

Bachelor of Science in Resource and Energy Engineering

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Abstract

The Bachelor of Science in Resource and Energy Engineering (BSREE) at UTA is a new program designed to prepare individuals to apply mathematical and scientific principles to the design, development and operational evaluation of energy generation, storage, conversion, and distribution systems. This includes instruction in conventional and renewable energy systems, electrical power systems, and electrical system design.

Based on two trends: (1) continued growth in the energy industry for both conventional and renewable resources; and (2) the need for a much larger, knowledgeable, and well-trained workforce to support and manage the emerging diversity and complexity in the energy industry, UTA designed a program to address both. While employment data shows that discipline specific engineers, e.g., electrical, industrial, petroleum, and others, continue to be in demand, there is a need for engineers who understand the energy industry from a broader perspective and are knowledgeable about both conventional and renewable energy sources. The BSREE program takes a systems approach to energy engineering that considers renewable and non-renewable sources, energy conversion, distribution, and storage. It will prepare graduates to provide interdisciplinary systems level economic and environmental analysis of natural and renewable resources, based on engineering, earth and physical science, and economic principles.

The new program requires foundational coursework in mathematics and engineering. (Table 1)

| Mathematics | Mechanical Engineering | Electrical Engineering | Industrial Engineering |
|------------------------|-------------------------------|-------------------------------|-------------------------------|
| Differential Equations | Statics | Computing Systems | Statistics |
| Linear Algebra | Dynamics | Circuit Analysis | Economics for Engineers |
| | | Linear Systems | |

Table 1. BSREE Required Courses in Mathematics, Mechanical, Electrical, and Industrial Engineering.

New courses to be developed for the program are listed in Table 2.

| | |
|------------------------------------|----------------------------|
| Chemistry of Fuels* | Thermal Engineering |
| Petroleum and Gas Engineering | Sustainable Energy Systems |
| Energy Engineering | Systems Modeling |
| Data Analytics and Visualization** | Energy Storage |
| Smart Grids** | Energy Governance |
| Management of Energy Projects | Capstone Design |

Table 2. BSREE New Courses in Resource and Energy Engineering. *denotes lab course, **denotes computer lab course

Students will be able to choose three technical elective courses, supporting specialization in Sustainability, Materials Science & Engineering, Civil Engineering, Nuclear Engineering, and others. The program requires 124 semester credit hours (SCH), comprised of 43 SCH Texas core, 72 SCH of required courses in math, science, and engineering, and 9 SCH of technical electives.

Texas is the largest producer and the largest consumer of energy in the U.S. In the center of the DFW metroplex, UTA is located near top economic drivers in the energy sectors of the economy. UTA has strong engineering programs in several disciplines, supporting the multidisciplinary nature of the program curriculum. There is a demonstrated need for a larger workforce with the comprehensive educational background to address the challenges of developing and managing a complex and diverse energy environment.

The career outlook for graduates of the program is exceedingly positive. As the United States works to transform to a net-zero carbon economy, employment growth in the energy industry continues to outpace employment in the overall domestic economy. From 2015 to 2019, the annual growth rate for energy employment in the United States was 3%, twice the rate of growth for the economy in general. Total energy employment rose by 4.0% from 2020 to 2021, and again energy jobs grew faster than overall U.S. employment, which rose 2.8%.

An assessment of regional (within 100 miles of UTA) employment that maps to the BSREE found a total of 14,217 positions that used terms related to energy and the word 'engineering' in the job title. In addition, a total of 3,650 positions specifically used the words 'energy engineering' in the job title.

The system-oriented approach will serve to help graduates of the program better understand and manage our energy resources, both conventional and renewable. In addition, the program will educate students in the broader issues related to energy including how economics and business decisions, as well as public policy, influence the energy industry. How energy is generated, transported, distributed, and how energy resources are managed is an integral part of the process for better building design, improved infrastructure, expanded cultural, recreational, and educational programs, and more. BSREE graduates will be prepared to lead this process and will be ready for immediate employment as energy engineers, design engineers, field engineers, plant engineers, utility engineers, energy auditors, renewable energy system integrators for homes and businesses, local and state government renewable-energy planners, and other positions in the energy field, or for graduate study in resource engineering and other related fields.