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 Engineering Student Services 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, and be calculus-ready. 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 catalog 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.

Catalog Rule
Students must fulfill the requirements stated in the catalog for the academic year in which they are first admitted at UNL. In consultation with advisors, a student may choose to follow a subsequent catalog 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 catalog year. The catalog which a student follows for degree programs in the COE will be classified and subject to the policies defined in the subsequent section.

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
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>MECH 448</td>
<td>Advanced Mechanics of Materials</td>
<td>3</td>
</tr>
<tr>
<td>MECH 449</td>
<td>Advanced Dynamics</td>
<td>3</td>
</tr>
<tr>
<td>MECH 451</td>
<td>Introduction to Finite Element Analysis I</td>
<td>3</td>
</tr>
<tr>
<td>MECH 452</td>
<td>Experimental Stress Analysis I</td>
<td>3</td>
</tr>
<tr>
<td>MECH 454</td>
<td>Introduction to Continuum Modeling</td>
<td>3</td>
</tr>
<tr>
<td>MECH 475</td>
<td>Introduction to Vibrations and Acoustics</td>
<td>3</td>
</tr>
<tr>
<td>MECH 480</td>
<td>Numerical Methods in Engineering</td>
<td>3</td>
</tr>
<tr>
<td>MECH 491</td>
<td>Special Topics in Engineering Mechanics</td>
<td>1-6</td>
</tr>
</tbody>
</table>

**Grade Rules**

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

**MECH 100 Introduction to Mechanical Engineering**
**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**
**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 381

**MECH 200 Engineering Thermodynamics**
**Prerequisites:** PHYS 212 and MECH 223.
**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, BSEN 344; MECH 300

**MECH 200H Honors: Engineering Thermodynamics I**
**Prerequisites:** Good standing in the University Honors Program or by invitation; PHYS 212; MECH 223.
**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, BSEN 344; MECH 300

**MECH 220 Statics**
**Prerequisites:** MATH 106.
**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; MECH 325H; MECH 373; MECH 373H

**MECH 223H Honors: Engineering Statics**
**Prerequisites:** Good standing in the University Honors Program or by invitation; MATH 107 and PHYS 211.
**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:** AGEN 324, BSEN 324; CIVE 361; MATL 360; MECH 325H; MECH 373; MECH 373H

**MECH 250 Mechanics I**
**Prerequisites:** PHYS 211.
**Notes:** 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 200H Honors: Engineering Thermodynamics I**
**Prerequisites:** Good standing in the University Honors Program or by invitation; PHYS 212; MECH 223.
**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, BSEN 344; MECH 300
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 310 Fluid Mechanics
Crosslisted with: MECH 310H
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 325, BSEN 325; AGEN 344, BSEN 344; BSEN 425, CIVE 425; CIVE 352; MECH 446

MECH 310H Fluid Mechanics
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 325, BSEN 325; AGEN 344, BSEN 344; BSEN 425, CIVE 425; CIVE 352; MECH 446

MECH 311 Fluid Mechanics Laboratory
Prerequisites: MECH/CIVE 310 or parallel.
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 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; BLAW 371; BLAW 371H; BLAW 372; ECEN 850, ECEN 450; ECON 311; FINA 361; MECH 343; MNGT 301; MRKT 350; SCMA 331; SCMA 350

MECH 324 Strength of Materials
Prerequisites: MECH 220 or 223.
Notes: For students in architecture and construction management.
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.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC
MECH 325 Mechanics of Elastic Bodies
Prerequisites: Good standing in the University Honors Program or by invitation; MECH 223 or 223H; 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 341; CIVE 378; MECH 343

MECH 325H Honors: Mechanics of Elastic Bodies
Prerequisites: Good standing in the University Honors Program or by invitation; MECH 223 or 223H; MATH 208.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC
Prerequisite for: CIVE 334; CIVE 378; MECH 343

MECH 330 Mechanical Engineering Analysis
Prerequisites: MATH 221; CSCE 155N, MECH 325 and 373; MECH 200.
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
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 343 Elements of Machine Design
Prerequisites: MECH 325; BSEN 206; JGEN 200 or 300; MECH 342; MATH 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; ECE 211; CSCE 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.
Notes: 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
Prerequisites: MATL 360; and MECH 325.
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.
Description: Force action related to displacement, velocity, and acceleration of rigid bodies. Kinematics of plane motion, kinetics of translation and rotation. Mass moment of inertia, vibration, work, energy and power, impulse and momentum.
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 350

MECH 373H Honors: Engineering Dynamics
Prerequisites: Good standing in the University Honors Program or by invitation; MECH 223 or 223H; MATH 208.
Description: Motion of particles and rigid bodies under the action of forces and moments. Kinematics of plane motion: displacement, velocity, and acceleration. Kinetics of translation and rotation; work, energy and power; impulse, momentum and impact. Introduction to vibration analysis.
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 350

MECH 380 Mechanical Engineering Measurements
Prerequisites: MATH 208; MECH 321 or STAT 380 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: Permission.
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: MECH 300 or equivalent.
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: MECH 300 and MECH 420/MECH 820.
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: MECH 300 or equivalent.
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
Prerequisites: MECH 300 or equivalent.
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: MECH 300 or equivalent.
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: MECH 200 and MECH 310/CIVE 310.
Description: Subsonic and supersonic air flow theory, dynamics of flight, performance parameters, roto- and design considerations.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC

MECH 414 Compressible Flow
Crosslisted with: MECH 814
Prerequisites: MECH 300 and MECH 310/CIVE 310.
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
Prerequisites: MECH310/CIVE 310 and MECH 380, or parallel.
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: MECH 310 and MATH 221/MATH 821.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC
MECH 420 Heat Transfer
Crosslisted with: 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 426 Heat Transfer at Nanoscales and in Ultrashort Time Domains
Crosslisted with: MECH 826
Prerequisites: MECH 420.
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 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 427 Computational Heat Transfer and Fluid Flow
Crosslisted with: MECH 831
Prerequisites: MECH 310; MATH 314; MECH 420 or parallel.
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 423 Facility Planning and Design
Prerequisites: IMSE 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 424 Laser Material Processing with Compressible Flow Perspective
Crosslisted with: MECH 824
Prerequisites: Permission.
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: MECH 420 or permission.
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 428 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 842  
**Prerequisites:** MECH 342.  
**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:** MECH 342 and MECH 350.  
**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:** MECH 200, MECH 342, MECH 350, and MECH 310/ CIVE 310.  
**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:** MECH 373, MECH 325.  
**Description:** Stresses and strains at a point. Theories of failure. Thick-walled pressure vessels and spinning discs. Torsion of noncircular sections. Torsion of thin-walled sections, open, closed, and multicelled. Bending of unsymmetrical sections. Cross shear and shear center. Curved beams. Introduction to elastic energy methods.  
**Credit Hours:** 3  
Max credits per semester: 3  
Max credits per degree: 3  
**Format:** LEC

MECH 449 Advanced Dynamics  
Crosslisted with: MECH 849  
**Prerequisites:** MECH 373 and MATH 221/821.  
**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:** MECH 350.  
**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  
Prerequisites: Open to College of Engineering Students only.  
Description: Matrix methods of analysis. Finite element stiffness method.  
Computer programs. Applications to structures and soils. Introduction to  
finite element analysis of fluid flow.  
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: MECH 325.  
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 853  
Prerequisites: MECH 350.  
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  
Prerequisites: MECH 343 and 350.  
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  
Prerequisites: MECH 342 and 343.  
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 857  
Prerequisites: ECEN 231; MECH 350 or parallel.  
Notes: Lab sessions allow for constructing mechatronic systems. Lab  
time arranged. A comprehensive design project included.  
Description: Theory, application, simulation, and design of systems that  
integrate mechanical, computer, and electronic components.  
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

MECH 474 Manufacturing Systems I  
Crosslisted with: 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
Prerequisites: MECH 373 and MATH 221.
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 480 Numerical Methods in Engineering
Crosslisted with: MECH 880
Prerequisites: MATH 221/821; and Computer Programming. Linear Algebra recommended.
Notes: Credit towards the degree cannot be earned in both CSCE/MATH 440/840 and MECH 480/880.
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 Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC

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 487 Thermal Fluids Laboratory
Prerequisites: MECH 300 and 380; MECH 420/820 or parallel.
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