

# Mechanical Engineering Courses

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## Courses

### **MECH 1305. Graphic & Design Fundamentals.**

An introduction to solid modeling concepts and software, dimensioning, and basic computer-aided engineering.

**Department:** Mechanical Engineering

**3 Credit Hours**

**5 Total Contact Hours**

3 Lab Hours

2 Lecture Hours

0 Other Hours

### **MECH 1321. Mechanics I-Statics.**

Mechanics I Statistics: [TCCN ENGR 2301] Principles of mechanics, vectors, force systems, equilibrium of particles and rigid bodies, force analysis of truss structures, distributed forces, centroids, and friction.

**Department:** Mechanical Engineering

**3 Credit Hours**

**3 Total Contact Hours**

0 Lab Hours

3 Lecture Hours

0 Other Hours

**Prerequisite(s):** (MATH 1411 w/C or better ) AND (PHYS 2420 w/C or better ) OR (PHYS 2120 w/C or better AND PHYS 2320 w/C or better)

### **MECH 2103. Engineering Computations.**

Programming related to Engineering problem solving.

**Department:** Mechanical Engineering

**1 Credit Hour**

**4 Total Contact Hours**

3 Lab Hours

1 Lecture Hour

0 Other Hours

**Prerequisite(s):** (MATH 1312 w/C or better)

### **MECH 2131. Manufacturing Engineering Lab.**

Basic, automated, and advanced manufacturing concepts. Shop demonstration and practices. Prerequisite: MECH 1305 with a grade of C or better.

**Department:** Mechanical Engineering

**1 Credit Hour**

**3 Total Contact Hours**

3 Lab Hours

0 Lecture Hours

0 Other Hours

**Prerequisite(s):** (MECH 1305 w/C or better ) OR (BE 1301 w/C or better)

### **MECH 2132. Additive Manufacturing Lab.**

Additive manufacturing processes are studied.

**Department:** Mechanical Engineering

**1 Credit Hour**

**3 Total Contact Hours**

3 Lab Hours

0 Lecture Hours

0 Other Hours

**Prerequisite(s):** (MECH 1305 w/C or better)

**MECH 2133. Metal Casting Lab.**

Metal casting processes are studied.

**Department:** Mechanical Engineering

**1 Credit Hour**

**3 Total Contact Hours**

3 Lab Hours

0 Lecture Hours

0 Other Hours

**Prerequisite(s):** (MECH 1305 w/C or better)

**MECH 2134. Intelligent Manufacturing Lab.**

Intelligent Manufacturing Lab: Practice in the use of sensors during a manufacturing process to enable information enabled manufacturing decisions to provide new information about the process, improve quality or enable the manufacture of otherwise impossible devices.

**Department:** Mechanical Engineering

**1 Credit Hour**

**3 Total Contact Hours**

3 Lab Hours

0 Lecture Hours

0 Other Hours

**Prerequisite(s):** (MECH 1305 w/C or better)

**MECH 2311. Intro to Thermal-fluid Sci.**

An introduction to basic concepts of thermodynamics and fluid mechanics to include properties, property relationships, states, and fluids. Presentation of the basic equations of thermal-fluid science, continuity, first and second laws of thermodynamics, and momentum. Prerequisite: MATH 1312 with a grade of "C" or better.

**Department:** Mechanical Engineering

**3 Credit Hours**

**5 Total Contact Hours**

3 Lab Hours

2 Lecture Hours

0 Other Hours

**Prerequisite(s):** (MATH 1312 w/C or better ) OR (MATH 2313 w/C or better ) OR (MATH 2326 w/C or better)

**MECH 2322. Mechanics of Materials.**

Mechanics of Materials: [TCCN ENGR 2332] Determination of stresses, deflections, and stability of deformable bodies, including axial loading, torsion, beam bending, column buckling, and principal and compound stresses and matrix structural analysis.

**Department:** Mechanical Engineering

**3 Credit Hours**

**3 Total Contact Hours**

0 Lab Hours

3 Lecture Hours

0 Other Hours

**Prerequisite(s):** (MECH 1321 w/C or better ) OR (BE 2434 w/C or better ) OR (CE 2315 w/C or better)

**MECH 2331. Matl & Manufacturing Processes.**

Properties of engineering materials and failure theories. Introduction to manufacturing processes, manufacturing equipment and quality assurance.

Prerequisite: CHEM 1305 with a grade of C or better.

**Department:** Mechanical Engineering

**3 Credit Hours**

**3 Total Contact Hours**

0 Lab Hours

3 Lecture Hours

0 Other Hours

**Prerequisite(s):** (CHEM 1305 w/C or better)

**MECH 2340. Mechanics II -Dynamics.**

Mechanics II Dynamics: [TCCN ENGR 2302] An introduction to dynamics (kinematics and kinetics) of particles and rigid bodies, work and energy, impulse and momentum.

**Department:** Mechanical Engineering

**3 Credit Hours**

**5 Total Contact Hours**

3 Lab Hours

2 Lecture Hours

0 Other Hours

**Prerequisite(s):** (MECH 1321 w/C or better ) OR (BE 2434 w/C or better ) OR (CE 2315 w/C or better)

**MECH 2342. Electro Mechanical Systems.**

Electro Mechanical Systems: [TCCN ENGR 2305] Circuit equations and network theorems. Introduction to digital logic circuits. Motors and generators. Principles of sensing, actuation, and control. Prerequisite:

**Department:** Mechanical Engineering

**3 Credit Hours**

**5 Total Contact Hours**

3 Lab Hours

2 Lecture Hours

0 Other Hours

**Prerequisite(s):** (MATH 1312 w/C or better ) OR (MATH 2313 w/C or better ) OR (MATH 2326 w/C or better)

**MECH 2351. Engineering Analysis I.**

Introduction to basic applications of mathematical principles and computational techniques to analyze and solve engineering problems; basics of differential equations; uses of mathematical software and programming languages for modeling and solving engineering problems. Prerequisite: MATH 1312 with a grade of C or better.

**Department:** Mechanical Engineering

**3 Credit Hours**

**3 Total Contact Hours**

0 Lab Hours

3 Lecture Hours

0 Other Hours

**Prerequisite(s):** (MATH 1312 w/C or better ) OR (MATH 2313 w/C or better ) OR (MATH 2326 w/C or better)

**MECH 3103. Mechatronics Lab.**

Computer controlled machines are studied. These include robots, drones and other important machines. Hands on experiences help students relate theory to practice.

**Department:** Mechanical Engineering

**1 Credit Hour**

**3 Total Contact Hours**

3 Lab Hours

0 Lecture Hours

0 Other Hours

**Prerequisite(s):** (MECH 2342 w/C or better ) OR (BE 2377 w/C or better ) OR (EE 2350 w/C or better)

**MECH 3113. Thermo-fluid Lab.**

Hands on experiences related to solid mechanics.

**Department:** Mechanical Engineering

**1 Credit Hour**

**3 Total Contact Hours**

3 Lab Hours

0 Lecture Hours

0 Other Hours

**Prerequisite(s):** (MECH 2311 w/C or better)

**MECH 3123. Solid Mechanics Lab.**

Hands on experiences related to solid mechanics.

**Department:** Mechanical Engineering

**1 Credit Hour**

**3 Total Contact Hours**

3 Lab Hours

0 Lecture Hours

0 Other Hours

**Prerequisite(s):** (MECH 2322 w/C or better ) OR (BE 2303 w/C or better ) OR (CE 2334 w/C or better)

**MECH 3135. Eng. Drawings & Inspection Lab.**

The class teaches standardized techniques for creating detailed drawings wherein geometric dimensioning and tolerance (GD&T) is implemented. It also teaches sectioning techniques, orthographic projection, auxiliary views, pictorial drawings, and the creation of assembly and detail drawings.

**Department:** Mechanical Engineering

**1 Credit Hour**

**3 Total Contact Hours**

3 Lab Hours

0 Lecture Hours

0 Other Hours

**Prerequisite(s):** (MECH 1305 w/C or better)

**MECH 3312. Thermodynamics.**

Continuation of MECH 2311. Application of principles of cycles and reactive systems; energy relationships and equilibrium requirements.

**Department:** Mechanical Engineering

**3 Credit Hours**

**3 Total Contact Hours**

0 Lab Hours

3 Lecture Hours

0 Other Hours

**Prerequisite(s):** (MECH 2311 w/C or better ) OR (BE 2375 w/C or better)

**MECH 3313. Thermo-Fluids Lab.**

A continuation of the Mechanical Engineering Lab series with practical measurement problems in the thermo-fluid area. Prerequisite: MECH 2311 with a grade of "C" or better.

**Department:** Mechanical Engineering

**3 Credit Hours**

**5 Total Contact Hours**

3 Lab Hours

2 Lecture Hours

0 Other Hours

**Prerequisite(s):** (MECH 2311 w/C or better ) OR (BE 2375 w/C or better)

**MECH 3314. Fluid Mechanics.**

Fluid properties, fluid statics, fluid flow concepts and basic equations, dimensional analysis and dynamic similitude, viscous effects, fluid resistance, laminar and turbulent boundary layers, flow-through pipes.

**Department:** Mechanical Engineering

**3 Credit Hours**

**3 Total Contact Hours**

0 Lab Hours

3 Lecture Hours

0 Other Hours

**Prerequisite(s):** (MECH 2311 w/C or better ) OR (BE 2375 w/C or better)

**MECH 3323. Solid Mechanics Lab.**

Displacement, velocity, acceleration, force, torque, strain, and stress measurements. Data acquisition, processing, and analysis. Statistical analysis of experimental data. Prerequisite: MECH 2322 with a grade of "C" or better.

**Department:** Mechanical Engineering

**3 Credit Hours**

**5 Total Contact Hours**

3 Lab Hours

2 Lecture Hours

0 Other Hours

**Prerequisite(s):** (MECH 2322 w/C or better)

**MECH 3334. Mechanical Design.**

Stress analysis, deflection analysis, and strength of mechanical elements; design of screws, fasteners, and joints; clutches, brakes, couplings, and shafting.

**Department:** Mechanical Engineering

**3 Credit Hours**

**3 Total Contact Hours**

0 Lab Hours

3 Lecture Hours

0 Other Hours

**Prerequisite(s):** (MECH 2331 w/C or better ) AND (MECH 2322 w/C or better ) OR (BE 2303 w/C or better ) OR (CE 2334 w/C or better)

**MECH 3345. System Dynamics.**

Kinematics of single and multiple degree of freedom systems; vibrations, kinematic simulation software, and an introduction to control systems.

**Department:** Mechanical Engineering

**3 Credit Hours**

**3 Total Contact Hours**

0 Lab Hours

3 Lecture Hours

0 Other Hours

**Prerequisite(s):** (MECH 2340 w/C or better ) OR (BE 2338 w/C or better ) AND (MECH 2342 w/C or better ) OR (BE 2377 w/C or better ) OR (EE 2350 w/C or better)

**MECH 3352. Engineering Analysis.**

Concepts and modeling of ordinary and partial differential equations for a variety of engineering phenomena using finite difference, finite volume, and finite element techniques. Introduction to statistics, data analysis, and probability theories.

**Department:** Mechanical Engineering

**3 Credit Hours**

**3 Total Contact Hours**

0 Lab Hours

3 Lecture Hours

0 Other Hours

**Prerequisite(s):** (MATH 2326 w/C or better AND MECH 2103 w/C or better)

**MECH 4144. Instrumentation Lab.**

The lab will provide practice for the contents covered in the lecture type of the instrumentation course, MECH 4243; the students will have a hands-on experience in the installation of the required measurement for mechanical purposes.

**Department:** Mechanical Engineering

**1 Credit Hour**

**3 Total Contact Hours**

3 Lab Hours

0 Lecture Hours

0 Other Hours

**Prerequisite(s):** (MECH 3352 w/C or better)

**Corequisite(s):** MECH 4243

**MECH 4195. Senior Prof. Orientation.**

Senior Professional Orientation (1-0) Introduction to the engineering profession with emphasis on job placement, professional ethics and an engineering field examination.

**Department:** Mechanical Engineering

**1 Credit Hour**

**1 Total Contact Hour**

0 Lab Hours

1 Lecture Hour

0 Other Hours

**MECH 4196. Independent Study.**

This course is intended to fulfill the requirements for any special topics for which the department does not have an established course on the subject area. The content and the goal of the course will be worked out between an instructor and the student. A substantial final report and presentation will be required. Prerequisite: Departmental approval. Restricted to class of JR and SR.

**Department:** Mechanical Engineering

**1 Credit Hour**

**1 Total Contact Hour**

0 Lab Hours

0 Lecture Hours

1 Other Hour

**MECH 4243. Elect. Instrumentation.**

This class aims to introduce electronic instrumentation systems and methods commonly employed to make accurate and meaningful measurements of mechanical and thermal systems. Mechanical quantities include, strain, force, pressure, moment, torque, displacement, velocity, acceleration, flow velocity, mass flow rate, volumetric flow rate, frequency, and time. Thermal quantities include temperature, heat flux, specific heat, and thermal conductivity. Emphasis on electronic instrumentation systems and software environments rather than mechanical measurement systems.

**Department:** Mechanical Engineering

**2 Credit Hours**

**2 Total Contact Hours**

0 Lab Hours

2 Lecture Hours

0 Other Hours

**Prerequisite(s):** (MECH 3352 w/C or better)

**MECH 4315. Heat Transfer.**

Introduction to heat transfer by conduction, convection, and radiation; steady and transient states; steady periodic states; heat transfer in engineering apparatuses.

**Department:** Mechanical Engineering

**3 Credit Hours**

**3 Total Contact Hours**

0 Lab Hours

3 Lecture Hours

0 Other Hours

**Prerequisite(s):** (MECH 3312 w/D or better AND MECH 3314 w/D or better)

**MECH 4316. Thermal System Design.**

Design, analysis, and optimization of fluid flow, heat transfer and energy processes of ducts and piping, heat exchangers, fluid machinery, power generation and environmental control systems. Use of computational fluid dynamics (CFD) tools to synthesize thermo-fluid system designs. Prerequisite: MECH 4315.

**Department:** Mechanical Engineering

**3 Credit Hours**

**3 Total Contact Hours**

0 Lab Hours

3 Lecture Hours

0 Other Hours

**Prerequisite(s):** (MECH 4315 w/D or better)

**MECH 4326. Finite Element Analysis.**

Introduction to finite element methods, discretization of governing equations and solution algorithms. Analysis of solid mechanics and structural problems using existing FEA computer programs. Prerequisites: MECH 2351 with a grade of "C" or better, and MECH 3334.

**Department:** Mechanical Engineering

**3 Credit Hours**

**3 Total Contact Hours**

0 Lab Hours

3 Lecture Hours

0 Other Hours

**Prerequisite(s):** (MECH 3334 w/D or better AND MECH 3352 w/D or better)

**MECH 4327. Artificial Intel. in Mech. Eng.**

This course delves into the evolving realm of mechanistic data science for mechanical engineering, emphasizing the integration of fundamental mathematical and scientific principles with contemporary artificial intelligence and data science methodologies. The curriculum is tailored to equip students with a comprehensive understanding of the myriad applications (using Python) and potentials of AI in mechanical engineering.

**Department:** Mechanical Engineering

**3 Credit Hours**

**3 Total Contact Hours**

0 Lab Hours

3 Lecture Hours

0 Other Hours

**Prerequisite(s):** (MECH 3352 w/D or better)

**MECH 4328. Intro to LabVIEW.**

Students will have completed the course with broad working knowledge of LabVIEW environment, a basic understanding of coding, & the ability to read & interpret existing code.

**Department:** Mechanical Engineering

**3 Credit Hours**

**3 Total Contact Hours**

0 Lab Hours

3 Lecture Hours

0 Other Hours

**Prerequisite(s):** (MECH 3352 w/C or better)

**MECH 4330. Dynamic Systems Simulation.**

Computational problems in the simulation of Dynamic Systems are covered.

**Department:** Mechanical Engineering

**3 Credit Hours**

**3 Total Contact Hours**

0 Lab Hours

3 Lecture Hours

0 Other Hours

**Prerequisite(s):** (MECH 3345 w/D or better AND MECH 3352 w/D or better)

**MECH 4332. MECH Comp App Vision Robotics.**

Mechanical Computational Applications in Vision and Robotics: Computational methods applicable to Mechanical Engineering problems. Vision processing, robotics, autonomous systems, drones, machine intelligence and control.

**Department:** Mechanical Engineering

**3 Credit Hours**

**3 Total Contact Hours**

0 Lab Hours

3 Lecture Hours

0 Other Hours

**Prerequisite(s):** (MECH 3345 w/D or better)

**MECH 4334. Mechanical Systems Control.**

Mechanical Systems Control: Theory and application of control to Mechanical Systems. Feedback, feedforward, PID and other controls used in Mechanical Engineering. Applications to drones, aircraft, missiles, robots and autonomous vehicles.

**Department:** Mechanical Engineering

**3 Credit Hours**

**3 Total Contact Hours**

0 Lab Hours

3 Lecture Hours

0 Other Hours

**Prerequisite(s):** (MECH 3445 w/D or better)

**MECH 4336. Principles of Engr Design.**

Design process and methodology from concept through analysis, layout, and report. Types of design problems, human element in design, computer aid in design, specification development, concept generation, concept evaluation, product generation, function and performance evaluation, design for manufacturing, design for assembly, design for life-cycle, sustainability, final product, documentation, ethics, safety, and economics. Prerequisite: MECH 3334.

**Department:** Mechanical Engineering

**3 Credit Hours**

**3 Total Contact Hours**

0 Lab Hours

3 Lecture Hours

0 Other Hours

**Prerequisite(s):** (MECH 3334 w/D or better)

**MECH 4338. Capstone Design Projects.**

The course will provide the students with intensive learning and hands-on experience in designing, manufacturing, building, and assembly of mechanical elements. The students in this class will be exposed to designing or analyzing the assigned components to work on within a particular project and within a team.

**Department:** Mechanical Engineering

**3 Credit Hours**

**6 Total Contact Hours**

0 Lab Hours

3 Lecture Hours

3 Other Hours

**Prerequisite(s):** (MECH 3334 w/D or better AND MECH 3352 w/D or better)

**MECH 4340. Mechanical Design II.**

The course will provide the students with intensive design concepts needed for vehicle design; this includes shaft design, gears, fasteners, and brakes. The course will introduce the students to more in-depth design concepts and hands-on experiences and develop more skills required for the job market.

**Department:** Mechanical Engineering

**3 Credit Hours**

**3 Total Contact Hours**

0 Lab Hours

3 Lecture Hours

0 Other Hours

**Prerequisite(s):** (MECH 3334 w/D or better)

**MECH 4344. Elect. Instrumentation.**

This class aims to introduce electronic instrumentation systems and methods commonly employed to make accurate and meaningful measurements of mechanical and thermal systems. Mechanical quantities include, strain, force, pressure, moment, torque, displacement, velocity, acceleration, flow velocity, mass flow rate, volumetric flow rate, frequency, and time. Thermal quantities include temperature, heat flux, specific heat, and thermal conductivity. Emphasis on electronic instrumentation systems and software environments rather than mechanical measurement systems.

**Department:** Mechanical Engineering

**3 Credit Hours**

**3 Total Contact Hours**

1 Lab Hour

2 Lecture Hours

0 Other Hours

**Prerequisite(s):** (MECH 3352 w/C or better)



**MECH 4345. Comm & Mech Sensor Protocols.**

Communications and Mechanical Sensor Protocols: Theory of standard communication protocols and the sensors/actuators that use them for the control of Mechanical Systems. The course will enable the selection and operation of devices used in autonomous mechanical systems.

**Department:** Mechanical Engineering

**3 Credit Hours**

**3 Total Contact Hours**

0 Lab Hours

3 Lecture Hours

0 Other Hours

**Prerequisite(s):** (MECH 3345 w/D or better)

**MECH 4346. Mechatronics.**

The integration of electronics and use of digital controls and microcontroller technology with mechanical systems; microprocessor control, control theory, actuators, and sensors. Prerequisite: MECH 3345.

**Department:** Mechanical Engineering

**3 Credit Hours**

**3 Total Contact Hours**

0 Lab Hours

3 Lecture Hours

0 Other Hours

**Prerequisite(s):** (MECH 3345 w/D or better)

**MECH 4366. Senior Design Project.**

Conceptual preliminary and final design solutions to engineering problems by students in teams. Prerequisite: Must be in the final semester and have a 2.0 GPA in the major.

**Department:** Mechanical Engineering

**3 Credit Hours**

**3 Total Contact Hours**

0 Lab Hours

3 Lecture Hours

0 Other Hours

**Prerequisite(s):** (CE 2326 w/C or better AND MECH 3334 w/D or better)

**MECH 4369. Engineering Practice.**

A group project in mechanical engineering comprising the design, analysis, manufacturing and testing of an equipment or system stemming from a mutual student-department interest. A substantial final report and presentation containing drawings, calculations, specifications, manufacturing process, and test results must be produced. A successful demonstration of the operation of the designed system is also required. Prerequisite: Departmental approval required. Restricted to level of UG.

**Department:** Mechanical Engineering

**3 Credit Hours**

**3 Total Contact Hours**

0 Lab Hours

0 Lecture Hours

3 Other Hours

**MECH 4370. Pre-Professional Experiences.**

Co-operative work study/internship/job training with mechanical engineering companies and national laboratories. Intended for mechanical engineering students who have completed at least one full semester of upper level mechanical engineering courses. It can be used for a maximum of 3 credit hours towards technical electives. Prerequisite: Departmental approval required. Restricted to class of JR, SR.

**Department:** Mechanical Engineering

**3 Credit Hours**

**3 Total Contact Hours**

0 Lab Hours

0 Lecture Hours

3 Other Hours

**MECH 4390. Renewable Energy.**

The course covers the fundamentals of renewable energy technologies that utilize solar, wind, hydro, geothermal, biomasses, and ocean energy sources.

**Department:** Mechanical Engineering

**3 Credit Hours**

**3 Total Contact Hours**

0 Lab Hours

3 Lecture Hours

0 Other Hours

**Prerequisite(s):** (MECH 3312 w/C or better AND MECH 3314 w/C or better)

**MECH 4392. Special Topics in Computation.**

Special topics in the area of Computation applied to Mechanical Engineering Problems.

**Department:** Mechanical Engineering

**3 Credit Hours**

**3 Total Contact Hours**

0 Lab Hours

3 Lecture Hours

0 Other Hours

**MECH 4393. Special Topics in Elect-Mech.**

Special topics in the area of Electro-Mechanical Design are covered.

**Department:** Mechanical Engineering

**3 Credit Hours**

**3 Total Contact Hours**

0 Lab Hours

3 Lecture Hours

0 Other Hours

**Prerequisite(s):** (MECH 3345 w/D or better)

**MECH 4394. Special Topics in Therm Fluid.**

Special topics in the area of Fluid and Thermal Design are covered.

**Department:** Mechanical Engineering

**3 Credit Hours**

**3 Total Contact Hours**

0 Lab Hours

3 Lecture Hours

0 Other Hours

**Prerequisite(s):** (MECH 3312 w/C or better)

**MECH 4395. Special Topics in Mech. Engr..**

Special Topics in Mechanical Engineering (3-0) Selected topics of current interest in Mechanical Engineering. Prerequisite: Senior standing in Engineering.

**Department:** Mechanical Engineering

**3 Credit Hours**

**3 Total Contact Hours**

0 Lab Hours

3 Lecture Hours

0 Other Hours

**MECH 4396. Independent Study.**

This course is intended to fulfill the requirements for any special topics for which the department does not have an established course on the subject area. The content and the goal of the course will be worked out between an instructor and the student. A substantial final report and presentation will be required. Prerequisite: Departmental approval required. Restricted to class of JR, SR.

**Department:** Mechanical Engineering

**3 Credit Hours**

**3 Total Contact Hours**

0 Lab Hours

0 Lecture Hours

3 Other Hours