Engineering Programs

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

- 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's happening in AE at UT?

- Areas of Study & Projects:
  - Aerodynamics
  - Airplane performance
  - Astronautics
  - Compressible flow
  - Propulsion - rocketry
  - Aero-structures
  - Guidance and control
  - Low gravity effects

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
Biosystems Engineering - What we do

- Bioenergy and energy conversion
- Natural resource management
- Environmental protection
- Water quality
- Forest engineering
- Food processing
- Agricultural applications
- Aquacultural production
- Ecological engineering
- Off-road vehicle and machine design
- Enjoy the outdoors!

CIVIL AND ENVIRONMENTAL ENGINEERING

Civil Engineering
- Construction
- Structural
- Geotechnical
- Transportation

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

What Chemical and Biomolecular Engineers Do

**Chemical**
- Process and prod.
- Biotechnology, ph.
- Gene therapy
- Vaccine prod.
- Biopharmaceuticals
- Energy from renewables
- Catalysis and reac.
- Pulp and paper
- Petrochemicals
- Food processing
- Specialty chemicals
- Isotopes, pollution control
- Advanced materials for energy and electronics
- Polymers, synthetic rubber, fibers
- Environmental health, air pollution, global climate
- Management consulting, investment banking, mergers and acquisitions, venture capital

**Broad Fundamental Education = Diverse Opportunities**

Chemical Engineering has been called “the liberal arts of engineering” because it is so widely applicable.

“Because of their training and skills, chemical engineers make strong candidates for jobs not traditionally associated with chemical engineering: sales, technical writing, law, insurance, real estate, publishing, finance, technical services, government.”

— Chemical Engineering Overview, Sloan Career Cornerstone Center

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Exciting Events in CBE at UTK

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What does a Computer Engineer do?

**Design cutting-edge systems...**
- Systems that combine hardware and software
- Broad areas include:
  - Communication networks - remote video systems, real-time streaming multi-media engines, network routers and switches
  - Robotic systems - autonomous control of vehicles
  - Embedded systems - cell phones, PDAs, automotive systems, as well as almost all consumer electronic products sold today
  - Reconfigurable computing - design chips that perform real-time tasks
  - Biomedical application - equipment for real-time processing of biomedical signals

**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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What does an Electrical Engineer do?

**Design, develop, and test electrotechnology solutions**
- Combines the latest technology with established electrical and magnetic principles
- Broad areas include:
  - Electronics - analog and digital, neuromorphic circuits, microelectronics, VLSI circuits, system on a chip
  - Signal/image/data processing - pattern/face recognition, sensor networks, robotics, bioinformatics, data mining
  - Communications - wireless communications, radio frequency to microwave frequency, antennas, cell phones, industrial plasmas
  - Power Systems/Power Electronics - fuel cells, solar cells, hybrid electric vehicles, electric machines, electric utility planning
  - Control Systems - aeronautics, motor drive control

**Potential employers...**
- Many companies have electrical engineering needs.
- Government agencies have strong emphasis on electrical engineering for future technology.
- Electrical engineering is a pervasive technology as many systems depend on electronics and electric power.

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What does an Industrial Engineer do?

INDUSTRIAL ENGINEERS work to eliminate wastes of time, money, materials, energy, and other resources.

Although most engineering disciplines limit application of skills to very specific areas, INDUSTRIAL ENGINEERING is applied in virtually every industry.

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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
  - Wireless sensor networks
  - Real-time ubiquitous computing
  - Digital communications
- Reconfigurable computing - design of chips that can be reconfigured to perform diverse tasks in real-time
- Classes include hands-on experience in design and testing of computer-based systems
- We emphasize system-level thinking in both research and teaching - a real edge in the marketplace

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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
- Robotics designs for military and civilian uses
- Image processing and multisensor fusion techniques.
- Electromagnetics and antenna design for microwave frequency
- Power electronics for hybrid electric vehicles and interface with solar cells or fuel cells
- Power system analysis and utility planning
- Most classes include hands-on experience in design/testing of electrical and/or magnetic systems
- We emphasize system-level thinking in both research and teaching - a real edge in the marketplace

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Industrial Engineering at UT provides:

- Opportunities to gain practical experience with our corporate partners
- Scholarship opportunities
  - Models for delivering classroom material
  - Student mentoring program
  - Enhanced advising program
Materials Science & Engineering

Materials
- Metals
- Ceramics
- Polymers
- Electronic
- Composite

Applications
- LCD Displays
- Medical Imaging
- Flash Memory
- Athletic Equipment
- Engine Components
- Catalysis
- Sensors
- Jet Turbines
- DVD-RW
- LED’s

Career Paths
- Development
- Management
- Quality Control
- Manufacturing
- Failure Analysis
- Materials Selection
- Design
- Manufacturing
- Failure Analysis
- Materials Selection

Industries
- Environmental
- Consumer Goods
- Security/Defense
- Telecommunications
- Sporting Goods
- Energy
- Biomedical
- Automotive
- Electronics
- Aerospace

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.

What's happening in ME at UT?

Automotive
- Controls
- Dynamics
- Fluid Mechanics
- Heat Transfer
- Solid Mechanics
- Thermodynamics
- Vibrations

Robotics

Areas of Study

What some Nuclear Engineers do?
- Nuclear Power
- Oil Well Logging
- Nuclear Medicine
- Nuclear Measurements in Industry
- Space Exploration
- Food Irradiation

Unique and Exciting Attributes of the Nuclear Engineering at UT
- Abundant undergraduate scholarships
  - No out-of-state fees for NE students from AL, AR, LA, MS, SC, KY, DE, VA, WV (~$11,000/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
  - UT students have been Finalists in 28 of past 32 years
- New building for UTNE on the horizon (New Estabrook)
- Highest paid engineering discipline offered at UTK according to the 2007 Engineering Income and Salary Survey published by ASCE and NSPE in April, 2007