

MECHANICAL ENGINEERING

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The Mechanical Engineering Program offers a four-year degree leading to the Bachelor of Science in Mechanical Engineering (BSME) and a two-year degree programs in Manufacturing and in Nuclear Technology. The program leading to the Bachelor of Science in Mechanical Engineering (BSME) degree is accredited by the Engineering Accreditation Commission of ABET, <http://www.abet.org>.

Mission

The mission of Mechanical Engineering at Arkansas Tech University is to develop and educate students to become mechanical engineers exhibiting professional competency and ethics, with a desire for life-long learning.

Program Educational Objectives

Graduates of the Mechanical Engineering program will be problem solving, responsible professionals ready for work in industry or further studies in graduate programs. Specifically, based on the needs of the program's regional industry partners, within a few years of graduation, mechanical engineering alumni will have:

- Obtained professional employment in an engineering or closely related field, entered a graduate program in engineering or gained admission to a professional program such as medicine, law or business.
- Solved problems by applying appropriate engineering tools to the analysis, design, and production of products or systems.
- Continued to develop their skills and increase their knowledge through professional activities including FE/PE certification, membership in professional societies, and continuing education courses.
- Demonstrated good communication skills and worked effectively in team environments that include diverse membership across disciplines, backgrounds, positions, and locations.

Vision

The Vision of the Mechanical Engineering Program is to be one of the region's exceptional accredited programs of mechanical engineering producing professionals for the state, nation and world.

It is highly recommended that all freshmen engineering students starting fall 2017 purchase laptop computers. Laptop computer specifications are at: <https://www.atu.edu/engineering/specifications.php>.

Transfer Policy for Electrical and Mechanical Engineering Departments

1. Upper level engineering courses (3000 and 4000 level) are transferable from ABET accredited institutions accredited by the Engineering Accreditation Commission (EAC).
2. Engineering senior design course credits are not transferable.

3. No more than 12 credit hours of the required 3000 - 4000 level engineering, engineering elective or technical elective course credits may be transferred.
4. All transfer courses from U.S. universities must be from institutions of higher education which have been accredited by a regional accrediting agency.
5. Courses presented for transfer credit from non-U.S. institutions which are not ABET accredited must be accompanied by supporting materials such as course outlines, catalog descriptions, and, possibly, examples of student work, tests, etc. All such supporting material must be presented in English and must also meet any additional requirements imposed by the Office of Admissions and the Registrar. Arkansas Tech University requires the applicant to submit his/her academic credentials to a credential evaluation service. Preapproved courses from institutions in the A TU Study Abroad Program are exempt from these requirements.

Student Outcomes

Students in Mechanical Engineering will be expected to meet the outcomes from ABET Engineering Accreditation Commission Criterion 3:

1. An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.
2. An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.
3. An ability to communicate effectively with a range of audiences.
4. An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.
5. An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.
6. An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.
7. An ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

For more information, please visit www.atu.edu/engineering/mechanical (<https://www.atu.edu/engineering/mechanical/>)

Programs

- Manufacturing, Associate of Science (<https://catalog.atu.edu/undergraduate/programs/stem/engineering-computing-sciences/mechanical-engineering/manufacturing-as/>)
- Mechanical Engineering, Bachelor of Science (<https://catalog.atu.edu/undergraduate/programs/stem/engineering-computing-sciences/mechanical-engineering/mechanical-engineering-bs/>)
- Nuclear Technology, Associate of Science (<https://catalog.atu.edu/undergraduate/programs/stem/engineering-computing-sciences/mechanical-engineering/nuclear-technology-as/>)

Courses

MCEG 1002 Engineering Graphics

General course in the most important types of engineering drawings. A foundation course in lettering, geometrical exercises, orthographic projections, including auxiliary views, sections, pictorial representation. The computer is introduced as a drafting tool. Lecture and laboratory four hours. \$25 per credit hour curriculum content fee.

MCEG 1011 Introduction to Mechanical Engineering

Prerequisite: Math ACTE score of 24 or higher, or grade of C or higher in MATH 1113, MATH 1914, or MATH 1203, or consent of instructor. An introductory lecture/lab course to acquaint students with the technical aspects of mechanical engineering and professional responsibility. \$25 per credit hour curriculum content fee.

MCEG 2013 Statics

Prerequisite: MATH 2924 and PHYS 2114. Principles of statics, resultants, equilibrium, and analysis of force systems. Structure analysis, forces in space, friction, centroids, and moments of inertia. \$25 per credit hour curriculum content fee.

MCEG 2023 Engineering Materials

Prerequisite: CHEM 2124. A study of the mechanical and physical properties, micro structure, and the various testings of engineering materials (metals, plastics, woods, and concrete) from the viewpoint of manufacture and construction. \$25 per credit hour curriculum content fee.

MCEG 2033 Dynamics

Prerequisite: MCEG 2013. A continuation of MCEG 2013. Study of problems of unbalanced force systems. Kinematics and kinetics of rigid bodies. Work and energy, impulse and momentum. \$25 per credit hour curriculum content fee.

MCEG 2203 Computational Methods in Engineering

Prerequisite: MCEG 1011 and MATH 2914. An introduction to common computational methods, tools, and procedures used in the solution of common engineering problems. A standard solution methodology is introduced along with instruction in units systems, spreadsheet and calculator computations and the use of engineering software. \$25 per credit hour curriculum content fee.

MCEG 3000 Engineering Internship/Research Experience

Cross-listed: ELEG 3000. Offered: As needed. Prerequisite: A minimum of 60 hours applicable toward the ATU Electrical/Mechanical engineering program requirements with a minimum 3.5 GPA; and acceptance in an Engineering Internship or Research Experience for Undergraduates Program.

A minimum of six weeks of supervised on-the-job training with a university research program, engineering firm, manufacturer, municipality, or company employing engineers. A written report is required within one week of internship completion. Students will also present their internship experience to an engineering class or at a student engineering RSO meeting.

Note: Satisfies College of Distinction requirement.

MCEG 3003 System Modeling and Analysis

Cross-listed: ELEG 3003. Prerequisite: COMS 1013 or MCEG 2203 and MATH 3243. Reduction of engineering systems to mathematical models; methods of analysis using computers; interpretation of numerical results; optimization of design variables. Examples are drawn from various engineering disciplines. \$25 per credit hour curriculum content fee.

MCEG 3013 Mechanics of Materials

Prerequisite: MCEG 2013. Fundamental stress and strain relationships, torsion, shear and bending moments, stresses and deflections in beams; introduction to statically indeterminate beams, columns, combined stresses, and safety factors. \$25 per credit hour curriculum content fee.

MCEG 3023 Manufacturing Processes

Prerequisite: MCEG 2023 and 3013. Morphological aspects of manufacturing processes, testing of engineering metals, metal working processes, metal forming processes, machining, non-destructive inspection methods, statistical process control, control charts, and total quality management concepts. \$25 per credit hour curriculum content fee.

MCEG 3313 Thermodynamics I

Prerequisite: MATH 2924 and PHYS 2114. An introduction to thermodynamics, including thermodynamic properties of pure substances, heat and work, the first and second laws of thermodynamics, and entropy with applications to power and refrigeration cycles. \$25 per credit hour curriculum content fee.

MCEG 3333 Alternative Energy Systems

A study of the design and implementation of alternative energy sources in power production and other applications. Renewable sources are emphasized. \$25 per credit hour curriculum content fee.

MCEG 3403 Machine Dynamics

Prerequisite: MCEG 2033 and MATH 3243. The study of the relative motion of machine components, force systems applied to these components, the motions resulting from these forces, and their effect on machine design criteria. \$25 per credit hour curriculum content fee.

MCEG 3413 Fundamentals of Mechanical Design

Prerequisite: MCEG 2033, 3013, and MATH 3243. Analysis of machines and components through application of basic fundamentals and principles. \$25 per credit hour curriculum content fee.

MCEG 3442 Mechanical Laboratory I

Prerequisite: MCEG 2023 and MCEG 3013. A study of the basic materials testing procedures and instrumentation. Emphasis will be placed on proper laboratory techniques including data collection, data reduction, and report preparation. Lecture one hour, laboratory three hours. \$40 course fee. \$25 per credit hour curriculum content fee.

MCEG 3453 Energy Management

Prerequisite: MCEG 3313. Energy management in commercial building and industrial plants. Utility rate structures. Sources of primary energy. Energy conversion devices. Prime movers of energy. Heat. Electricity. Lighting. HVAC Equipment. Building envelope. Electric motors. Estimating energy savings. Economic justification. Energy auditing. \$25 per credit hour curriculum content fee.

MCEG 3503 Basic Nuclear Engineering

Prerequisite: MATH 2924, CHEM 2124 and PHYS 2114. An introduction to atomic and nuclear processes and to nuclear science and engineering fundamentals, including the nature of nuclear radiation, the nuclear chain reaction, criticality, power reactor types, and applications of nuclear technology. \$25 per credit hour curriculum content fee.

MCEG 3512 Radiation Detection Laboratory

Prerequisite: ASNT major and MCEG 3503 or MCEG 3523.

A study of each of the common kinds of nuclear radiation, including the detection and analysis methods and applications to nondestructive assays. Use of computers in analyses. Lecture one hour, laboratory three hours. \$40 course fee. \$25 per credit hour curriculum content fee.

MCEG 3523 Radiation Health Physics

Prerequisite: MATH 2914, CHEM 2124, or consent.

A study of the protection of individuals and population groups against the harmful effects of ionizing radiation. Included in the study is: (1) radiation detection and measurement, (2) relationships between exposure and biological damage, (3) radiation and the environment, (4) design criteria for processes, equipment, and facilities so that radiation exposure is minimized, and (5) environmental impact of nuclear power plants. \$25 per credit hour curriculum content fee.

MCEG 3612 Manufacturing Laboratory

Co-requisite: MCEG 3023.

Prerequisite: MCEG 2023.

Students will conduct various hands-on activities associated with manufacturing processes using industry typical practices. One hour lecture, one hour lab. \$40 course fee. \$25 per credit hour curriculum content fee.

MCEG 3663 Engineering Internship

Prerequisite: Mechanical engineering major with junior standing and a minimum GPA of 2.75/4.000; MCEG 3013 and 3313.

Students will gain experiential learning in an industrial environment by participation in an engineering internship with an approved industry partner. Students will be required to participate in engineering project(s) under supervision of an engineer at the selected partner industry, complete written and oral reports. \$25 per credit hour curriculum content fee.

Note: May not be repeated for credit.

MCEG 3991 Special Problems in Engineering

Prerequisite: Minimum of three hours at the junior level in area of study. Individual or specialized study in advanced area under the direction of a faculty advisor. \$25 per credit hour curriculum content fee.

MCEG 3992 Special Problems in Engineering

Prerequisite: Minimum of three hours at the junior level in area of study. Individual or specialized study in advanced area under the direction of a faculty advisor. \$25 per credit hour curriculum content fee.

MCEG 3993 Special Problems in Engineering

Prerequisite: Minimum of three hours at the junior level in area of study. Individual or specialized study in advanced area under the direction of a faculty advisor. \$25 per credit hour curriculum content fee.

MCEG 3994 Special Problems in Engineering

Prerequisite: Minimum of three hours at the junior level in area of study. Individual or specialized study in advanced area under the direction of a faculty advisor. \$25 per credit hour curriculum content fee.

Faculty Professors

- John Krohn (<https://www.atu.edu/engineering/mechanical/profiles/jkrohn.php>)

Associate Professor

- Robert Fithen (<https://www.atu.edu/engineering/mechanical/profiles/rfithen.php>)

Assistant Professor

- Stanton Apple (<https://www.atu.edu/engineering/mechanical/profiles/sapple.php>)
- Seyed Ehsan Hosseini (<https://www.atu.edu/engineering/mechanical/profiles/shosseini.php>)
- Mohammed Amjadi Kashani
- Mehmet Kelestemur (<https://www.atu.edu/engineering/mechanical/profiles/mkelestemur.php>)
- Randy Kelley (<https://www.atu.edu/engineering/mechanical/profiles/rkelley8.php>)