Mechanical Engineering (MEC)

Major and Minor in Mechanical Engineering
Department of Mechanical Engineering, College of Engineering and Applied Sciences

CHAIRPERSON: Fu-Pen Chiang  UNDERGRADUATE PROGRAM DIRECTOR: Jon Longtin  UNDERGRADUATE SECRETARY: Patricia Brockbank
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Minors of particular interest to students majoring in Mechanical Engineering: Science and Engineering (LSE)

Faculty
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 Korach, Assistant Professor, Ph.D., Northwestern University: Nanotribology.
Robert V. Kukta, Associate 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.
Goldie Nejat, Assistant Professor, Ph.D., University of Toronto: Robotics; Design and Manufacturing.
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.
Anurag Purwar, Research Assistant Professor and SPIR Coordinator, Ph.D., Stony Brook University: Computer-aided design and computer graphics; design and manufacturing.
Jahangir Rastegar, Associate Professor, Ph.D., Stanford University: Kinematics; dynamics; vibration control of high performance machinery; optimal design of mechanical systems.
Jalilhe Sesay, Visiting Assistant Professor, Ph.D., Stony Brook University: Fluid mechanics and heat transfer.
Satya Sharma, Visiting Professor, Ph.D., University of Pennsylvania: Manufacturing and production.
James Tasi, Professor Emeritus, Ph.D., Columbia University: Mechanics of solids.
Ani Ural, Visiting Assistant Professor, Ph.D., Cornell University: Experimental and computational fracture mechanics; Orthopedic biomechanics.
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, Associate Professor, Ph.D., Cambridge University: Turbulent combustion; solidification; magnetohydrodynamics; two-phase flow.
Yu Zhou, Assistant Professor, Ph.D., Johns Hopkins University: Design; Robotics.

Affiliated Faculty
Robert D. Cess, Marine Sciences Research Center
Clinton Rubin, Biomedical Engineering
George Stell, Chemistry

Adjunct Faculty
Estimated number: 5

Teaching Assistants
Estimated number: 17

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 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 educational objectives of the undergraduate mechanical engineering program at Stony Brook University recognize 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 pursues graduate study. Most of the students entering graduate schools continue with mechanical engineering studies. However, some go to law, business, and medical schools. The mechanical engineering curriculum 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 as well as 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.

Program Educational Objectives
The educational objectives of the mechanical engineering program are to prepare our graduates to:

1. Establish a successful career in mechanical engineering or related fields in industry and other organizations where an engineering approach to problem solving is highly valued.

2. Contribute significantly in a multidisciplinary work environment with high ethical standards and with an understanding of the role of engineering in the economy and the environment.

3. Excel in graduate study and research, reaching advanced degrees in engineering and related disciplines.


**Program Outcomes**

To prepare students for the above educational objectives, we have adopted the following set of program outcomes that describe what they are expected to attain when they graduate:

a. the ability to apply knowledge of mathematics, science, and engineering to mechanical engineering problems (in particular, a knowledge of chemistry and calculus-based physics with depth in at least one, an ability to apply advanced mathematics through multivariate calculus and differential equations, and a familiarity with statistics and linear algebra);

b. the ability to design and conduct experiments and to analyze and interpret data;

c. 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;

d. the ability to identify, formulate, and solve engineering problems;

e. the ability to function as a member of multidisciplinary teams;

f. a solid understanding of professional and ethical responsibility;

g. an ability to communicate effectively in written, oral, and visual form;

h. the broad education necessary to understand the impact of engineering solutions in a global and societal context;

i. a recognition of the need for and the ability to engage in life-long learning;

j. a knowledge of contemporary issues; and

k. the ability to use modern engineering techniques, skills, and computing tools necessary for engineering practice.

More details about the program educational objectives and outcomes can be found at [http://me.eng.sunysb.edu/abet.php](http://me.eng.sunysb.edu/abet.php).

**Courses Offered in Mechanical Engineering**

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

- 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 125 Fundamentals of Machining
- 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 213 Studies in Nanotechnology
- MEC 214 Probability and Statistics
- 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 Laboratory I: Sensors and Instrumentation
- MEC 317 Mechanical Engineering Laboratory II
- MEC 320 Engineering Design Methodology and Optimization
- MEC 323 Internal Combustion Engine
- MEC 325 Manufacturing Processes
- 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 Machinery and Applications
- MEC 422 Thermal System Design
- MEC 440, 441 Mechanical Engineering Design I, II
- MEC 442 Introduction to Experimental Stress Analysis
- MEC 450 Mechatronics
- MEC 455 Applied Stress Analysis
- MEC 460 Introduction to Robotics: Theory and Applications
- MEC 470 Introduction to Tribology
- 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
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 or MAT 171

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. ESG 198 Fundamentals of Engineering Chemistry

   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 ESG 198:
      CHE 131 General Chemistry I or CHE 141 Honors Chemistry I

3. Laboratories

Sample Course Sequence for the Major in Mechanical Engineering

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<tr>
<th>Freshman Fall</th>
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<td>MEC 101</td>
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<td>PHY 131/133</td>
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<td>MEC 260</td>
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<tr>
<td>AMS 261 or MAT 203</td>
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<tr>
<td>ESG 281 or PHY 251/252</td>
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<td>MEC 316</td>
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<td>MEC 364</td>
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<td>EST 392 (D.E.C. F)</td>
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<td>MEC 422</td>
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<td>MEC 440</td>
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<td>MAT 132</td>
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<tr>
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<td>D.E.C.</td>
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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
MEC 125 Fundamentals of Machining
MEC 202 Engineering Drawing and CAD I
MEC 203 Engineering Drawing and CAD II
MEC 214 Probability and Statistics

MEC 260 Engineering Statics
MEC 262 Engineering Dynamics
MEC 301 Thermodynamics
MEC 325 Manufacturing Processes
MEC 305 Heat and Mass Transfer
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
MECHANICAL ENGINEERING

MEC 320 Engineering Design Methodology and Optimization
MEC 410 Design 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. A minimum grade of “C” in MEC 260 and MEC 262 is required for the BE degree. 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.

The Combined B.E./M.S. Degree Program in Mechanical Engineering
The combined B.E./M.S. program in mechanical engineering allows students to use up to nine graduate credits taken as an undergraduate toward both B.E. and M.S. degree requirements, thus reducing the normal time required to complete both degrees. The program is designed for upper-division mechanical engineering students with superior academic records. For detailed program requirements, including admission requirements, please refer to the Graduate Bulletin.