

MECHANICAL ENGINEERING TECHNOLOGY

Mechanical Engineering Technology (MET) teaches the practical application of engineering principles in mechanical design, computer-aided technologies, materials, mechanical power, and manufacturing. MET is an excellent major for students who love the applied aspects of engineering found in jobs such as product designer, manufacturing facility design, quality control, plant manager, and test engineer. At OSU, the MET curriculum is just as rigorous as an engineering program. In fact, the early classes in MET are nearly identical to a mechanical engineering curriculum, but the upper-division classes will focus much more heavily on practical application of the material so that the MET student will be better prepared to make an immediate contribution on the job.

An important element in MET is the use of laboratory experience as a teaching tool. The MET program has laboratories in mechatronics, fluid power, materials, fluid mechanics, thermal science, basic instrumentation, 3D printing, computer-aided design, manufacturing, and computer aided drafting/manufacturing/engineering (CAD/CAM/CAE). Senior capstone design courses consist of teams of students who complete industry-sponsored interdisciplinary design projects. The senior design projects integrate the knowledge and skills learned during the MET course of study. All students are provided with the latest computer software for the courses that MET students take. Where appropriate, laboratories with modern computer data acquisition systems and on-screen displays are available.

In addition to the required mechanical engineering technology courses, students are provided a solid foundation in calculus, physics, chemistry, and computer programming. Minor degree choices are available in mechatronics or entrepreneurship.

Program Educational Objectives

The Mechanical Engineering Technology (MET) program at Oklahoma State University focuses on preparing graduates so that they are able to productively contribute at their workplace after a short introductory period. A few years after graduation, a graduate from the OSU MET program should be able to:

- Employ the latest design and analysis tools in engineering and manufacturing.
- Introduce new technologies and methods into their workplace to maximize value to their employer.
- Work collaboratively in multi-disciplinary teams.
- Demonstrate professionalism in the workplace by using the highest standards of ethics and personal integrity.
- Be a life-long learner through participation and membership in professional organizations, continuation of professional/graduate studies, and/or self-study.

Student Outcomes

Students graduating from the MET program are expected to achieve the following outcomes (1-5):

1. an ability to apply knowledge, techniques, skills and modern tools of mathematics, science, engineering, and technology to solve broadly-defined engineering problems appropriate to the discipline;

2. an ability to design systems, components, or processes meeting specified needs for broadly-defined engineering problems appropriate to the discipline;
3. an ability to apply written, oral, and graphical communication in broadly defined technical and non-technical environments; and an ability to identify and use appropriate technical literature;
4. an ability to conduct standard tests, measurements, and experiments and to analyze and interpret the results to improve processes; and
5. an ability to function effectively as a member as well as a leader on technical teams.

Preparation for a specific industrial function is accomplished by selecting courses that emphasize a given design area, such as fluid power, mechanical design, computer-aided design/manufacturing/engineering (CAD/CAM/CAE), power generation, and HVAC (heating, ventilation, air conditioning). Because the program focuses on the application of engineering principles to the pragmatic solution of problems, graduates are immediately productive with minimal on-the-job training, thus increasing their value to industry. Industries employing MET graduates include manufacturing companies of all types (aircraft, automobile, compressor and turbine, fluid power manufacturers and others); energy companies (such as natural gas, electrical power generation, and the oil and gas industries); and service companies (transportation industry, architecture and professional engineering firms, and those supporting the oil and gas industry).

The Bachelor of Science program in Mechanical Engineering Technology program is accredited by the Engineering Technology Accreditation Commission of ABET, <http://www.abet.org> (<http://www.abet.org/>), under the general criteria and the Mechanical Engineering Technology Program criteria.

Courses

MET 1121 Technical Graphics

Prerequisites: A grade of "C" or better in ENGR 1332 or ENGR 1322.

Description: Visualization of 3-D objects, sketching, manual drafting of engineering drawings to ANSI standards, interpreting typical industrial drawings.

Credit hours: 1

Contact hours: Lecture: 1 Contact: 1

Levels: Undergraduate

Schedule types: Lecture

Department/School: Engineering Technology

MET 1123 Technical Drawing and Basic CAD

Description: Sketching, manual drafting and CAD generation of engineering drawings to ANSI standards. Interpreting typical industrial drawings. Students with two years high school or one year practical ANSI drafting/CAD may substitute an advanced course in mechanical engineering technology with consent of their advisers. Previously offered as GENT 1153.

Credit hours: 3

Contact hours: Lecture: 3 Contact: 3

Levels: Undergraduate

Schedule types: Lecture

Department/School: Engineering Technology

MET 2103 Industrial Materials

Prerequisites: CHEM 1314 or CHEM 1215 or CHEM 1414.

Description: A survey of the properties, characteristics and applications of metals, polymers, ceramics and other industrial materials. Terminology, concepts and principles involved in material selection, specification and processing. Laboratory activities include data collection and report generation, determination of material properties, and evaluation of material characteristics. Previously offered as GENT 1103.

Credit hours: 3

Contact hours: Lecture: 3 Contact: 3

Levels: Undergraduate

Schedule types: Lecture

Department/School: Engineering Technology

MET 2223 Geometric Dimensioning and Tolerancing with Computer-Aided Design

Prerequisites: A grade of "C" or better in (GENT 1153 or MET 1123) or a grade of "C" or better in (ENGR 1332 or equivalent) and MET 1121 (can be concurrent enrollment in MET 1121).

Description: Theory and application of Geometric Dimensioning and Tolerancing (GD&T) technique. Creation and analysis of tolerances for manufacturing with advanced computer-aided design (CAD) and engineering drawings.

Credit hours: 3

Contact hours: Lecture: 3 Contact: 3

Levels: Undergraduate

Schedule types: Lecture

Department/School: Engineering Technology

MET 2313 Fundamentals of Hydraulic Fluid Power

Prerequisites: A grade of "C" or better in ENSC 2113 or GENT 2323.

Description: Basic fluid power concepts. Standard hydraulic symbols, component design and application, fluid power system considerations, design, and operation. Previously offered as MPT 2313.

Credit hours: 3

Contact hours: Lecture: 2 Lab: 2 Contact: 4

Levels: Undergraduate

Schedule types: Lab, Lecture, Combined lecture and lab

Department/School: Engineering Technology

MET 3003 Dynamics

Prerequisites: A grade of "C" or better in GENT 2323 or ENSC 2113.

Description: Plane motion of particles and rigid bodies. Force-acceleration, work-energy, and impulse-momentum principles. Graphical analysis, mechanisms and vibrations.

Credit hours: 3

Contact hours: Lecture: 3 Contact: 3

Levels: Undergraduate

Schedule types: Lecture

Department/School: Engineering Technology

MET 3113 Basic Instrumentation

Prerequisites: A grade of "C" or better in MATH 2123 or MATH 2144, and GENT 3323 or ENSC 2143, and ENGR 2421.

Description: Data analysis. Theory, operational characteristics and application of transducers for measurement of strain, force, velocity, acceleration, displacement, time, frequency, temperature, pressure. Previously offered as MPT 3114.

Credit hours: 3

Contact hours: Lecture: 2 Lab: 2 Contact: 4

Levels: Undergraduate

Schedule types: Lab, Lecture, Combined lecture and lab

Department/School: Engineering Technology

MET 3313 Applied Fluid Mechanics

Prerequisites: A grade of "C" or better in (MATH 2123 or MATH 2144), (PHYS 1114 or PHYS 2014), and (GENT 2323 or ENSC 2113).

Description: Practical analysis of fluid systems including static forces, the Bernoulli and general energy equations, laminar and turbulent flows, measurements of flow and pressure, lift and drag, pumps, and fans. Previously offered as MPT 3313.

Credit hours: 3

Contact hours: Lecture: 3 Contact: 3

Levels: Undergraduate

Schedule types: Lecture

Department/School: Engineering Technology

MET 3343 Metallurgy and Polymers

Prerequisites: A grade of "C" or better in (CHEM 1215 or CHEM 1314 or CHEM 1414 or CHEM 1515).

Description: Provides an overview of common ferrous and nonferrous metals, metal crystal structures, grain development in metal, heat treating practices, and how these aspects impact a material's characteristics. Polymer properties, an introduction to thermoplastics and thermosets, physical and mechanical properties, polymer structure and arrangement, manufacturing methods and common additives. Previously offered as MFGT 3343.

Credit hours: 3

Contact hours: Lecture: 3 Lab: 0 Contact: 3

Levels: Undergraduate

Schedule types: Lecture

Department/School: Engineering Technology

MET 3433 Basic Thermodynamics

Prerequisites: A grade of "C" or better in (MATH 2123 or MATH 2144) and (PHYS 1114 or PHYS 2014).

Description: Basic scientific principles of energy and the behavior of substances as related to engines and systems. Gas laws, vapors and engine cycles. Previously offered as MPT 3433 and GENT 3433.

Credit hours: 3

Contact hours: Lecture: 3 Contact: 3

Levels: Undergraduate

Schedule types: Lecture

Department/School: Engineering Technology

MET 3453 Heat Transfer

Prerequisites: A grade of "C" or better in (MATH 2144 or MATH 2123 and (PHYS 2014 or PHYS 1114).

Description: Conduction, convection, radiation, condensation and boiling heat transfer. Heat exchangers. Prediction of heat transfer rates. Retardation and enhancement of heat transfer. Course previously offered as MPT 4433 and GENT 4433.

Credit hours: 3

Contact hours: Lecture: 3 Contact: 3

Levels: Undergraduate

Schedule types: Lecture

Department/School: Engineering Technology

MET 3543 Manufacturing Processes

Prerequisites: Grade of "C" or better in (MET 1123 or ENG 1332) and (MET 3343 or ENSC 3313).

Description: Manufacturing processes used to transform new materials including metals and non-metals into finished goods. Traditional and nontraditional manufacturing processes. Introduction to CAD/CAM. Basic process selection. Meteorology and measurement fundamentals. Previously offered as GENT 1223 and MET 1213.

Credit hours: 3

Contact hours: Lecture: 2 Lab: 2 Contact: 4

Levels: Undergraduate

Schedule types: Lab, Lecture, Combined lecture and lab

Department/School: Engineering Technology

MET 3803 Fundamentals of Mechatronics

Prerequisites: Grade of "C" or better in EET 3104 or EET 2635.

Description: Fundamentals of mechatronic systems and components. Different modelling approaches used for mechatronics systems, sensors and actuators, data acquisition and interfacing, signal conditioning, and PLCs. Previously offered as GENT 3503. Same course as EET 3803.

Credit hours: 3

Contact hours: Lecture: 2 Lab: 2 Contact: 4

Levels: Undergraduate

Schedule types: Lab, Lecture, Combined lecture and lab

Department/School: Engineering Technology

MET 4003 Machine Elements

Prerequisites: A grade of "C" or better in (MATH 2133 or MATH 2153) and (GENT 3323 or ENSC 2143).

Description: Applications of statics and strength to the design of machine components. Problems of choosing materials, impact and fatigue loading.

Credit hours: 3

Contact hours: Lecture: 3 Contact: 3

Levels: Undergraduate

Schedule types: Lecture

Department/School: Engineering Technology

MET 4023 Advanced Mechanical Computer-Aided Design

Prerequisites: A grade of "C" or better in MET 1123 or ENGR 1332 or equivalent.

Description: Computer-aided design methodologies and processes. State-of-the-art technologies and methodologies in 3D modeling and design processes.

Credit hours: 3

Contact hours: Lecture: 3 Contact: 3

Levels: Undergraduate

Schedule types: Lecture

Department/School: Engineering Technology

MET 4033 Applied Vibration and Acoustics

Prerequisites: A grade of "C" or better in GENT 3323 or ENSC 2143.

Description: Free and forced vibration of mechanical systems with an emphasis on practical applications. Introduction to sound wave generation and propagation. Mechanical system design methods for noise and vibration mitigation.

Credit hours: 3

Contact hours: Lecture: 3 Contact: 3

Levels: Undergraduate

Schedule types: Lecture

Department/School: Engineering Technology

MET 4050 Advanced Mechanical Design

Prerequisites: Junior standing and consent of instructor.

Description: Special problems in mechanical engineering technology. Previously offered as MFGT 4050 and MPT 4050. Offered for variable credit, 1-3 credit hours, maximum of 6 credit hours.

Credit hours: 1-3

Contact hours: Contact: 1-3 Other: 1-3

Levels: Undergraduate

Schedule types: Independent Study

Department/School: Engineering Technology

MET 4103 Senior Design I

Prerequisites: Grade of "C" or better in (MET 1123 or MET 1121) and Senior Standing.

Description: First part of a two semester sequence for the MET capstone project. Focuses on finding and beginning a practical engineering design project. Includes selected topics in engineering design, project management, ethics, and intellectual property.

Credit hours: 3

Contact hours: Lecture: 2 Lab: 2 Contact: 4

Levels: Undergraduate

Schedule types: Lab, Lecture, Combined lecture and lab

Department/School: Engineering Technology

MET 4113 Practical Computational Fluid Dynamics

Prerequisites: A grade of "C" or better in MET 3313 or ENSC 3233 or MAE 3333.

Description: An introduction to the practical use of Computational Fluid Dynamics (CFD) commercial software. Students will be introduced to the concepts governing CFD, but the majority of the class will be utilized in learning the use of a popular commercial code. May not be used for degree credit with MET 5113.

Credit hours: 3

Contact hours: Lecture: 3 Contact: 3

Levels: Undergraduate

Schedule types: Lecture

Department/School: Engineering Technology

MET 4123 Senior Design II

Prerequisites: A grade of "C" or better in MET 4103 and ENGL 3323. Must be taken in the immediately subsequent semester after completing MET 4103.

Description: Second part of a two semester sequence for the MET capstone project. Finishes work on the practical engineering design project begun in MET 4103. Includes selected topics in engineering design, project management, ethics, and intellectual property.

Credit hours: 3

Contact hours: Lecture: 2 Lab: 2 Contact: 4

Levels: Undergraduate

Schedule types: Lab, Lecture, Combined lecture and lab

Department/School: Engineering Technology

MET 4133 Interdisciplinary Design I

Prerequisites: A grade of "C" or better in (MET 1223 or MET 2223) and MET 4003 and permission of the instructor.

Description: First part of an interdisciplinary capstone project for engineering technology seniors. Conduct mechanical design, prototype development, and project management on practical engineering design project. Same course as MET 4103.

Credit hours: 3

Contact hours: Lecture: 2 Lab: 2 Contact: 4

Levels: Undergraduate

Schedule types: Lab, Lecture, Combined lecture and lab

Department/School: Engineering Technology

MET 4143 Interdisciplinary Design II

Prerequisites: A grade of "C" or better in (MET 1223 or MET 2223) and MET 4003 and permission of the instructor.

Description: Second part of an interdisciplinary capstone project for engineering technology seniors. Conduct mechanical design, prototype development, and project management on practical engineering design project. Same course as MET 4123.

Credit hours: 3

Contact hours: Lecture: 2 Lab: 2 Contact: 4

Levels: Undergraduate

Schedule types: Lab, Lecture, Combined lecture and lab

Department/School: Engineering Technology

MET 4173 Additive Manufacturing: Materials, Methods and Applications

Prerequisites: Senior standing or consent of instructor.

Description: Theory and practice of additive manufacturing, materials and their applications in various fields. Discuss their applications in product development, data visualization, rapid prototyping, and specialized manufacturing, with special emphasis on direct digital manufacturing.

Credit hours: 3

Contact hours: Lecture: 3 Contact: 3

Levels: Undergraduate

Schedule types: Lecture

Department/School: Engineering Technology

MET 4203 Finite Element Methods

Prerequisites: A grade of "C" or better in GENT 3323 or ENSC 2143.

Description: Application of Finite Element Methods to machine component design. Problems involving stress, strain, temperature and vibration will be solved using state of the art Finite Element Software. May not be used for degree credit with MET 5203.

Credit hours: 3

Contact hours: Lecture: 3 Contact: 3

Levels: Undergraduate

Schedule types: Lecture

Department/School: Engineering Technology

MET 4223 Geometric Dimensioning and Tolerancing

Prerequisites: A grade of "C" or better in MET 1123 or ENGR 1332 or equivalent.

Description: Theory and Application of Geometric Dimensioning and Tolerancing (GD&T) technique based on ASME Y14.5. Creation, analysis, and inspection of tolerances for manufacturing. Previously offered as MET 3223.

Credit hours: 3

Contact hours: Lecture: 3 Contact: 3

Levels: Undergraduate

Schedule types: Lecture

Department/School: Engineering Technology

MET 4713 Internal Ballistics

Prerequisites: A grade of "C" or better in (ENSC 2123 or MET 3003) and ENSC 2143 and (ENSC 3233 or MET 3313).

Description: This course is about launching projectiles. Course topics include projectile launching systems, solid propellant combustion, design and manufacturing of projectiles and ammunition, internal ballistic models, design and manufacturing of the barrel, structural dynamics of the barrel, dynamics of guns, firing mechanisms and fire-control systems, SAAMI Standards, and project. May not be used for degree credit with MET 5713.

Credit hours: 3

Contact hours: Lecture: 3 Contact: 3

Levels: Undergraduate

Schedule types: Lecture

Department/School: Engineering Technology

MET 4723 External Ballistics

Prerequisites: A grade of "C" or better in (ENSC 2123 or MET 3003) and (ENSC 3233 or MAE 3333 or MET 3313).

Description: This course focuses on the motion of a projectile in the air. Course topics include vacuum trajectory, aiming principles and devices, aerodynamic forces and moments, ballistic coefficient, flat-tire point-mass trajectory, weather, Coriolis effects, gyroscopic effect, point-mass trajectory, pitching and yawing motion, measurement of projectile speed and environmental conditions, long-range shooting, and project. May not be used for degree credit with MET 5723.

Credit hours: 3

Contact hours: Lecture: 3 Contact: 3

Levels: Undergraduate

Schedule types: Lecture

Department/School: Engineering Technology

MET 4733 Terminal Ballistics and Armor

Prerequisites: Grade of "C" or better in (MET 3003 or ENSC 2123) and permission of the instructor.

Description: Practical applications of dynamics theories to the mechanical behavior of projectiles and targets at impact. Structural and body armor system design, test, and analyses. May not be used for degree credit with MET 5733.

Credit hours: 3

Contact hours: Lecture: 3 Contact: 3

Levels: Undergraduate

Schedule types: Lecture

Department/School: Engineering Technology

MET 4803 Mechatronic System Design

Prerequisites: Grade of "C" or better in GENT 3123 and MET 3803 (can be concurrent enrollment in GENT 3123).

Description: Modelling of mechanical, electrical, and hydraulic components. Feedback control systems, electro-hydraulic drives, electrical drives, and microcontroller programming. Previously offered as GENT 4503. Same course as EET 4803.

Credit hours: 3

Contact hours: Lecture: 2 Lab: 2 Contact: 4

Levels: Undergraduate

Schedule types: Lab, Lecture, Combined lecture and lab

Department/School: Engineering Technology

MET 4883 Tool Design**Prerequisites:** A grade of "C" or better in MET 2213 and MET 3343.**Description:** Basic design and development of special tools for processing or manufacturing engineering materials. Design and specification and inspection tools using appropriate techniques of engineering graphics and analysis. Previously offered as MFGT 4883.**Credit hours:** 3**Contact hours:** Lecture: 2 Lab: 2 Contact: 4**Levels:** Undergraduate**Schedule types:** Lab, Lecture, Combined lecture and lab**Department/School:** Engineering Technology**MET 4953 Industrial Assessment and Improvement****Prerequisites:** Senior standing and consent of instructor.**Description:** Plant assessment and improvement-based concepts, strategies, and tools for manufacturing operations. Emphasis is on small to medium-sized manufacturing operations. Issues include energy, water, waste, quality, and productivity analysis across the organization from a systems perspective. Justification of improvement projects and measurement of results. May not be used for degree credit with IEM 4953 or IEM 5953.**Credit hours:** 3**Contact hours:** Lecture: 3 Contact: 3**Levels:** Undergraduate**Schedule types:** Lecture**Department/School:** Engineering Technology**MET 4993 Mechanical Engineering Technology Practice****Prerequisites:** Junior standing and consent of department head.**Description:** Supervised industrial experience in mechanical engineering technology practice with minimal continual duration of eight weeks. Comprehensive journal, written report, and oral presentation.**Credit hours:** 3**Contact hours:** Lecture: 3 Contact: 3**Levels:** Undergraduate**Schedule types:** Lecture**Department/School:** Engineering Technology**MET 5113 Practical Computational Fluid Dynamics****Prerequisites:** Graduate standing.**Description:** An introduction to the practical use of Computational Fluid Dynamics (CFD) commercial software. Students will be introduced to the concepts governing CFD, but the majority of the class will be utilized in learning the use of a popular commercial code. May not be used for degree credit with MET 4113.**Credit hours:** 3**Contact hours:** Lecture: 3 Contact: 3**Levels:** Graduate**Schedule types:** Lecture**Department/School:** Engineering Technology**MET 5203 Finite Element Methods****Credit hours:** 3**Contact hours:** Lecture: 3 Contact: 3**Levels:** Graduate**Schedule types:** Lecture**Department/School:** Engineering Technology**MET 5713 Internal Ballistics****Prerequisites:** Graduate standing.**Description:** This course is about launching projectiles. Course topics include projectile launching systems, solid propellant combustion, design and manufacturing of projectiles and ammunition, internal ballistic models, design and manufacturing of the barrel, structural dynamics of the barrel, dynamics of guns, firing mechanisms and fire-control systems, SAAMI Standards, and project. May not be used for degree credit with MET 4713.**Credit hours:** 3**Contact hours:** Lecture: 3 Contact: 3**Levels:** Graduate**Schedule types:** Lecture**Department/School:** Engineering Technology**MET 5723 External Ballistics****Prerequisites:** Graduate standing.**Description:** This course focuses on the motion of a projectile in the air. Course topics include the vacuum trajectory, aiming principles and devices, aerodynamic forces and moments, ballistic coefficient, flat-tire point-mass trajectory, weather, Coriolis effects, gyroscopic effect, point-mass trajectory, pitching and yawing motion, measurement of projectile speed and environmental conditions, long-range shooting, and project. May not be used for degree credit with MET 4723.**Credit hours:** 3**Contact hours:** Lecture: 3 Contact: 3**Levels:** Graduate**Schedule types:** Lecture**Department/School:** Engineering Technology**MET 5733 Terminal Ballistics and Armor****Prerequisites:** Graduate standing.**Description:** Practical applications of dynamics theories to the mechanical behavior of projectiles and targets at impact. Structural and body armor system design, test, and analyses. May not be used for degree credit with MET 4733.**Credit hours:** 3**Contact hours:** Lecture: 3 Contact: 3**Levels:** Graduate**Schedule types:** Lecture**Department/School:** Engineering Technology

Undergraduate Programs

- Mechanical Engineering Technology, BSET (<http://catalog.okstate.edu/engineering-architecture-technology/mechanical-engineering-technology/bset/>)

Faculty

Aaron Alexander, PhD—**Associate Professor and Program Coordinator**
Professors: Richard A. Beier, PhD, PE (emeritus); Young Chang, PhD, PE, CFPS (emeritus); Chulho Yang, PhD, PE

Associate Professors: Kenneth Belanus, MSEM (emeritus); Warren L. Lewis, MS; Hitesh Vora, PhD

Assistant Professors: Lingfeng Tao, PhD; Yafeng Wang, PhD

Teaching Associate: Laura Emerson, MS