designed: 1) to provide the skills and instill the values necessary for success in the engineering profession and/or graduate-level study through rigorous instruction in fundamentals and engineering practice; 2) to provide the technological skills to practice modern mechanical engineering in today's global marketplace, and the opportunity to develop specialized interests through electives, involvement in research projects, and industrial internships; 3) to provide comprehensive training in design and laboratory practice; and 4) to encourage the development of communication and leadership skills while increasing awareness of environmental and ethical responsibilities as a professional engineer.

The program in mechanical engineering provides students with a core education in mathematics and the physical sciences along with a broad sequence of courses covering thermal processes and fluid mechanics, mechanical design, solid mechanics, and the dynamic behavior and control of mechanical systems. Students also take courses that introduce them to the use of advanced computational methods for engineering design and analysis and data processing and analysis. A series of laboratory courses introduces them to sensors and electronics, modern instrumentation and experimental techniques used in engineering for tasks ranging from product design, evaluation, and testing to research. In

addition, students can select electives to provide either higher level academic training in preparation for graduate school or a broader exposure to subjects related to engineering practice to enhance their preparation for a job after graduation. All of these activities are carefully integrated so that graduates will demonstrate: 1) the ability to apply knowledge of mathematics, science, and engineering to mechanical engineering problems; 2) the ability to design and conduct experiments and to analyze and interpret data; 3) the ability to work professionally in both the thermal and mechanical systems areas including the design and realization of such systems to meet desired needs; 4) the ability to identify, formulate, and solve engineering problems; 5) the ability to function as a member of multidisciplinary teams; 6) a solid understanding of professional and ethical responsibility; 7) an ability to communicate effectively in written, oral, and visual form; 8) the broad education necessary to understand the impact of engineering solutions in a global and societal context; 9) a recognition of the need for and the ability to engage in life-long learning; 10) a knowledge of contemporary issues; and 11) the ability to use modern engineering techniques, skills, and computing tools necessary for engineering practice. The current Program Educational Objectives for the mechanical engineering program are available at <http://me.eng.sunysb.edu/undergraduate-program.php>.

The spectrum of activity within each career area includes research, development, design, testing, manufacturing, operations and maintenance, marketing and sales, administration, and consulting. Some of the industries that require the expertise of mechanical engineers are: aerospace, automotive, industrial machinery and equipment, power, transportation, environmental, mining, chemical, textile, petroleum, pharmaceutical, computing, electronics, office machinery, and consumer household products. The program in Mechanical Engineering is accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology.

Courses Offered in Mechanical Engineering

See the Course Descriptions listing in this *Bulletin* for complete information.

MEC 100 Introduction to Mechanical Engineering
 MEC 101, 102 Engineering Computing and Problem Solving I, II
 MEC 104-E Practical Science of Things
 MEC 105-E Everyday Science
 MEC 111 Computer Science for Engineers
 MEC 112 Practical C/C++ for Scientists and Engineers
 MEC 160-E Introductory Nuclear Science and Technology
 MEC 200 Technical Communication in Mechanical Engineering I
 MEC 202, 203 Engineering Drawing and CAD I, II
 MEC 260 Engineering Statics
 MEC 262 Engineering Dynamics
 MEC 280-H Pollution and Human Health
 MEC 290-H Nuclear Technology: History, Society, Medicine and the Environment
 MEC 300 Technical Communication in Mechanical Engineering II
 MEC 301 Thermodynamics
 MEC 305 Heat and Mass Transfer
 MEC 309 Numerical Methods for Engineering Analysis
 MEC 310 Introduction to Machine Design
 MEC 316 Mechanical Engineering Lab I: Sensors and Instrumentation
 MEC 317 Mechanical Engineering Laboratory II
 MEC 320 Engineering Design Methodology and Optimization
 MEC 323 Internal Combustion Engine
 MEC 326 Manufacturing Processes and Machining
 MEC 342 Introduction to Experimental Stress Analysis
 MEC 350 Energy Conversion and Alternate Energy Technologies
 MEC 363 Mechanics of Solids
 MEC 364 Introduction to Fluid Mechanics

MEC 381 Transport and Fate of Pollutants
 MEC 391, 392 Introduction to Automotive Engineering I, II
 MEC 393 Engineering Fluid Mechanics
 MEC 398 Thermodynamics II
 MEC 402 Mechanical Vibrations
 MEC 406 Energy Management in Commercial Buildings
 MEC 410 Design of Machine Elements
 MEC 411 Control System Analysis and Design
 MEC 412 Computer-Aided Design
 MEC 420 Turbomachinery and Applications
 MEC 421 Statistical Quality Control and Design of Experiments
 MEC 422 Thermal System Design
 MEC 440, 441 Mechanical Engineering Design I, II
 MEC 455 Applied Stress Analysis
 MEC 475 Undergraduate Teaching Practicum
 MEC 488 Mechanical Engineering Internship
 MEC 490-492 Topics in Mechanical Engineering
 MEC 495 Professional Engineering Seminar
 MEC 499 Research in Mechanical Engineering

Requirements for Acceptance to the Major in Mechanical Engineering

Freshman and transfer applicants who have specified their interest in the Mechanical Engineering major may be accepted directly into the major upon admission to the University. Students in good academic standing who were admitted to the University but not immediately accepted into the major may apply for acceptance in any semester. Priority for admission to the Mechanical Engineering major is given to those students who have 1) completed MAT 132 and PHY 132 or their equivalents; 2) earned a g.p.a. of 3.0 in all mathematics and physics courses with no more than one grade in the C range; and 3) received completed course evaluations for all transferred courses that are to be used to meet requirements of the major.

Requirements for the Major in Mechanical Engineering (MEC)

The major in Mechanical Engineering leads to the Bachelor of Engineering degree.

Completion of the major requires approximately 107 credits.

1. Mathematics

- a. MAT 131, 132 Calculus I, II
- b. AMS 261 Applied Calculus III
or MAT 203 Calculus III with Applications
- c. AMS 361 Applied Calculus IV: Differential Equations
or MAT 303 Calculus IV with Applications

Note: The following alternate calculus course sequences may be substituted for MAT 131, 132 in major requirements or prerequisites:

MAT 125, 126, 127
or AMS 151, 161
or MAT 141, 142

2. Natural Sciences

- a. PHY 131/133, 132/134 Classical Physics I, II and Laboratories
- b. PHY 251 Modern Physics and PHY 252 Modern Physics Laboratory
or ESG 281 Engineering Introduction to the Solid State
- c. CHE 198 Chemistry for Engineers

Notes:

The following alternate physics course sequences may be substituted for PHY 131/133, 132/134:

PHY 125, 126, 127 Classical Physics A, B, C
or PHY 141, 142 Classical Physics I, II: Honors

The following chemistry courses may be substituted for CHE 198 :

CHE 131 General Chemistry I
or CHE 141 Honors Chemistry I

3. Laboratories

MEC 316 Mechanical Engineering Laboratory I
MEC 317 Mechanical Engineering Laboratory II

4. Mechanical Engineering

MEC 101 Engineering Computing and Problem Solving I
MEC 102 Engineering Computing and Problem Solving II

Sample Course Sequence for the Major in Mechanical Engineering

Freshman Fall	Credits
First Year Seminar 101	1
MAT 131	4
MEC 101	2
PHY 131/133	4
WRT 101	3
D.E.C.	3
Total	17

Spring	Credits
D.E.C.	3
MAT 132	4
MEC 102	2
PHY 132/134	4
WRT 102	3
Total	16

Sophomore Fall	Credits
MEC 200	1
MEC 202	1
MEC 260	3
AMS 261 or MAT 203	4
ESG 281 or PHY 251/252	4
D.E.C.	3
Total	16

Spring	Credits
MEC 203	2
MEC 262	3
MEC 363	3
AMS 361 or MAT 303	4
CHE 198 or 131	4
Total	16

Junior Fall	Credits
MEC 301	3
ESG 332	4
MEC 316	4
MEC 364	3
EST 392 (D.E.C. F)	3
Total	17

Spring	Credits
MEC 300	1
MEC 305	3
MEC 310	3
MEC 317	2
MEC 320	3
MEC 326	4
Total	16

Senior Fall	Credits
MEC 410	3
MEC 411	4
MEC 422	3
MEC 440	3
Technical elective	3
Total	16

Spring	Credits
MEC 441	3
Technical Elective	3
Technical Elective	3
D.E.C.	3
D.E.C.	3
Total	15

MEC 202 Engineering Drawing and CAD I

MEC 203 Engineering Drawing and CAD II

MEC 260 Engineering Statics

MEC 262 Engineering Dynamics

MEC 301 Thermodynamics

MEC 305 Heat and Mass Transfer

MEC 326 Manufacturing Processes and Machining

MEC 363 Mechanics of Solids

MEC 364 Introduction to Fluid Mechanics

5. Materials Science

ESG 332 Materials Science I: Structure and Properties of Materials

6. Engineering Design

MEC 310 Introduction to Machine Design

MEC 320 Engineering Design Methodology and Optimization

MEC 410 Design and Analysis of Machine Elements

MEC 411 System Dynamics and Controls

MEC 422 Thermal System Design

MEC 440 Mechanical Engineering Design I

MEC 441 Mechanical Engineering Design II

7. Engineering Economics

EST 392 Engineering and

Manufacturing Economics

or ECO 108 Introduction to Economics

8. Technical Electives

Three technical elective courses are required, two mechanical engineering (MEC) courses and one selected from courses offered by any department of the College of Engineering and Applied Sciences, including MEC. A list of approved technical elective courses may be found in the Department's Undergraduate Guide.

9. Writing and Oral Communication Requirement

MEC 200 Technical Communication in Mechanical Engineering I

MEC 300 Technical Communication in Mechanical Engineering II

Grading

All courses taken to satisfy requirements 1 through 8 above must be taken for a letter grade. The grade point average for the courses MEC 260, 262, 301, 305, 310, 316, 317, 320, 326, 363, 364, 410, 411, 422, 440, 441, and all technical electives (with the exception of MEC 488) must be at least 2.00. When a course is repeated, the higher grade will be used in calculating this average.

The Minor in Mechanical Engineering

The minor in Mechanical Engineering is offered for students who want the record of their University studies to show a significant amount of upper-division work in the discipline. Entry into this minor presupposes a background in mathematics and physics, represented by the prerequisite requirements for the courses listed below.

Requirements for the Minor in Mechanical Engineering (MEC)

Completion of the minor requires 18-20 credits, of which 12-13 are from required courses and 6-7 from electives.

A student who wishes to pursue this minor should consult with the undergraduate program director in the Department of Mechanical Engineering before registering for the elective courses. All courses must be taken for a letter grade and a g.p.a. of 2.00 or higher is required for the six courses that constitute the minor.

1. Four required courses:

MEC 260 Engineering Statics

MEC 262 Engineering Dynamics

MEC 301 Thermodynamics

or ESG 302 Thermodynamics of Materials

MEC 363 Mechanics of Solids

2. Two elective courses chosen from either group A or group B

MEC 305 Heat and Mass Transfer

MEC 310 Introduction to Machine Design

MEC 320 Engineering Design Methodology and Optimization

MEC 326 Manufacturing Processes and Machining

MEC 364 Introduction to Fluid Mechanics

MEC 393 Engineering Fluid Mechanics

MEC 398 Thermodynamics II

MEC 402 Mechanical Vibrations

MEC 411 System Dynamics and Control

Note: Other electives require the approval of the undergraduate program director.