ENGINERING MECHANICS MINOR

Description
This minor is for engineering majors ONLY.
The College of Engineering enables its students to participate in this approved minor subject to the following conditions:

1. A minor will not reduce or alter the existing course or degree requirements for students electing to pursue a minor.
2. A student’s minor program must be organized and approved by an advisor prior to the submission of the senior check to the department chair or head.
3. The minor must be approved by the advisor, the department chair or head, the Dean and the cognizant program offering the minor.
4. The College of Engineering will follow the “Plan A/B” format of the Arts and Sciences College in which a student pursuing a single minor must complete the “Plan A” requirements. A student pursuing a double (or greater) minor must fulfill either the “Plan A” or “Plan B” requirements for both minors depending on which plan is offered by the cognizant department.
5. Minors on the Lincoln or Omaha campuses may be added by approval of the College of Engineering Curriculum Committee and faculty.

College Requirements

College Admission

College Entrance Requirements
Students must have high school credit for (one unit is equal to one high school year):

1. 4 units of mathematics: 2 of algebra, 1 of geometry, 1 of precalculus and trigonometry.
2. 4 units of English.
3. 3 units of natural science that must include 1 unit of physics and 1 unit of chemistry (chemistry requirement waived for students in construction management).
4. 2 units of a single foreign language.
5. 3 units of social studies.
6. Students having a composite ACT score of 28 or greater (or equivalent SAT score) will be admitted to the College of Engineering even if they lack any one of the following: trigonometry, chemistry, or physics.
7. Students having an ACT score of 19 or less in English (or equivalent SAT score) must take ENGL 150 Writing and Inquiry or ENGL 151 Writing and Argument.

A total of 16 units is required for admission.

Students who lack entrance units may complete precollege training by Independent Study through the UNL Office of On-line and Distance Education, in summer courses, or as a part of their first or second semester course loads while in the Exploratory and Pre-Professional Advising Center or other Colleges at UNL.

Students should consult their advisor, their department chair, or the Office of the Dean if they have questions on current policies.

Other Admission Requirements
Students who transfer to the University of Nebraska–Lincoln from other accredited colleges or universities and wish to be admitted to the College of Engineering (COE) must meet COE freshman entrance requirements and have a minimum cumulative GPA of 2.5 for Nebraska residents or 3.0 for non-residents. Students not meeting either of these requirements must enroll in the Explore Center or another UNL college until they meet COE admission requirements.

The COE accepts courses for transfer for which a C or better grade was received. Although UNL accepts D grades from the University of Nebraska at Kearney and at Omaha, not all majors in the COE accept such low grades. Students must conform to the requirements of their intended major and, in any case, are strongly encouraged to repeat courses with a grade of C- or less.

All transfer students must adopt the curricular requirements of the undergraduate bulletin current at the time of transfer to the COE—not that in use when they entered UNL. Upon admission to UNL, students wishing to pursue degree programs in the COE will be classified and subject to the policies defined in the subsequent section.

College Degree Requirements

Grade Rules
Grade Appeals
In the event of a dispute involving any college policies or grades, the student should appeal to his/her instructor, and appropriate department chair or school director (in that order). If a satisfactory solution is not achieved, the student may appeal his/her case through the College Academic Appeals Committee on his/her campus.

Bulletin Rule
Students must fulfill the requirements stated in the bulletin for the academic year in which they are first admitted at UNL. In consultation with advisors, a student may choose to follow a subsequent bulletin for any academic year in which they are admitted to and enrolled as a degree-seeking student at UNL in the College of Engineering. Students must complete all degree requirements from a single bulletin year. The bulletin which a student follows for degree requirements may not be more than 10 years old at the time of graduation.

Requirements for Minor Offered by Department

Plan A Minor
Twelve (12) credit hours beyond the regular undergraduate engineering mechanics sequence (MECH 223 Engineering Statics, MECH 325 Mechanics of Elastic Bodies, and MECH 373 Engineering Dynamics). These may be chosen from the following courses with content in engineering mechanics, excluding any of these courses required in the student’s curriculum by the major department:

- MECH 416 Engineering Acoustics
- MECH 417 Engineering Vibrations
- MECH 418 Engineering Dynamics
MECH 448 Advanced Mechanics of Materials 3
MECH 449 Advanced Dynamics 3
MECH 451 Introduction to Finite Element Analysis 3
MECH 452 Experimental Stress Analysis I 3
MECH 454 Introduction to Continuum Modeling 3
MECH 475 Introduction to Vibrations and Acoustics 3
MECH 480 Numerical Methods in Engineering 3
MECH 491 Special Topics in Engineering Mechanics 1-6

Grade Rules
Pass/No Pass
No course taken Pass/No Pass will be counted toward the minor.

MECH 100 Introduction to Mechanical Engineering
Crosslisted with: MECH 100H
Description: Overview of mechanical engineering. Introduction to problem layout, and development of basic skills required to solve mechanical engineering problems. Collection, manipulation and presentation of engineering data.
Credit Hours: 1
Max credits per semester: 1
Max credits per degree: 1
Format: LEC

MECH 100H Introduction to Mechanical Engineering
Crosslisted with: MECH 100
Description: Overview of mechanical engineering. Introduction to problem layout, and development of basic skills required to solve mechanical engineering problems. Collection, manipulation and presentation of engineering data.
Credit Hours: 1
Max credits per semester: 1
Max credits per degree: 1
Format: LEC

MECH 130 Introduction to CAD
Crosslisted with: MECH 130H
Description: Principles and accepted practices of geometric design. Computer generation of 2D and 3D models for mechanical systems. Introduction to engineering design practices such as specifications, dimensioning, and tolerance.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC
Prerequisite for: AGEN 470, BSEN 470; MECH 342, MECH 342H; MECH 381

MECH 130H Introduction to CAD
Crosslisted with: MECH 130
Description: Principles and accepted practices of geometric design. Computer generation of 2D and 3D models for mechanical systems. Introduction to engineering design practices such as specifications, dimensioning, and tolerance.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC
Prerequisite for: AGEN 470, BSEN 470; MECH 342, MECH 342H; MECH 381

MECH 200 Engineering Thermodynamics
Prerequisites: Open to College of Engineering Students only.
Description: First and Second Laws of Thermodynamics, properties of gases and vapors. Sources of energy and its conversion to work.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC
Prerequisite for: AGEN 344, AGEN 344H, BSEN 344, BSEN 344H; MECH 300

MECH 200H Honors: Engineering Thermodynamics I
Prerequisites: Open to College of Engineering Students only.
Description: First and Second Laws of Thermodynamics, properties of gases and vapors. Sources of energy and its conversion to work. Honors students will be expected to study beyond the students in the normal sections and do a special project.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC
Prerequisite for: AGEN 344, AGEN 344H, BSEN 344, BSEN 344H; MECH 300

MECH 220 Statics
Crosslisted with: MECH 220H
Prerequisites: Open to College of Engineering Students only.
Description: Fundamental concepts, equilibrium of force systems, analysis of simple frames and trusses. Centroid and moments of inertia and friction.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC

MECH 220H Statics
Crosslisted with: MECH 220
Description: Fundamental concepts, equilibrium of force systems, analysis of simple frames and trusses. Centroid and moments of inertia and friction.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC

MECH 223 Engineering Statics
Prerequisites: MATH 107 (grade of C or better), PHYS 211 (grade of C or better)
Description: Action of forces on engineering structures and machines. Force systems, static equilibrium of frames and machines. Friction, center of gravity, moment of inertia, vector algebra.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC
Offered: FALL/SPR
Prerequisite for: AGEN 324, BSEN 324; CIVE 361; MATL 360, MATL 360H; MECH 325H; MECH 373; MECH 373H
MECH 223H Honors: Engineering Statics
Prerequisites: Open to College of Engineering Students only.
Description: Bodies in equilibrium. Vector algebra, equivalent force systems, distributed loads, and center of gravity. Analysis of trusses, frames, and machines. Friction, wedges, crews, and belts. Area moments of inertia.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC
Prerequisite for: MECH 324, BSEN 324; CIVE 361; TATL 360, TATL 360H; MECH 325H; MECH 373; MECH 373H

MECH 250 Mechanics I
Prerequisites: PHYS 211. Parallel: MATH 208. For electrical engineering majors
Description: Force actions in static coplanar systems with applications to engineering structures and machines. Resultants, moments, couples, equivalent force systems, vector algebra. Static equilibrium conditions and equations.
Credit Hours: 2
Max credits per semester: 2
Max credits per degree: 2
Format: LEC
Prerequisite for: MECH 351

MECH 300 Thermal Systems and Design
Prerequisites: MECH 200, CSCE 155N
Description: Applications of control-volume analysis (mass, energy, and momentum), both transient and steady; mixtures of gases and vapors; introduction to combustion; thermodynamic relations and establishment of data banks of thermal properties; applications of computer-aided engineering to processes and cycles; methodologies and case studies for thermal systems design; execution of small-scaled design projects.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC
Offered: FALL/SPR
Prerequisite for: MECH 446; MECH 487

MECH 311 Fluid Mechanics Laboratory
Prerequisites: PHYS 211. Parallel: MATH 208
Description: Fluid mechanics experiments and demonstrations. Conservation principles; determination of fluid properties, velocity, pressure, and flow measurements; pipe flow; open channel flow; and instrumentation techniques.
Credit Hours: 1
Max credits per semester: 1
Max credits per degree: 1
Format: LAB

MECH 310 Fluid Mechanics
Crosslisted with: MECH 310
Prerequisites: MECH 373; MATH 221
Notes: Parallel: MECH 200, or BSEN 244 or by permission for non-ME students.
Description: Fluid statics, equations of continuity, momentum, and energy dimensional analysis and dynamic similitude. Applications to: flow meters; fluid pumps and turbines; viscous flow and lubrication; flow in closed conduits and open channels. Two-dimensional potential flow.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC
Offered: FALL/SPR
Prerequisite for: AGEN 324, AGEN 325H, BSEN 324, BSEN 325H;
AGEN 344, AGEN 344H, BSEN 344, BSEN 344H; BSEN 425, CIVE 425;
CIVE 352; MECH 446

MECH 321 Engineering Statistics and Data Analysis
Prerequisites: MATH 208
Description: An applications-oriented course for formulating and solving engineering statistical problems. Includes Descriptive statistics, probability distributions, variability, sampling, confidence intervals, tests of significance, basics of statistical process control, and design of experiments.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC
Prerequisite for: ABUS 341, MRKT 341; ACCT 308, ACCT 308H;
BLAW 371; BLAW 371H; BLAW 372, BLAW 372H; ECEN 850, ECEN 450;
ECON 311, ECON 311H; FINA 361; MECH 343, MECH 343H; MNGT 301;
MRKT 350, SCMA 331; SCMA 350

MECH 324 Strength of Materials
Crosslisted with: MECH 324H
Description: Stress and strain analysis in elastic materials. Use of properties of materials in the analysis and design of welded and riveted connections, statically determinate and indeterminate flexure members, columns. Combined stresses, axial, eccentric and torsional loading. Observations of laboratory tests for axially loaded specimens. Introduction to shear and moment diagrams. For students in architecture and construction management.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC
MECH 324H Strength of Materials
Crosslisted with: MECH 324
Description: Stress and strain analysis in elastic materials. Use of properties of materials in the analysis and design of welded and riveted connections, statically determinate and indeterminate flexure members, columns. Combined stresses, axial, eccentric and torsional loading. Observations of laboratory tests for axially loaded specimens. Introduction to shear and moment diagrams. For students in architecture and construction management.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC

MECH 325 Mechanics of Elastic Bodies
Prerequisites: MECH 223, MATH 208
Description: Concept of stress and strain considering axial, torsional, and bending forces. Shear and moments. Introduction to combined stresses and column theory.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC
Prerequisite for: CIVE 334, CIVE 334H; CIVE 341; CIVE 378, CIVE 378H; MECH 343, MECH 343H

MECH 325H Honors: Mechanics of Elastic Bodies
Prerequisites: MECH 223, MATH 208
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC
Prerequisite for: CIVE 334, CIVE 334H; CIVE 378, CIVE 378H; MECH 343, MECH 343H

MECH 330 Mechanical Engineering Analysis
Crosslisted with: MECH 330H
Description: Conceptual modeling of mechanical engineering systems. Analytical exploration of engineering behavior of conceptual models. Case studies drawn from mechanical engineering problems.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC

MECH 330H Mechanical Engineering Analysis
Crosslisted with: MECH 330
Description: Conceptual modeling of mechanical engineering systems. Analytical exploration of engineering behavior of conceptual models. Case studies drawn from mechanical engineering problems.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC

MECH 342 Kinematics and Dynamics of Machinery
Crosslisted with: MECH 342H
Prerequisites: MECH 130 and MECH 373
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC
Prerequisite for: MECH 343, MECH 343H

MECH 342H Kinematics and Dynamics of Machinery
Crosslisted with: MECH 342
Prerequisites: MECH 130 and MECH 373
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC
Prerequisite for: MECH 343, MECH 343H

MECH 343 Elements of Machine Design
Crosslisted with: MECH 343H
Prerequisites: MECH 325; BSEN 206; JGEN 200 or 300; MECH 342; MATL 360; MECH 321 or STAT 380 or parallel.
Description: Design of machine elements under different conditions of loading. Design work includes a project of broader scope (done primarily out of class) requiring a breadth of knowledge. Failure theories for static and dynamic loading of bolts, springs, bearings, and shafts.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC
Offered: FALL/SPR
Prerequisite for: MECH 446

MECH 343H Elements of Machine Design
Crosslisted with: MECH 343
Prerequisites: MECH 325; BSEN 206; JGEN 200 or 300; MECH 342; MATL 360; MECH 321 or STAT 380 or parallel.
Description: Design of machine elements under different conditions of loading. Design work includes a project of broader scope (done primarily out of class) requiring a breadth of knowledge. Failure theories for static and dynamic loading of bolts, springs, bearings, and shafts.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC
Offered: FALL/SPR
Prerequisite for: MECH 446
MECH 350 Introduction to Dynamics and Control of Engineering Systems  
Prerequisites: MECH 373; ELEC 211; CSCE 155N or AGEN/BSEN 212A; MATH 314 or parallel.  
Description: Unified treatment of the dynamics and control of engineering systems. Emphasis on physical aspects, formulation of mathematical models, application of various mathematical methods, and interpretation of results in terms of the synthesis and analysis of real systems.  
Credit Hours: 3  
Max credits per semester: 3  
Max credits per degree: 3  
Format: LEC  
Offered: FALL/SPR  
Prerequisite for: MECH 446

MECH 350H Introduction to Dynamics and Control of Engineering Systems  
Crosslisted with: MECH 350  
Prerequisites: MECH 373; ELEC 211; CSCE 155N or AGEN/BSEN 212A; MATH 314 or parallel.  
Description: Unified treatment of the dynamics and control of engineering systems. Emphasis on physical aspects, formulation of mathematical models, application of various mathematical methods, and interpretation of results in terms of the synthesis and analysis of real systems.  
Credit Hours: 3  
Max credits per semester: 3  
Max credits per degree: 3  
Format: LEC  
Offered: FALL/SPR  
Prerequisite for: MECH 446

MECH 351 Mechanics II  
Prerequisites: MECH 250. For electrical engineering majors  
Description: Application of Newton’s laws to engineering problems involving coplanar kinematics and kinetics of particles. Work, energy, impulse, and momentum. Conservative systems. Periodic motion.  
Credit Hours: 2  
Max credits per semester: 2  
Max credits per degree: 2  
Format: LEC

MECH 370 Manufacturing Methods and Processes  
Crosslisted with: MECH 370H  
Prerequisites: Open to College of Engineering Students only.  
Description: Introduction to traditional and modern manufacturing processes and methods to include: foundry; forming processes; welding; metal removal theory and practices; modern manufacturing systems and automation; and economics of process selection.  
Credit Hours: 3  
Max credits per semester: 3  
Max credits per degree: 3  
Format: LEC

MECH 370H Manufacturing Methods and Processes  
Crosslisted with: MECH 370  
Prerequisites: Open to College of Engineering Students only.  
Description: Introduction to traditional and modern manufacturing processes and methods to include: foundry; forming processes; welding; metal removal theory and practices; modern manufacturing systems and automation; and economics of process selection.  
Credit Hours: 3  
Max credits per semester: 3  
Max credits per degree: 3  
Format: LEC

MECH 373 Engineering Dynamics  
Prerequisites: MECH 223, MATH 208. Open to College of Engineering Students only  
Description: Unified treatment of the dynamics and control of engineering systems. Emphasis on physical aspects, formulation of mathematical models, application of various mathematical methods, and interpretation of results in terms of the synthesis and analysis of real systems.  
Credit Hours: 3  
Max credits per semester: 3  
Max credits per degree: 3  
Format: LEC  
Prerequisite for: CIVE 310; CIVE 310H; MECH 310, MECH 310H; MECH 342, MECH 342H; MECH 350, MECH 350H

MECH 373H Honors: Engineering Dynamics  
Prerequisites: Good standing in the University Honors Program or by invitation; MECH 223 or 223H; MATH 208.  
Description: Unified treatment of the dynamics and control of engineering systems. Emphasis on physical aspects, formulation of mathematical models, application of various mathematical methods, and interpretation of results in terms of the synthesis and analysis of real systems.  
Credit Hours: 3  
Max credits per semester: 3  
Max credits per degree: 3  
Format: LEC  
Prerequisite for: CIVE 310; CIVE 310H; MECH 310, MECH 310H; MECH 342, MECH 342H; MECH 350, MECH 350H

MECH 380 Mechanical Engineering Measurements  
Crosslisted with: MECH 380H  
Prerequisites: ELEC 231; JGEN 200 or 300; MECH 321 or STAT 380 or parallel; MECH 350 and MECH 310, or parallel.  
Description: Theory, statistics, applications and design of mechanical engineering experiments.  
Credit Hours: 3  
Max credits per semester: 3  
Max credits per degree: 3  
Format: LEC  
Offered: FALL/SPR  
Prerequisite for: MECH 487

MECH 380H Mechanical Engineering Measurements  
Crosslisted with: MECH 380  
Prerequisites: ELEC 231; JGEN 200 or 300; MECH 321 or STAT 380 or parallel; MECH 350 and MECH 310, or parallel.  
Description: Theory, statistics, applications and design of mechanical engineering experiments.  
Credit Hours: 3  
Max credits per semester: 3  
Max credits per degree: 3  
Format: LEC  
Offered: FALL/SPR  
Prerequisite for: MECH 487
MECH 381 Elements of Computer-Aided Design  
**Prerequisites:** MATH 221; MECH 130 or CSCE 155N or permission  
**Description:** Principles and techniques currently used for the computer-aided design (CAD). Applications of interactive graphics devices for drafting, design, and analysis. Modelling and analogy of engineering systems. Elementary finite element, Bode, and numerical analyses. CAD case studies and term project.  
**Credit Hours:** 3  
**Max credits per semester:** 3  
**Max credits per degree:** 3  
**Format:** LEC

MECH 399 Undergraduate Research and Thesis  
**Prerequisites:** Open to College of Engineering Students only.  
**Description:** Engineering design or laboratory investigation that an undergraduate is qualified to undertake.  
**Credit Hours:** 1-5  
**Min credits per semester:** 1  
**Max credits per semester:** 5  
**Max credits per degree:** 6  
**Format:** IND

MECH 403 Internal Combustion Engines  
**Crosslisted with:** MECH 803  
**Prerequisites:** Open to College of Engineering Students only.  
**Description:** Basic cycle analysis and engine types, fundamental thermodynamics and operating characteristics of various engines are analyzed, combustion processes for spark and compression-ignition engines, fuels, testing procedures, and lubrication systems are evaluated. Emphasis on the thermodynamic evaluation of the performance and understanding the basic operation of various engine types.  
**Credit Hours:** 3  
**Max credits per semester:** 3  
**Max credits per degree:** 3  
**Format:** LEC

MECH 404 Theory of Combustion  
**Crosslisted with:** MECH 804  
**Prerequisites:** Open to College of Engineering Students only.  
**Description:** Stoichiometric analysis of combustion processes. Energy transfer, flame propagation, and transformation velocities during combustion. Combustion applications and design considerations. Emission formation and methods of control.  
**Credit Hours:** 3  
**Max credits per semester:** 3  
**Max credits per degree:** 3  
**Format:** LEC

MECH 405 Turbomachinery  
**Crosslisted with:** MECH 805  
**Prerequisites:** MECH 300 and MECH 310/CIVE 310  
**Description:** Thermodynamic analysis and design of axial and radial flow turbines, compressors, and pumps. Fundamentals of the operating characteristics and performance parameters of turbomachines will be evaluated. Cavitation and blade element theory.  
**Credit Hours:** 3  
**Max credits per semester:** 3  
**Max credits per degree:** 3  
**Format:** LEC

MECH 406 Air Conditioning Systems Design  
**Crosslisted with:** MECH 806  
**Prerequisites:** Open to College of Engineering Students only.  
**Description:** Application of thermodynamic and fluid dynamic principles to the design of air conditioning systems. Comprehensive design project is an integral part of the course.  
**Credit Hours:** 3  
**Max credits per semester:** 3  
**Max credits per degree:** 3  
**Format:** LEC

MECH 407 Power Plant Systems Design  
**Crosslisted with:** MECH 807  
**Description:** Application of thermodynamic and fluid dynamic principles to the design of Power Plants. Comprehensive design project is an integral part of the course.  
**Credit Hours:** 3  
**Max credits per semester:** 3  
**Max credits per degree:** 3  
**Format:** LEC

MECH 408 Heat Exchanger Design  
**Crosslisted with:** MECH 808  
**Prerequisites:** Open to College of Engineering Students only.  
**Description:** Design methodology for various heat exchangers employed in mechanical engineering. Introduction to computer-aided design as applied to heat exchangers. Practical exercises in actual design tasks.  
**Credit Hours:** 3  
**Max credits per semester:** 3  
**Max credits per degree:** 3  
**Format:** LEC

MECH 413 Aerodynamics  
**Crosslisted with:** MECH 813  
**Prerequisites:** Open to College of Engineering Students only.  
**Description:** Subsonic and supersonic air flow theory, dynamics of flight, performance parameters, rotor analysis, and special topics.  
**Credit Hours:** 3  
**Max credits per semester:** 3  
**Max credits per degree:** 3  
**Format:** LEC

MECH 414 Compressible Flow  
**Crosslisted with:** MECH 814  
**Description:** Analysis of the flow of compressible fluids by means of the momentum equation, continuity equation, and the laws of thermodynamics and some application of thermodynamic laws to incompressible fluids.  
**Credit Hours:** 3  
**Max credits per semester:** 3  
**Max credits per degree:** 3  
**Format:** LEC

MECH 415 Two-Phase Flow  
**Crosslisted with:** MECH 815  
**Description:** Transport phenomena of homogeneous and heterogeneous types of mixtures such as solid-liquid, liquid-liquid, and liquid-gas. Properties of components and mixtures. Flow induced vibrations and parameter distributions. Optimization and design problems in multiphase systems.  
**Credit Hours:** 3  
**Max credits per semester:** 3  
**Max credits per degree:** 3  
**Format:** LEC
MECH 416 Engineering Acoustics
Crosslisted with: MECH 816
Prerequisites: Open to College of Engineering Students only.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC

MECH 420 Heat Transfer
Crosslisted with: MECH 420H, MECH 820
Prerequisites: MECH 310
Description: Heat transfer by conduction, convection, and radiation. Correlation of theory with experimental data and engineering design.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC

MECH 420H Heat Transfer
Crosslisted with: MECH 420, MECH 820
Prerequisites: MECH 310
Description: Heat transfer by conduction, convection, and radiation. Correlation of theory with experimental data and engineering design.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC

MECH 421 Elements of Nuclear Engineering
Crosslisted with: MECH 821, ENGR 421
Prerequisites: ENGR 300 or 301 or 310; MATH 208/208H; and PHYS 212/212H
Description: Survey of nuclear engineering concepts and applications. Nuclear reactions, radioactivity, radiation interaction with matter, reactor physics, risk and dose assessment, applications in medicine, industry, agriculture, and research.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC

MECH 422 Industrial Quality Control
Crosslisted with: MECH 822
Prerequisites: MECH 321 or STAT 380
Description: Statistical process control and quality assurance techniques in manufacturing. Control charts, acceptance sampling, and analyses and design of quality control systems.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC
Offered: FALL/SPR

MECH 424 Laser Material Processing with Compressible Flow Perspective
Description: Fundamentals of laser material processing. Laser material interactions from the compressible flow perspective. Analytical, semi-analytical, and numerical approaches.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC

MECH 425 Solar Energy Engineering
Crosslisted with: MECH 825
Prerequisites: Open to College of Engineering Students only.
Description: Conversion of solar energy into more useful forms with emphasis on environmental heating and cooling applications. Includes solar energy availability, solar collectors and design, solar systems and their simulation and solar economics.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC

MECH 426 Heat Transfer at Nanoscales and in Ultrashort Time Domains
Crosslisted with: MECH 826
Description: Heat transfer in nanoscale and nanostructured materials. Heat transfer in ultrafast laser materials processing.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC

MECH 431 Computational Heat Transfer and Fluid Flow
Crosslisted with: MECH 831
Prerequisites: Open to College of Engineering Students only.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC

MECH 434 Facility Planning and Design
Prerequisites: ENGR 315
Description: Design, analysis and layout of facilities: queuing, material handling systems, material flow analysis, systematic layout planning and design of warehouse facilities.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC

MECH 436 Introduction to Continuum Biomechanics
Crosslisted with: MECH 836
Description: Introduction to biomechanics. Basic anatomy, biomaterials, kinematics, dynamics, visco-elasticity, bio-fluid mechanics, and bio-heat transfer.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC
MECH 437 Biomedical Device Design
Crosslisted with: MECH 837
Prerequisites: ENGM 223, 325, and 373, or equivalent
Description: Design of devices intended for use in biomedical environments. Introduction to modeling of the bio-environments, biomaterials, and material selection. Overview of design methodologies and strategies used in biomedical device design from a material properties perspective. Introduction to federal regulation and other pertinent issues.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC

MECH 438 Mechanics of Biomaterials
Crosslisted with: MECH 838
Prerequisites: MECH 343 or parallel
Description: Theory, application, simulation, and design of biomaterials that apply mechanical principles for solving medical problems (case studies in artery, brain, bone, etc.). Tentative Topics include Mechanical characterization of biomaterials; Bio-manufacturing a tissue; Function-structure relationship; Design and analysis of medical implants; Active response of biomaterials: growth and remodeling mechanism; Cellular behavior and measurements, etc.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC

MECH 442 Intermediate Kinematics
Crosslisted with: MECH 442H, MECH 842
Prerequisites: Open to College of Engineering Students only.
Description: Analytical cam design. Geometry of constrained plane motion and application to the design of mechanisms. Analysis and synthesis of pin-jointed linkage mechanisms.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC

MECH 442H Intermediate Kinematics
Crosslisted with: MECH 442, MECH 842
Prerequisites: Open to College of Engineering Students only.
Description: Analytical cam design. Geometry of constrained plane motion and application to the design of mechanisms. Analysis and synthesis of pin-jointed linkage mechanisms.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC

MECH 444 Intermediate Dynamics of Machinery
Crosslisted with: MECH 844
Prerequisites: Open to College of Engineering Students only.
Description: Fundamentals of vibration, vibration and impact in machines, balance of rotors, flexible rotor dynamics and instabilities, parametric vibration, advanced dynamics and design of cam mechanisms, and dynamics of flywheel.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC
Prerequisite for: MECH 915

MECH 445 Mechanical Engineering Design Concepts
Crosslisted with: MECH 845
Prerequisites: Open to College of Engineering Students only.
Description: Development of design concepts. Introduction to synthesis techniques and mathematical analysis methods. Applications of these techniques to mechanical engineering design projects.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC

MECH 446 Mechanical Engineering Design I
Prerequisites: MECH 300, MECH 310, MECH 343, MECH 350, professional admission to Mechanical Engineering BS program
Description: Synthesis, design, and a written report on two projects, plus a proposal for the students final design project in MECH 447. The two projects should span the general areas of mechanical engineering developing breadth, resourcefulness, creativity and most importantly, the use of the design process. Guest lectures by practicing designers will be a part of the class when appropriate.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC
Prerequisite for: MECH 447
ACE: ACE 10 Integrated Product

MECH 447 Mechanical Engineering Design II
Prerequisites: MECH 446, professional admission to Mechanical Engineering BS program
Description: Definition, scope, analysis, synthesis, and the design for the solution of a comprehensive engineering problem in any major area of mechanical engineering.
Credit Hours: 2
Max credits per semester: 2
Max credits per degree: 2
Format: LAB
ACE: ACE 10 Integrated Product

MECH 448 Advanced Mechanics of Materials
Crosslisted with: MECH 848
Prerequisites: Open to College of Engineering Students only.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC
Prerequisite for: MECH 915; MECH 933; MECH 935; MECH 938
MECH 449 Advanced Dynamics
Crosslisted with: MECH 849
Prerequisites: MECH 373 and MATH 221/821. Open to College of Engineering Students only.
Description: Particle Dynamics using Newton's laws, energy principles, momentum principles. Rigid body dynamics using Euler's equations and Lagrange's equations. Variable mass systems. Gyroscopic motion.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC
Prerequisite for: MECH 935

MECH 450 Mechanical Engineering Control Systems Design
Crosslisted with: MECH 850
Prerequisites: Open to College of Engineering Students only.
Description: Applications of control systems analysis and synthesis for mechanical engineering equipment. Control systems for pneumatic, hydraulic, kinematic, electromechanical, and thermal systems.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC

MECH 451 Introduction to Finite Element Analysis
Crosslisted with: MECH 851
Prerequisites: Open to College of Engineering Students only.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC

MECH 452 Experimental Stress Analysis I
Crosslisted with: MECH 852
Prerequisites: Open to College of Engineering Students only.
Description: Investigation of the basic theories and techniques associated with the analysis of stress using mechanical strain gages, electric strain gages, brittle lacquer, photoelasticity, and membrane analogy.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC

MECH 453 Robotics: Kinematics and Design
Crosslisted with: MECH 453H, MECH 853
Prerequisites: Open to College of Engineering Students only.
Description: Robotics synthesize some aspects of human function by the use of mechanisms, sensors, actuators, and computers.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC

MECH 453H Robotics: Kinematics and Design
Crosslisted with: MECH 453, MECH 853
Prerequisites: Open to College of Engineering Students only.
Description: Robotics synthesize some aspects of human function by the use of mechanisms, sensors, actuators, and computers.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC

MECH 454 Introduction to Continuum Modeling
Crosslisted with: MECH 854
Prerequisites: MATH 221/821, MECH 325 and MECH 373
Description: Basic concepts of continuum modeling. Development of models and solutions to various mechanical, thermal and electrical systems. Thermo-mechanical and electro-mechanical coupling effects. Differential equations, dimensional methods and similarity.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC

MECH 455 Vehicle Dynamics
Crosslisted with: MECH 855
Description: Introduction to basic mechanics governing automotive vehicle dynamic acceleration, braking, ride, handling and stability. Analytical methods, including computer simulation, in vehicle dynamics. The different components and subsystems of a vehicle that influence vehicle dynamic performance.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC

MECH 456 Dynamics of Internal Combustion Engines
Crosslisted with: MECH 856
Description: Basics of design of the internal combustion engines. Design of various engine parts such as pistons, connecting rods, valve trains, crankshafts, and the vibration dampers. Dynamics of the engine. The vibration of the crankshaft assembly and the valve train. Balancing of the engines.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC

MECH 457 Mechatronic Systems Design
Crosslisted with: MECH 457H, MECH 857
Prerequisites: Open to College of Engineering Students only.
Description: Theory, application, simulation, and design of systems that integrate mechanical, computer, and electronic components. Includes a comprehensive design project.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC
MECH 457H Mechatronic Systems Design
Crosslisted with: MECH 457, MECH 857
Prerequisites: Open to College of Engineering Students only.
Description: Theory, application, simulation, and design of systems that integrate mechanical, computer, and electronic components. Includes a comprehensive design project.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC

MECH 458 Digital Control of Mechanical Systems
Crosslisted with: MECH 858
Prerequisites: MECH 450
Description: Introduction to digital measurement and control of mechanical systems. Applications of analysis and synthesis of discrete time systems.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC

MECH 470 Theory and Practice of Materials Processing
Crosslisted with: MECH 870
Description: Theory, practice and application of conventional machining, forming and non-traditional machining processes with emphasis on tool life, dynamics of machine tools and adaptive control.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC
Prerequisite for: MECH 970

MECH 474 Manufacturing Systems I
Crosslisted with: MECH 474H, MECH 874
Prerequisites: Open to College of Engineering Students only.
Description: Principles of automated production lines; analysis of transfer lines; group technology; flexible manufacturing systems; and just-in-time; and optimization strategies for discrete parts manufacturing.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC

MECH 474H Manufacturing Systems I
Crosslisted with: MECH 474, MECH 874
Prerequisites: Open to College of Engineering Students only.
Description: Principles of automated production lines; analysis of transfer lines; group technology; flexible manufacturing systems; and just-in-time; and optimization strategies for discrete parts manufacturing.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC

MECH 475 Introduction to Vibrations and Acoustics
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC

MECH 476 Manufacturing Information Systems
Crosslisted with: MECH 876
Prerequisites: Senior standing; CSCE 155A, CSCE 155E, CSCE 155H, CSCE 155N, or CSCE 155T or equivalent
Description: An exploration of information systems and their impact in a manufacturing environment. Software, hardware, database systems, enterprise resource planning, networking, and the Internet.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC

MECH 477 Manufacturing Information Systems
Crosslisted with: MECH 877
Prerequisites: Open to College of Engineering Students only.
Description: An exploration of information systems and their impact in a manufacturing environment. Software, hardware, database systems, enterprise resource planning, networking, and the Internet.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC

MECH 480 Numerical Methods in Engineering
Crosslisted with: MECH 880
Prerequisites: Open to College of Engineering Students only.
Description: Numerical algorithms and their convergence properties in: solving nonlinear equations; direct and iterative schemes for linear systems of equations; eigenvalue problems; polynomial and spline interpolation; curve fitting; numerical integration and differentiation; initial and boundary values problems for Ordinary Differential Equations (ODEs) and systems of ODEs with applications to engineering; finite difference methods for partial differential equations (potential problems, heat-equation, wave-equation). Credit towards the degree cannot be earned in both CSCE/MATH 340/840 and ENGM 480/880.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC

MECH 482 NUCLEAR ENGR LAB I
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LAB

MECH 483 Engineering Analysis with Finite Elements
Crosslisted with: MECH 883
Prerequisites: MECH 310; MECH 343; MECH 350; MECH 420 or parallel
Description: Analysis of engineering systems using finite elements; a critical and challenging task performed during the design process for many engineering systems. Four very distinct domains are studied: Structural stress analysis, heat transfer, fluid flow, and modal analysis.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC

MECH 484 NUCLEAR ENGR LAB II
Credit Hours: 1
Max credits per semester: 1
Max credits per degree: 1
Format: LAB
MECH 485 NUCLEAR REACTOR TECH  
Credit Hours: 3  
Max credits per semester: 3  
Max credits per degree: 3  
Format: LEC  

MECH 487 Thermal Fluids Laboratory  
Prerequisites: MECH 300 and 380; MECH 420/820 or parallel. Open to College of Engineering Students only.  
Description: Design, execution, and evaluation of physical experiments in the areas of thermodynamics, fluid mechanics, and heat transfer.  
Credit Hours: 2  
Max credits per semester: 2  
Max credits per degree: 2  
Format: LAB  

MECH 488 Kinematics and Machine Design Laboratory  
Prerequisites: Open to College of Engineering Students only.  
Description: Design projects and physical experiments in the area of machine design and kinematics.  
Credit Hours: 2  
Max credits per semester: 2  
Max credits per degree: 2  
Format: LEC  

MECH 491 Special Topics in Engineering Mechanics  
Crosslisted with: MECH 491H, MECH 891  
Prerequisites: Open to College of Engineering Students only.  
Description: Treatment of special topics in engineering mechanics by experimental, computational and/or theoretical methods. Topics vary from term to term.  
Credit Hours: 1-6  
Min credits per semester: 1  
Max credits per semester: 6  
Max credits per degree: 6  
Format: LEC  

MECH 491H Special Topics in Engineering Mechanics  
Crosslisted with: MECH 491, MECH 891  
Prerequisites: Open to College of Engineering Students only.  
Description: Treatment of special topics in engineering mechanics by experimental, computational and/or theoretical methods. Topics vary from term to term.  
Credit Hours: 1-6  
Min credits per semester: 1  
Max credits per semester: 6  
Max credits per degree: 6  
Format: LEC  

MECH 498 Laboratory and Analytical Investigations  
Crosslisted with: MECH 498, MECH 898  
Prerequisites: Open to College of Engineering Students only.  
Description: Investigation and written report of research into specific problem in any major area of mechanical engineering.  
Credit Hours: 6.00  
Max credits per semester: 6  
Max credits per degree: 6  
Format: LAB  

MECH 499 Honors Thesis  
Prerequisites: Open to College of Engineering Students only.  
Description: Honors thesis research project meeting the requirements of the University Honors Program. Independent research project executed under the guidance of a member of the faculty of the Department of Mechanical Engineering which contributes to the advancement of knowledge in the field. Culminates in the presentation of an honors thesis to the department and college.  
Credit Hours: 3-5  
Min credits per semester: 3  
Max credits per semester: 5  
Max credits per degree: 5  
Format: IND  

MECH 499H Honors Thesis  
Prerequisites: Open to College of Engineering Students only.  
Description: Honors thesis research project meeting the requirements of the University Honors Program. Independent research project executed under the guidance of a member of the faculty of the Department of Mechanical Engineering which contributes to the advancement of knowledge in the field. Culminates in the presentation of an honors thesis to the department and college.  
Credit Hours: 1-3  
Min credits per semester: 1  
Max credits per semester: 3  
Max credits per degree: 3  
Format: IND