DEPARTMENT OF ENGINEERING
COLLEGE OF ARTS AND SCIENCES

Faculty

Jeannette Herring Russell (2002). Professor of Engineering and Department Chair. B.S., Mississippi State University; M.B.A., Colorado State University; Ph.D., Vanderbilt University; P.E.

Don Van (2001). Professor of Engineering and Director of Accreditation. B.S. and M.S., University of Illinois in Chicago; M.S. and Ph.D., New Jersey Institute of Technology; P.E., CEM.

Jay Bernheisel (2006). Associate Professor of Engineering. B.S.M.E. and M.S.M.E., Rose-Hulman Institute of Technology; Ph.D., Northwestern University; P.E.

Georg Pingen (2010). Associate Professor of Engineering. B.A., Samford University; B.S. and M.S., Washington University; Ph.D., University of Colorado at Boulder; P.E.

Randal S. Schwindt (2004). Professor of Engineering. B.S., Hardin-Simmons University; M.S., Texas A&M University; Ph.D., University of Illinois-Champaign; P.E.

Staff

Christine Rowland (2006). Academic Secretary—

Admission Requirements
- Students must have a cumulative GPA of at least 3.5, as well as a GPA of at least 3.5 in engineering courses.
- Students must have completed at least ten credit hours of sophomore-level engineering courses. Transfer students must have completed at least two engineering courses at Union.

Progression Requirements
- Students must maintain a GPA of 3.5 overall and in engineering courses.
- Students must complete each honors contract course with a grade of B or better and achieve satisfactory completion of the honors contract for each course.

Curriculum Requirements
- Students must take at least 12 credits of honors contract courses.
  - For electrical engineering concentration students, typical honors contract courses include EGR 361 (4 credits), EGR 405 (4 credits), EGR 475 (4 credits), and EGR 498 (1 credit).
  - For mechanical engineering concentration students, typical honors contract courses include EGR 320 (3 credits), EGR 355 (4 credits), EGR 475 (4 credits), and EGR 498 (1 credit).
- Students must complete an honors project that is distinctly different from the senior design project. The honors project will be either a research project or a humanitarian engineering design project, with specific requirements to be determined in conjunction with the student's departmental honors advisor. It is expected that a typical honors project will require roughly 250-300 hours of work.
- Students must attend four colloquia per year, organized by the Honors Community.

Assessment of Majors

Assessment of majors culminates with the Fundamentals in Engineering (FE) exam taken during the senior year. The test, prepared by the National Council of Examiners for Engineering and Surveying, is administered by the State of Tennessee as the first step toward becoming a licensed professional engineer.

Student Award

The Service through Engineering Award is given by the faculty of the Department of Engineering to the senior who best exemplifies the use of engineering knowledge in service to society.

Course Offerings in Engineering (EGR)

( ) Hours Credit; F–Fall, W–Winter; S–Spring; Su–Summer

101. Introduction to Engineering Design and Analysis (2) F
Provides an overview of the engineering profession, including technical and legal responsibilities, the design and analysis method, and application of the engineering process to problem solving.

105. Engineering Graphics (3) S
Graphical communication methods through one of the widely used software packages–ProE; covers 2-D projections and views, 3-D surface and solid modeling, and general concepts such as object dimensions and tolerances.

109. Introduction to Matlab and Computer Programming (2) S
Pre- or Corequisite: MAT 211.
Introduces computer programming using Matlab as a high-level programming language and as an engineering computational tool. Includes general computer programming principles and structures and the unique features of Matlab, such as vector and matrix operations, with application to engineering.

209. Survey of Computational Engineering (1) F—Odd Years
Using tutorials, an introductory exposure to the broad analysis and optimization capabilities offered by modern engineering software packages will be provided. In particular, structural and thermal simulation and optimization will be explored with Creo Simulate and structural, thermal, uid, and multi-physics simulations will be explored with COMSOL Multiphysics.

210. Materials Engineering (3) S
Prerequisites: CHE 111, PHY 231.
Examines the structure of material at the atomic level, including how physical, thermal, and mechanical properties affect the behavior of materials.

240. Mechanical Engineering Fundamentals I: Mechanics (3) F
Prerequisites: MAT 212; PHY 231.
Introduces vector analysis of forces and torques. Examines rigid bodies and determinate structures at equilibrium. Covers kinematics of a particle and of a rigid body. Presents kinetic analysis using force-acceleration, work-energy, and impulse-momentum techniques.

250. Mechanical Engineering Fundamentals II: Thermo-fluid Dynamics I (4) S
Prerequisite: PHY 232; Pre- or Corequisites: EGR 109; MAT 314.
Introduces macroscopic concepts of thermodynamics, including rst and second laws, properties of a pure substance, and energy analysis; also introduces hydrostatics and uid dynamics, including pressure distribution, relations for uid particles, and development of conservation theorems. Includes weekly lab.

261. Electrical Engineering Fundamentals I: Digital Logic (3) F

Basic principles of logic design, including Boolean algebra, number systems, combinational and sequential logic, and programmable logic devices. Introduces computer simulation techniques for logic circuits. Credit toward the engineering major or minor will not be granted for both EGR 261 and CSC 160.

262. Electrical Engineering Fundamentals II: Electric and Electronic Circuits (4) S

416. Physical Principles of Solid State Devices (3) As Needed
Prerequisites: EGR 262; MAT 314.
Introduces concepts in material science and quantum physics, including modern theory of solids, magnetic and optical properties of materials, semi-conductors and semi-conductor devices, dielectric materials, and superconductivity.

455. Energy Conversion (3) F
Pre- or Corequisite: EGR 355.
Provides a comprehensive analysis of current energy systems, including fossil power plants, nuclear plants, and other forms of renewable energy sources; covers the Rankine cycle, steam generators, combustion, and turbines; presents information on the environmental impact of energy generation.

456. Machine and Mechanism Theory and Design (3) S
Prerequisite: EGR 360.
Covers design, selection, and evaluation of mechanisms for various applications, including planar and spatial linkages, cams, gears, planetary and non-planetary gear systems, linkage synthesis, and linkage dynamics.

470. Heat Transfer (3) S
Prerequisite: EGR 355.
The analysis of various heat transfer modes, including conduction, natural and forced convection, and radiation;