Engineering at the University of Tennessee

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Engineering Programs

12 Undergraduate programs:
- Aerospace Engineering
- Biomedical Engineering
- Biosystems Engineering
- Civil Engineering
- Chemical and Biomolecular Engineering
- Computer Engineering
- Computer Science
- Electrical Engineering
- Industrial Engineering
- Material Science and Engineering
- Mechanical Engineering
- Nuclear Engineering

Interdisciplinary Themes

What do Aerospace Engineers do?

AE's research, develop, and design aircraft and spacecraft components and systems for government, military, and commercial enterprises.

Systems and components can involve technologies associated with propulsion, airframe, avionics, aerodynamics, sensors, light-weight materials. AE's are also involved in flight testing and flight performance evaluation.

What do Biomedical Engineers do?

BME research, develop and design technologies and products used in medicine and medical research.

Technologies and products are associated with all aspects of diagnosis, treatment and care...from surgery to rehabilitation. BME's often work closely with physicians and other health care providers. Many BME's also attend medical school.

What is happening in BME at UT?

Areas of Study and Projects:
- Biomechanics
- Physiology
- Biomaterials
- Bioinstrumentation
- Biosensors - micro-electromechanical systems
- Orthopedic implants - design and clinical evaluation
- Clinical studies
- Surgical navigation

CIVIL AND ENVIRONMENTAL ENGINEERING

Civil Engineering
- Construction
- Structural
- Geotechnical
- Coastal

Environmental Engineering
- Air Quality
- Water Resources
- Waste Management
- Transportation
- Water Quality

Biosystems Engineering - What we do

- The application of engineering principles to the complex biological systems that make up most of the natural world.
- Examples:
  - Bioenergy and energy conversion
  - Natural resource management
  - Environmental protection
  - Water quality
  - Forest engineering
  - Food processing
  - Agricultural applications
  - Aquaculture production
  - Ecological engineering
  - Off-road vehicle and machine design
  - Enjoy the outdoors!
  - Also have a Pre-Professional Curriculum (Pre-Med, Pre-Dental, Pre-Vet)

Biosystems Engineering - Program Strengths

1) The breadth of the curriculum provides:
- Exposure to course content from Mechanical, Civil, Electrical, and Chemical Engineering.
- Unique preparation to work in "systems" types of engineering jobs - the big picture.
- Ability to readily adapt to new or future technologies and demands - not tied to any current approach or technology.

2) The emphasis on design.
- Start in freshman year in BS/EE104 Design Apprenticeship, culminating in a Senior Design Project which takes a real design from problem definition through testing of the solution prototype.
**Industry**

Bioinformatics, Data mining, Multiple research laboratories including Seelab, chemical Center for Intelligent Systems and Machine Learning.

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**Exciting Events in CBE @ UTK**

National Design Competitions

Student Research in Faculty Labs

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**What does a Computer Engineer do?**

- Design cutting-edge systems...
  - Systems that combine hardware and software
  - Networked embedded systems
  - Embedded systems - autonomous control of vehicle
  - Biomedical applications - equipment for real-time processing

- Potential employers...
  - Almost all large corporations need computer engineers
  - Government agencies have strong emphasis on computer-based systems
  - High-tech industry relies heavily on computer engineering

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**Chemical and Biomolecular Engineering**

Chemical/Biomolecular Engineers are trained to:
- Understand the fundamentals of physical, chemical, and biological processes.
- Discover, analyze, and manipulate molecular-scale properties of materials, cells, and molecules, and the environment.
- Develop new processes and products that are essential in everyday life, advancing health, and improving environmental conditions.

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**Computer Engineering at UT**

- UT has a broad range of teaching and research activities in the Computer Engineering program.
- Multiple large robotics research groups that study and design state-of-the-art artificial intelligence systems.
- Variety of communication networks research activities.
- High-performance Internet switches and routers.

- Potential employers...
  - Almost all large corporations need computer engineers
  - Government agencies have strong emphasis on computer engineering
  - High-tech industry relies heavily on computer engineering

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**What does a Computer Scientist do?**

- Create, design, and maintain advanced software systems.
- Develop algorithmic processes that describe and transform information.
- Potential employers...
  - Almost all large corporations and most businesses need computer scientists.
  - Government and research institutions.

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**Electrical Engineering at UT**

- UT has a broad range of teaching and research activities in the Electrical Engineering program.
- Analog mixed-signal circuit design for chips on future MARS rover and other NASA missions.
- Electronics and MEMs for biosensors and microfluidics.
**What does an Industrial Engineer do?**

- **Industrial Engineers** figure out how to do things better. They engineer processes and systems that improve quality and productivity and save time, money, materials, energy.
- **Industrial Engineering** is not just about manufacturing. It also encompasses service industries, entertainment industries, shipping and logistics businesses, health care organizations and government.

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**Industrial Engineering at UT provides:**

- Many practitioners say that IE has the best of both worlds: education in both engineering and business.
- Whether it’s shortening a rollercoaster line, streamlining an operating room, distributing products worldwide, or making superior automobiles, IE’s work to save companies and government money and increase efficiencies.

IE at UTK offers:

- Scholarship opportunities
- Opportunities for experience
- Student mentoring program
- Enhanced advising program

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**What’s happening in MSE at UT?**

- ~ $5 M in annual research funding
- ~ $60K per year in MSE Undergrad Scholarship
- Research opportunities for freshmen & sophomores
  - Research at UT, ORNL, and other places
  - Attending major international conferences to present research results
- Biomaterials and Nanomaterials Concentrations
- Curriculum features hands-on lab courses
- 8 MSE faculty hold joint appointments with ORNL
- UT-ORNL Joint Institute for Advanced Materials under construction
- Low student-to-faculty ratio

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**What do mechanical engineers do?**

- ME’s design, develop, analyze and manufacture machines and mechanical systems.
- Systems such as engines and turbines, land transport vehicles, ships, aircraft, pumps and fans, air-conditioning and refrigeration systems, building services, industrial plants, commercial products and manufacturing equipment and processes.

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**Examples of What Nuclear Engineers Do**

- Nuclear Power
- Nuclear Medicine
- Space Exploration
- Oil Exploration
- Industrial Measurements
- Food Preservation

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**Nuclear Engineering at UT**

- UT Nuclear Engineering Department founded in 1957
  - Produced over 1000 graduates in the past 54 years
- Abundant undergraduate scholarships
  - No out-of-state tuition for UTNE students from AL, AR, LA, MS, SC, KY, DE, VA, WV (Savings of over $12,000 per year)
- Master Student Program
  - Earn both BS and MS in five years or less
- Close ties with the nearby Oak Ridge Nuclear Complex
- Outstanding record in National Student Design Contest
  - UTNE students have been Contest Finalists in 12 of past 15 years
- Nuclear power renaissance means high demand for nuclear engineers now and in the future in both the U.S. and worldwide

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**Get Involved in Your Education**

- International experience
- Undergraduate research
- Student society and leadership activities