

ELECTRICAL ENGINEERING

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The Electrical Engineering program offers three four-year degrees in Electrical and Computer Engineering. The programs leading to the BS Computer Engineering, BS Electrical Engineering, and BS Electrical Engineering with Biomedical Option are accredited by the Engineering Accreditation Commission of ABET (<http://www.abet.org>). The accredited computer engineering program is one of only three such programs in the state of Arkansas.

Mission

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

In order to fulfill its mission, the program has established the following educational objectives.

Graduates of the Arkansas Tech University Computer and Electrical Engineering degree programs, within a few years of graduating, will have

- Obtained employment in an engineering or closely-related field, or entered a graduate program in engineering or a related field or gained admission to a professional program such as medicine, law or business.
- Solved problems aided by the engineering proficiencies they learned in their undergraduate program.
- Recognized a pathway to make positive contributions to society using their engineering talents and skills by practicing their profession in an ethical and responsible manner.
- Engaged in continuing education and pursuit of membership in professional societies as well as FE/PE certification, or other certifications relevant to their chosen occupational field.
- Demonstrated accountability and worked effectively in a team environment with strong emphasis on multidisciplinary membership, inclusion, and communication.

Vision

The vision of Electrical Engineering is to be one of the regions exceptional accredited programs of electrical engineering producing professionals for the state, nation and world.

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

Transfer Policy for Electrical and Mechanical Engineering Programs

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 ATU Study Abroad Program are exempt from these requirements.

Student Outcomes

Students in Computer Engineering, Electrical Engineering, and Electrical Engineering with a Biomedical option 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/electrical (<https://www.atu.edu/electrical/>)

Programs

- Computer Engineering, Bachelor of Science (<https://catalog.atu.edu/undergraduate/programs/stem/engineering-computing-sciences/electrical-engineering/computer-engineering-bs/>)
- Electrical Engineering, Bachelor of Science (<https://catalog.atu.edu/undergraduate/programs/stem/engineering-computing-sciences/electrical-engineering/electrical-engineering-bs/>)
- Electrical Engineering, Bachelor of Science - Biomedical (<https://catalog.atu.edu/undergraduate/programs/stem/engineering-computing-sciences/electrical-engineering/electrical-engineering-bs-biomedical/>)

Courses

ELEG 1011 Introduction to Electrical Engineering

Prerequisite: Math ACTE score of 24 or higher, or a grade of C or higher in MATH 1113, or MATH 1914, or MATH 1203, or consent of the instructor.

An introductory lecture/lab course to acquaint students with the fundamental techniques in the field of electrical engineering. Topics include technical aspects of electrical engineering including an introduction to computational techniques/software, basic introduction to computer-aided drafting (CAD), an introduction to programming, and basic circuit prototyping. \$25 per credit hour curriculum content fee.

ELEG 2103 Electric Circuits I

Prerequisite: MATH 2924 with a grade of C or better.

An introduction to circuit theory and electrical devices. Topics include resistive circuits, independent and dependent sources; analysis methods, network theorems; RC and RL first order circuits, and RLC second order circuits. \$25 per credit hour curriculum content fee.

ELEG 2111 Electric Circuits Laboratory

Prerequisite: ELEG 2103.

Report writing; use of basic electrical measurement devices; voltmeters, ammeters, R meters, wattmeters, and oscilloscopes. Computer modeling and data analysis of AC and DC circuits. Emphasis on developing laboratory techniques through experiments paralleling topics in ELEG 2103 and ELEG 2113. Laboratory three hours per week. \$40 laboratory fee. \$25 per credit hour curriculum content fee.

ELEG 2113 Electric Circuits II

Prerequisite: ELEG 2103 with a C or better and MATH 3243 or consent of instructor.

A continuation of ELEG 2103 covering phasor analysis, steady state power, complex network functions, frequency response, transformers, Laplace methods. \$25 per credit hour curriculum content fee.

ELEG 2130 Digital Logic Design Lab

Co-requisite: ELEG 2134 or consent of instructor.

Laboratory must be taken during the same semester as the lecture, ELEG 2134. A study of basic digital logic circuit design and implementation. Circuit schematic development utilizing computerized automated design tools. Computer modeling and simulation of digital systems. Emphasis will be placed on proper laboratory techniques, including data collection, data reduction, and report preparation. Laboratory three hours. \$40 laboratory fee.

ELEG 2134 Digital Logic Design

Prerequisite: ELEG 1011 or COMS 1013 Co-requisites: ELEG 2130 Binary numbers and codes, Boolean algebra, combinational and sequential logic including: minimization techniques, memory systems, register transfers, control logic design, and state machines. \$25 per credit hour curriculum content fee.

ELEG 3000 Engineering Internship/Research Experience

Cross-listed: MCEG 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.

ELEG 3003 System Modeling and Analysis

Cross-listed: MCEG 3003 Prerequisites: 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.

ELEG 3103 Electronics I

Prerequisite: ELEG 2111 and ELEG 2113 Physics and electrical characteristics of diodes, bipolar transistors, and field effect transistors, behavior of these devices as circuit elements; common electronic circuits in discrete and integrated form; digital circuits including standard IC gates and flip flops, linear circuits including standard discrete and integrated amplifier configurations and their characteristics.

\$25 per credit hour curriculum content fee.

ELEG 3123 Signals and Systems

Prerequisite: MATH 3243 and ELEG 2113.

Signal and system modeling, time and frequency domain analysis, singularity functions, the Dirac Delta function, impulse response, the superposition integral and convolution, Fourier series and Fourier and Laplace transformations. \$25 per credit hour curriculum content fee.

ELEG 3133 Microprocessor Systems Design

Prerequisite: ELEG 2134 and ELEG 2130.

Digital design using microprocessors. Microcomputer architecture, memory structures, I/O interfaces, addressing modes, interrupts, assembler programming, and development tools. This course should also attract computer science students interested in hardware. \$25 per credit hour curriculum content fee.

ELEG 3143 Electromagnetics

Prerequisite: MATH 2934 and PHYS 2124.

An introduction to static and dynamic electromagnetic fields using vector methods. Transmission lines, electrostatic fields, magnetostatic fields, Maxwell's equations, plane electromagnetic wave propagation, reflection, refraction, attenuation, antennas, reciprocity, and gain. \$25 per credit hour curriculum content fee.

ELEG 3153 Electrical Machines

Prerequisite: ELEG 2113.

Steady state analysis of single phase and polyphase transformers, direct current machines, synchronous machines, induction machines, and special purpose machines. Special emphasis will be given to the modeling and control of these machines. \$25 per credit hour curriculum content fee.

ELEG 3163 Electric Power Systems

Prerequisite: ELEG 2113 and PHYS 2124.

Introduction to power system analysis and operation. Topics included: mathematical modeling of power system components, power flow analysis, symmetric and asymmetric faults and economic operation of power systems. \$25 per credit hour curriculum content fee.

ELEG 3203 Renewable Energy Technology

Prerequisite: ELEG 2113.

An introduction and comprehensive overview of renewable energy technology. Topics include distributed generations and renewable energies including wind power, solar power, fuel cells and hydropower. Emphasis will be placed on basic concepts, operation principles and economics of existing and emerging renewable energy technologies. \$25 per credit hour curriculum content fee.

Faculty Professors

- Carl Greco (<https://www.atu.edu/engineering/electrical/profiles/cgreco.php>)

Assistant Professor

- Afsana Ahamed (<https://www.atu.edu/engineering/electrical/profiles/aahamed.php>)
- Matthew Young (<https://www.atu.edu/engineering/electrical/profiles/myoung.php>)
- Zahra Zamanipour
- Kaiman Zeng (<https://www.atu.edu/engineering/electrical/profiles/kzeng.php>)

Instructor

Jacob Weidenfeller (<https://www.atu.edu/engineering/electrical/profiles/jweidenfeller.php>)