Mechanical Engineering (MEC)

Major and Minor in Mechanical Engineering

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

Mechanical Engineering (MEC)

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 Mechanical Engineering program is accredited by the Engineering Accreditation Commission of ABET, http://www.abet.org.

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.

4. Achieve success in professional development through life-long learning.

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/index.php?option=com_content&view=article&id=50&Itemid=143

Mechanical Engineering (MEC)

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, MAT 132 Calculus I, II
b. AMS 261 Applied Calculus IIIor 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, MAT 132 in major requirements or prerequisites: MAT 125, MAT 126, MAT 127 or AMS 151, AMS 161 or MAT 141, MAT 142 or MAT 171

2. Natural Sciences
a. PHY 131/PHY 133, PHY 132/PHY 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/PHY 133, PHY 132/PHY 134: PHY 125, PHY 126, PHY 127, PHY 133, PHY134 Classical Physics A, B, C and Laboratories or PHY 141, PHY 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
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 220 Practical Electronics Mechanical Engineers
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
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 300 Technical Communication in Mechanical Engineering
Grading

The grade point average of all required MEC courses and all technical electives must be at least 2.00.

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 the following:
MEC 305 Heat and Mass Transfer
MEC 310 Introduction to Machine Design
MEC 320 Engineering Design Methodology and Optimization
MEC 325 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 Accelerated B.E./M.S. Degree Program in Mechanical Engineering

The accelerated 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.

Sample Course Sequence for the Major in Mechanical Engineering

Freshman Fall	**Credits**	**Spring**	**Credits**
First Year Seminar 101	1	First Year Seminar 102	1

MAT 131	4	D.E.C.	3
MEC 101	2	MAT 132	4
PHY 131/133	4	MEC 102	2
WRT 101	3	PHY 132/134	4
D.E.C.	3	WRT 102	3
Total	17	Total	17
Sophomore Fall	**Credits**	**Spring**	**Credits**
MEC 125*	1	MEC 203	2
MEC 220	2	MEC 262**,***	3
MEC 202	1	MEC 363***	3
MEC 260**	3	AMS 361 or MAT 303	4
AMS 261 or MAT 203	4	ESG 198 or CHE 131	4
ESG 281 or PHY 251/252	4	MEC 214	1
D.E.C.	3		
Total	18	Total	17
Junior Fall	**Credits**	**Spring**	**Credits**
MEC 301	3	MEC 300	1
ESG 332	4	MEC 305	3
MEC 316	3	MEC 310	3
MEC 364	3	MEC 317	2
EST 392 or ECO 108 (D.E.C. F)	3	MEC 320	3
		MEC 325	3
Total	16	Total	15
Senior Fall	**Credits**	**Spring**	**Credits**
MEC 410	3	MEC 441	3
MEC 411	4	Technical Elective	3
MEC 422	3	Technical Elective	3
MEC 440	3	D.E.C.	3
Technical elective	3	D.E.C.	3
Total	16	Total	15

*Note: http://www.stonybrook.edu/ugrdbulletin/current/pdfs/mecM.pdf

MEC

Mechanical Engineering

MEC 101: Engineering Computing and Problem Solving I

Computer integrated introduction to engineering design and analysis. The mechanical engineering profession, engineering ethics, and engineering impact on society. Engineering equations, graphs, dimensional analysis, curve fitting, optimization in engineering design. Introduction to vectors and engineering statics, failure, and materials selection. Use of spreadsheets and MATLAB.

Pre- or co-requisites: AMS 151 or MAT 125 or MAT 131 or MAT 141 and PHY 125 or PHY 131 or PHY 141

2 credits

MEC 102: Engineering Computing and Problem Solving II

Introduction to programming with MATLAB. Control structures, arrays and matrix operations, functions, object-oriented programming, interfacing MATLAB with other languages. Projects includes applications in solid mechanics, fluid mechanics, thermodynamics and heat transfer, control theory, and basic design concepts. Emphasizes the interpretation of previous analysis in terms of generating results, making quantitative comparisons, and assessing changes that optimize or otherwise maximize the usefulness of the result.

Prerequisite: A grade of C or better in MEC 101

2 credits

MEC 104 - E: Practical Science of Things

A practical introduction to the science and engineering of objects and phenomena in everyday life. The basic principles that underlie the operation common to modern devices such as rollercoasters, balloons, vacuum cleaners, airplanes, bicycles, thermostats, air conditioners, automobiles, and GPS systems are developed by investigating how they work. Issues of design, safety, and environmental impact are also discussed.

Prerequisite: Satisfaction of entry skill in mathematics requirement (Skill 1) or satisfactory completion of D.E.C. C

3 credits

MEC 105 - E: Everyday Science

A practical introduction to the science and engineering of objects and phenomena in everyday life. The basic principles that underlie the operation common to modern devices such as xerographic copiers, tape recorders, computers, microwaves, lasers, CDs, plastics, nuclear weapons, and magnetic resonance imaging (MRI) are developed by investigating how they work. Issues of design, safety, and environmental impact are also discussed.

Prerequisite: Satisfaction of entry skill in mathematics requirement (Skill 1) or satisfactory completion of D.E.C. C

3 credits

MEC 125: Fundamentals of Machining Practices

Hands-on experience in the fundamentals of machining. Topics include introductions to various metrology tools and devices, as well as metalworking tools and practices including sawing, sheet metal cutting and punching, drilling, reaming, tapping and threading, turning on the lathe, boring, milling, and welding. This course has an associated fee. Please see www.stonybrook.edu/coursefees for more information.

Prerequisite: MEC major or permission of instructor

1 credit

MEC 202: Engineering Drawing and CAD I

Introduces methods used to communicate design ideas through the techniques of freehand technical sketching and computer-aided design software. Includes the principles of engineering drawing and sketching for mechanical design and the application of computer-aided design software in developing engineering drawings and mechanical designs.

Prerequisite: MEC major or permission of department

1 credit

MEC 203: Engineering Drawing and CAD II

Application of computer graphics and solid modeling to design and representation of 3D objects, their assembly and tolerance analysis. Includes hands-on experience in the use of CAD software packages for solid modeling.

Prerequisite: MEC 202

2 credits

MEC 213: Studies in Nanotechnology

The emerging field of nanotechnology develops solutions to engineering problems by taking advantage of the unique physical and chemical properties of nanoscale materials. This interdisciplinary, co-taught course introduces materials and nano-fabrication methods with applications to electronics, biomedical, mechanical and environmental engineering. Guest speakers and a semester project involve ethics, toxicology, economic and business implications of nanotechnology. Basic concepts in research and design methodology and characterization techniques will be demonstrated. Course is cross-listed as BME 213, MEC 213, and EST 213 and is required for the Minor in Nanotechnology Studies (NTS).

3 credits

MEC 214: Probability and Statistics for Mechanical Engineers

Foundations of probability and statistics as applied to mechanical measurements and experimentation. Basic statistical analysis of data and assessing likelihood of future events based on past history. Concept of random sampling. Uncertainty analysis and error propagation, using both analytical and graphical tools. Assessing dominant sources of error in measurements.

Prerequisites: MAT 126 or 131 or 141 or AMS 151; MEC major or permission of instructor. Corequisites: MAT 127 or 132 or 142 or 171 or AMS 161

1 credit

MEC 220: Practical Electronics Mechanical Engineers

This is a lecture and laboratory 2 credit course that will overview basic electronics from a practical level (versus a theoretical approach) to provide mechanical engineering students with the fundamentals to do basic electronics work needed for laboratories, subsequent courses and their professional careers.

Prerequisites:PHY127, PHY132, or PHY142; MEC major

2 credits

MEC 260: Engineering Statics

A review of vector algebra. Concept of force. Equilibrium of particles. Moments about points and lines, couples and equivalent force systems. Equilibrium of rigid bodies. Analysis of simple structures such as trusses, frames, and beams. Centroids, centers of gravity, and moments of inertia. Dry friction with applications to wedges, screws, and belts. Method of virtual work, potential energy, and stability.

Prerequisite: PHY 131/133 or 141 or 125 Corequisite: AMS 261 or MAT 203

3 credits

MEC 262: Engineering Dynamics

Vectorial kinematics of particles in space, orthogonal coordinate systems. Relative and constrained motions of particles. Dynamics of particles and the systems of particles, equations of motion, energy and momentum methods. Collisions. Two- and three-dimensional kinematics and dynamics of rigid bodies. Moving frames and relative motion. Free, forced, and damped vibrations of particles and rigid bodies.

Prerequisite: A grade of "C" or better in MEC 260

3 credits

MEC 280 - H: Pollution and Human Health

An examination of major environmental pollution problems such electromagnetic radiation, ozone layer depletion, and global warming, with a specific focus on the resulting effects on human health. Assessment of health risks in relation to the formulation of environmental and workplace regulations is also considered.

Prerequisite: One D.E.C. category E course

3 credits

MEC 300: Technical Communication in Mechanical Engineering

Aims to ensure proficiency in the types of communication necessary for success in the engineering profession. Provides students with the ability to apply their knowledge of correct written and spoken English to the diverse modes of communication encountered and used by engineers in the professional workplace.

Prerequisites: WRT 102; MEC Major; U3 or U4
Corequisite: MEC 317

1 credit, S/U grading

MEC 301: Thermodynamics

Variables that describe the thermodynamic state of a system or control volume, including absolute temperature, internal energy, enthalpy, and entropy are introduced, and basic principles governing the transformations of energy, especially heat and work, are developed. Underlying principles are used to analyze and solve problems related to thermodynamic systems and to determine the changes in properties of the systems and surroundings implied by changes in inputs, configuration, or constraints.

Prerequisites: AMS 261 or MAT 203; PHY 125 or 131/133 or 141; MEC Major

3 credits

MEC 305: Heat and Mass Transfer

The fundamental laws of momentum, heat and mass transfer, and the corresponding transport coefficients. Principles of steady-state and transient heat conduction in solids are investigated. Laminar and turbulent boundary layer flows are treated, as well as condensation and boiling phenomena, thermal radiation, and radiation heat transfer between surfaces. Applications to heat transfer equipment are covered throughout the course.

Prerequisites: MEC 301 and 364; MEC 102 or 111 or 112, or ESG 111, or ESE 124, or CSE 114 or 130

3 credits

MEC 309: Numerical Methods for Engineering Analysis

Solving nonlinear equations, systems of linear equations, interpolation/extrapolation, curve fitting integration, and differential equations. Special emphasis on the implementation of numerical methods in FORTRAN computer programs to solve computation problems that arise in the engineering design process.

Prerequisites: MEC 102 or 111 or 112 or CSE 114 or 130 or ESG 111; AMS 261 or MAT 203; AMS 361 or MAT 303

3 credits

MEC 310: Introduction to Machine Design

Application of graphical and analytical methods to the analysis and synthesis of mechanism. Covers concepts of degrees of freedom, graphical and analytical linkage synthesis, position, velocity, acceleration, and force analysis of linkage mechanisms. Introduces principles behind the operation of various machine elements such as gears and gear trains, cams, flywheels and their design, and analysis techniques.

Prerequisites: MEC 102 or 111 or 112 or CSE 114 or 130 or ESG 111; MEC 262 (ESG 316 for ESG majors)
Pre- or Corequisite: MEC 203

3 credits

MEC 316: Mechanical Engineering Lab I: Sensors and Instrumentation

The spatial and temporal resolution of modern instrumentation and sensors that are particular to mechanical engineering. Concepts of static and dynamic response as well as probability, statistics, and the statistical analysis of data are discussed. Includes basic circuit components. Laboratory safety. Students learn to operate instruments for measuring temperature, pressure, flow velocity, displacement, angle, acceleration, and strain. Design project. This course has an associated fee. Please see www.stonybrook.edu/coursefees for more information.

Prerequisites: MEC 214; MEC 220; MEC 363; AMS 361 or MAT 303;
Corequisites: MEC 301 and MEC 364

2 credits

MEC 317: Mechanical Engineering Laboratory II

Hands-on experience in solid and fluid mechanics and heat transfer. Emphasis is on the understanding of fundamental principles as well as familiarity with modern experimentation. Lectures at the beginning of the course provide background information and theories of experimentation. Student groups perform four experiments each in solid mechanics and in fluid mechanics and heat transfer. Report writing is an integral part of the course, with emphasis on design of experiment, interpretation and presentation of data, error analysis, and conclusions. This course has an associated fee. Please see www.stonybrook.edu/coursefees for more information.

Prerequisites: MEC 316 and 364
Corequisite: MEC 305 and MEC 300

2 credits

MEC 320: Engineering Design Methodology and Optimization

The general process of engineering design as a systematic and disciplined process. Covers materials related to the formulation of design specifications and criteria; conceptual design and evaluation of the design options; design creativity; formulation of analyzable models; simulation and optimization techniques; design for manufacture; design for reliability; engineering economics; and engineering ethics.

Prerequisites: MEC 102 or 111 or 112 or CSE 114 or 130 or ESG 111
Corequisite: MEC 310

3 credits

MEC 325: Manufacturing Processes

The relationship between product design and manufacturing. Materials properties and influence. Introduces traditional and nontraditional manufacturing processes and their capabilities and limitations. Measurement inspection, reliability, and quality engineering. Economic impact of modern process engineering. Hands-on experience in various manufacturing machines and processes.

Prerequisite: ESG 332
Pre- or Corequisite: MEC 125

3 credits

MEC 325: Manufacturing Processes

The relationship between product design and manufacturing. Materials properties and influence. Introduces traditional and nontraditional manufacturing processes and their capabilities and limitations. Measurement inspection, reliability, and quality engineering. Economic impact of modern process engineering. Hands-on experience in the fundamentals of machining including ,metrology tools, saw, sheet metal working, drilling, reaming, taping, turning, boring, milling, welding, and rapid prototyping. . Spring, 3 credits.

3 credits, Letter graded (A, A-, B+, etc.)

MEC 363: Mechanics of Solids

Stress and deformation of engineering structures and the influence of the mechanical behavior of materials. Concepts of stress and strain, constitutive relations, analysis of statically indeterminate systems, study of simple bars and beams, and stability conditions. Emphasis on force equilibrium, elastic response of materials, geometric compatibility, Mohr's circle, stresses and deflections in beams, and torsion and buckling of rods. Design for bending, shear, and combined states of stress.

Prerequisite: A grade of "C" or better in MEC 260

3 credits

MEC 364: Introduction to Fluid Mechanics

Fundamental properties of fluids and their conservation laws with applications to the design and evaluation of flows of engineering interest. Topics include hydrostatics, surface tension, dimensional analysis and dynamic similitude, Euler's equation, rotating coordinate systems, boundary layers, lubrication, drag on immersed bodies, open channel and pipe flows, and turbomachinery.

Prerequisite: MEC 262; MEC Major
Pre- or Corequisite: MEC 301

3 credits

MEC 393: Engineering Fluid Mechanics

The application of the principles of fluid mechanics to important areas of engineering practice such as turbomachinery, hydraulics, and wave propagation. Prepares students for advanced coursework in fluid dynamics. Extends the study of viscous effects, compressibility, and inertia begun in MEC 364.

Prerequisite: MEC 364

3 credits

MEC 398: Thermodynamics II

Psychrometrics and psychrometric charts. Thermodynamic considerations for the design and performance of cooling towers, humidifiers, and dehumidifiers. Reacting mixtures, combustion, and chemical equilibrium. Thermodynamics of fluid flow, simple compression, and expansion processes. Analysis and design of gas and vapor power cycles. Cycles with reheat, intercooling, and cogeneration plants. Refrigeration cycles.

Prerequisites: MEC 301 and 364

3 credits

MEC 400: Research and Nanotechnology

This is the capstone course for the minor in Nanotechnology Studies (NTS). Students learn primary aspects of the professional research enterprise through writing a journal-quality manuscript and making professional presentations on their independent research (499) projects in a formal symposium setting. Students will also learn how to construct a grant proposal (a typical NSF graduate fellowship proposal), methods to search for research/fellowship funding, and key factors in being a research mentor.

Prerequisites: MEC 213; at least one semester of independent research (499 level)

3 credits

MEC 402: Mechanical Vibrations

Modeling, analysis and design for mechanical vibrations. Fundamentals of free vibration, harmonically excited vibration and vibration under general forcing conditions are considered for one degree, two degree and multidegree of freedom systems; continuous systems; vibration design strategies including isolation and absorbers.

Prerequisites: MEC 262 and 363

3 credits

MEC 410: Design of Machine Elements

Application of analytical methods, material science, and mechanics to problems in design and analysis of machine components. Includes the design of mechanical components such as bearings, gears, shafting, springs, fasteners, belts, clutches, and brakes, and takes into consideration factors such as manufacturability and reliability. Design projects with open-ended and interactive problems are assigned to integrate several machine elements in a system.

Prerequisites: MEC 310 and 363

3 credits

MEC 411: Control System Analysis and Design

Analysis and design of feedback control systems. Topics include system modeling; transfer function; block diagram and signal-flow graph; sensors, actuators, and control circuit design; control system characteristics and performance; stability analysis; root locus method; Bode diagram; PID and lead-lag compensator design.

Prerequisites: MEC 262; AMS 361 or MAT 303

4 credits

MEC 422: Thermal System Design

Device design and system design. Quantitative data for system design including operating characteristics of compressors, turbines, heat exchangers, piping systems, internal combustion engines, and other component equipment. Component matching and system simulation. Optimization including thermoeconomic evaluation and energy analysis. Case studies: refrigeration and air conditioning systems, combined cycles, steam-injected gas turbines.

Prerequisite: MEC 305

3 credits

MEC 423: Internal Combustion Engines

Introduction to internal combustion engines and their operation. Analytical approach to the engineering problem and performance analysis of internal combustion engines. Topics include thermodynamics fundamentals; fuel-air cycle analysis; engine combustion; emission formation and control strategies. Includes both the relevant fundamental concepts and the extensive practical knowledge base on which engine research, development, and design depend. The students are expected to complete a project, in which they will interpret real-life engine data in the light of course principles and ideal engine cycle analysis. Co-Scheduled with MEC 423

3 credits, Letter graded (A, A-, B+, etc.)

MEC 423: Internal Combustion Engines

Introduction to internal combustion engines and their operation. Analytical approach to the engineering problem and performance analysis of internal combustion engines. Topics include thermodynamics fundamentals; fuel-air cycle analysis; engine combustion; emission formation and control strategies. Includes both the relevant fundamental concepts and the extensive practical knowledge base on which engine research, development, and design depend. Not for credit in addition to MEC 523.

Prerequisite: MEC 305

3 credits

MEC 440: Mechanical Engineering Design I

Part I of the two-semester capstone design project sequence. Senior students select a project with multiple realistic constraints, develop the necessary technical background, and write a proposal, progress reports, and a preliminary design report. Includes an oral presentation on the development and progress of the project. Not counted as a technical elective. The final grade will be assigned at the end of the two course sequence MEC 440-MEC 441. This course has an associated fee. Please see www.stonybrook.edu/coursefees for more information.

Prerequisites: MEC 125, 300, 310, 317, 320, and 325; MEC major; U4 standing
Corequisites: MEC 410 and 411

3 credits

MEC 441: Mechanical Engineering Design II

Part II of the two-semester capstone design project sequence. Students complete the project design, incorporating engineering standards, build and test a prototype, write a mid-term report and a final design report, and give an oral presentation. Not counted as a technical elective. This course has an associated fee. Please see www.stonybrook.edu/coursefees for more information.

Prerequisite: MEC 440

3 credits

MEC 442: Introduction to Experimental Stress Analysis

The concepts of three-dimensional stress and strain, their transformation laws, and their mutual relationships are discussed in detail. Results from theory of elasticity as pertinent to experimental stress analysis are also presented. Experimental techniques studied include two-dimensional photoelasticity, resistance strain gauge, moire method, brittle coating, and analog methods. The application of different techniques to the measurement of stress and strain in models as well as actual structures is demonstrated. Students form small groups and each group is assigned different laboratory projects to gain experience in various experimental stress analysis methods. Previously offered as MEC 342.

Prerequisite: MEC 363

3 credits

MEC 450: Mechatronics

An introduction to the design, modeling, analysis, and control of mechatronic systems (smart systems comprising mechanical, electrical, and software components). Fundamentals of the basic components needed for the design and control of mechatronic systems, including sensors, actuators, data acquisition systems, microprocessors, programmable logic controllers, and I/O systems, are covered. Hands-on experience in designing and building practical mechatronic systems is provided through integrated lab activities.

Prerequisites: MEC 310 and 316

3 credits

MEC 455: Applied Stress Analysis

A study of linear elastic solids with emphasis on internal stress analysis. Simple boundary value problems at plane structures are analyzed with various solution techniques. Major topics are stress and strain tensors, linear elasticity, principle of virtual work, torsion, stress functions, stress concentration, elementary fracture, and plasticity.

Prerequisite: MEC 363

3 credits

MEC 470: Introduction to Tribology

Focus is on the fundamentals of tribology, the science of surfaces in relative motion, with an introduction to friction, lubrication, and wear. The basics of tribology science: engineering surfaces, contact mechanics, lubrication theory, wear processes and modeling, wear properties of materials, and tribology test methods will be covered. Analysis of tribological aspects of machine components and bearings. Industrial case studies will be presented to place the topics in context to industry and society.

Prerequisites: MEC 363 and 364

3 credits

MEC 475: Undergraduate Teaching Practicum

Students assist the faculty in teaching by conducting recitation or laboratory sections that supplement a lecture course. The student receives regularly scheduled supervision from the faculty instructor. May be used as an open elective only and repeated once.

Prerequisites: U4 standing; a minimum g.p.a. of 3.00 in all Stony Brook courses and the grade of B or better in the course in which the student is to assist; permission of department

3 credits

MEC 488: Mechanical Engineering Internship

Participation in off-campus engineering practice. Students are required to submit a proposal to the department at the time of registration and two term reports before the end of the semester. May be repeated up to a limit of 12 credits.

Prerequisite: Permission of undergraduate program director

3-9 credits, S/U grading

MEC 491: Topics in Mechanical Engineering

Treatment of an area of mechanical engineering that expands upon the undergraduate curriculum. Topics may include advanced material in a specialty, development of a specialized experimental technique, or a specific area of design. Topics may vary from semester to semester. Semester supplements to this Bulletin contain specific description when course is offered. May be repeated as the topic changes.

Prerequisite: U3 or U4 standing in a B.E. degree major; permission of department (course prerequisites vary with topic)

1-4 credits

MEC 492: Topics in Mechanical Engineering

Treatment of an area of mechanical engineering that expands upon the undergraduate curriculum. Topics may include advanced material in a specialty, development of a specialized experimental technique, or a specific area of design. Topics may vary from semester to semester. Semester supplements to this Bulletin contain specific description when course is offered. May be repeated as the topic changes.

Prerequisite: U3 or U4 standing in a B.E. degree major; permission of department (course prerequisites vary with topic)

1-4 credits

MEC 495: Professional Engineering Seminar

Prepares the student to enter the workplace as a practicing engineer. Topics include professional ethics, professional activities, professional engineering licensing, patents, seeking entry-level employment, and exposure to the engineering work environment. Aids in preparation for the EIT/FE exam. Includes speakers from a variety of disciplines, within the College and from industry.

Prerequisites: CEAS major; U4 standing

1 credit, S/U grading

MEC 499: Research in Mechanical Engineering

An independent research project under the supervision of a mechanical engineering faculty member. Permission to register requires the agreement of the faculty member

to supervise the research and submission of a one-page research proposal. May be repeated but only six credits of research electives may be counted as technical electives.

Prerequisite: Permission of department

0-3 credits