Cendara University

Department of Mechanical Engineering

Course Catalog

B.Eng./M.Eng. in Mechanical Engineering

Below is a comprehensive listing of all Mechanical Engineering courses offered for undergraduate (B.Eng.) and graduate (M.Eng.) students. Each entry includes the course code, title, description, prerequisites, and assigned credit hours.

Undergraduate Courses (B.Eng.)

MECH 101: Introduction to Mechanical Engineering

Credits: 3
Description:
An overview of the field of mechanical engineering, including its history, fundamental principles, and modern applications. Topics include major subdisciplines, an introduction to engineering ethics, and industry practices.
Prerequisites: None

MECH 111: Engineering Graphics & CAD

Credits: 4
Description:
Fundamental skills in technical drawing, computer-aided design (CAD), and blueprint reading. Introduction to CAD software for creating, annotating, and analyzing engineering designs.
Prerequisites: None

MECH 122: Engineering Mechanics I – Statics

Credits: 4
Description:
Covers the fundamentals of statics, including force systems, equilibrium, structural analysis, centroids, and moments of inertia. Designed for engineering problem-solving.
Prerequisites: MATH 120 (Calculus I)

MECH 123: Engineering Mechanics II – Dynamics

Credits: 4
Description:
Study of particles and rigid bodies in motion, Newton's laws, kinematics, kinetics, work and energy, impulse and momentum.
Prerequisites: MECH 122 (Engineering Mechanics I)

MECH 201: Materials Science for Engineers

Credits: 3
Description:
Explores the structures, properties, testing, and applications of metals, polymers, ceramics, and composites. Discussion of selection criteria for materials in mechanical systems.
Prerequisites: CHEM 105 (General Chemistry I)

MECH 231: Thermodynamics I

Credits: 4
Description:
Introduces the first and second laws of thermodynamics, basic thermodynamic properties, simple systems, energy transformations, and entropy concepts.
Prerequisites: PHYS 130 (General Physics I); MATH 121 (Calculus II)

MECH 241: Fluid Mechanics

Credits: 4
Description:
Study of fluids at rest and in motion, including properties, hydrostatics, conservation laws, and applications to engineering systems.
Prerequisites: MECH 122 (Engineering Mechanics I), MECH 231 (Thermodynamics I)

MECH 252: Manufacturing Processes

Credits: 3
Description:
Overview of modern and traditional manufacturing processes such as casting,

forming, machining, welding, and additive manufacturing. Laboratory demonstrations included.
Prerequisites: MECH 201 (Materials Science)

MECH 263: Computer-Aided Manufacturing (CAM)

Credits: 3
Description:
Application of CAM technologies, programming CNC machines, and process planning in manufacturing. Includes practical exercises using industry-standard CAM software.
Prerequisites: MECH 111 (Engineering Graphics & CAD)

MECH 272: Mechatronics

Credits: 4
Description:
Integration of mechanical, electrical, and computer systems in intelligent machines. Focus on microcontrollers, sensors, actuators, and system integration.
Prerequisites: EECS 210 (Intro to Electronics), MECH 122 (Engineering Mechanics I)

MECH 321: Mechanics of Materials

Credits: 4
Description:
Covers stress and strain analysis, axial loading, bending, shear, torsion, deflection, and stability of structural members. Laboratory component included.
Prerequisites: MECH 123 (Engineering Mechanics II), MECH 201 (Materials Science)

MECH 331: Thermodynamics II

Credits: 4
Description:
Advanced concepts in thermodynamics, including cycles for power and refrigeration, mixtures, chemical reactions, and an introduction to heat transfer.
Prerequisites: MECH 231 (Thermodynamics I)

MECH 342: Heat Transfer

Credits: 4
Description:
Principles of heat conduction, convection, and radiation with engineering applications. Includes numerical analysis of heat transfer problems.
Prerequisites: MECH 231 (Thermodynamics I), MATH 222 (Differential Equations)

MECH 353: Mechanical Design I

Credits: 3
Description:
Fundamental approaches in mechanical design, including analysis and selection of mechanical elements such as gears, shafts, and fasteners. Team-based design project.
Prerequisites: MECH 321 (Mechanics of Materials)

MECH 354: Mechanical Design II

Credits: 3
Description:
Advanced topics in product design, reliability, optimization techniques, and design for manufacturability. Capstone design project.
Prerequisites: MECH 353 (Mechanical Design I)

MECH 371: Dynamics of Machinery

Credits: 3
Description:
Kinematics and dynamics of machines including linkages, cams, gears, and balancing of rotating and reciprocating masses.
Prerequisites: MECH 123 (Engineering Mechanics II)

MECH 401: Senior Project I

Credits: 2
Description:
Proposal and conceptual design phase of a major team-based engineering project. Emphasis on project planning, literature review, and ethics.
Prerequisites: Senior standing in Mechanical Engineering

MECH 402: Senior Project II

Credits: 4
Description:
Completion and presentation of a team engineering project, including design, analysis, prototyping, and reporting.
Prerequisites: MECH 401 (Senior Project I)

Graduate Courses (M.Eng.)

MECH 510: Advanced Thermodynamics

Credits: 3
Description:
In-depth exploration of thermodynamic theory for complex systems, including exergy analysis, multi-phase systems, and non-equilibrium thermodynamics.
Prerequisites: MECH 331 (Thermodynamics II) or equivalent

MECH 521: Finite Element Analysis

Credits: 3
Description:
Theory and application of the finite element method for solving mechanical engineering problems in solid mechanics, heat transfer, and fluid flow.
Prerequisites: MECH 321 (Mechanics of Materials); recommended: MATH 350 (Numerical Methods)

MECH 531: Robotics and Automation

Credits: 3
Description:
Principles of robotics, manipulators, sensor integration, motion planning, and computer vision for automated mechanical systems. Industrial case studies included.
Prerequisites: MECH 272 (Mechatronics) or consent of instructor

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MECH 542: Advanced Fluid Mechanics

Credits: 3
Description:

Covers advanced fluid dynamics topics including compressible flow, boundary layers, turbulence modeling, and computational techniques.
Prerequisites: MECH 241 (Fluid Mechanics)

MECH 556: Sustainable Energy Systems

Credits: 3
Description:
Analysis of renewable energy systems, including solar, wind, geothermal, and bioenergy. Focus on engineering design and sustainability assessment.
Prerequisites: MECH 331 (Thermodynamics II) or consent of instructor

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MECH 570: Mechanical Systems Control

Credits: 3
Description:
Dynamic modeling and control of mechanical systems using classical and modern methods. Includes simulation and analysis using MATLAB/Simulink.
Prerequisites: MECH 371 (Dynamics of Machinery); recommended: EECS 305 (Control Systems)

MECH 590: Research Seminar in Mechanical Engineering

Credits: 1
Description:
Weekly seminars on current research topics in mechanical engineering. Participation in research discussions and presentations by faculty and guest speakers.
Prerequisites: Graduate standing in Mechanical Engineering

MECH 598: Independent Study

Credits: 2–4
Description:
Individual study or research under faculty supervision in an area of special interest to the student. Requires approval of supervising faculty and department chair.
Prerequisites: Graduate standing; instructor consent

MECH 599: Graduate Thesis

Credits: 6
Description:
Original research under the guidance of a faculty advisor, culminating in a written thesis and oral defense before a faculty committee.
Prerequisites: Completion of at least 18 graduate credits; approval of thesis proposal

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For further information and course planning, please consult the Academic Advising Office or the Department of Mechanical Engineering at mecheng@cendara.edu.
