DEPARTMENT OF ENGINEERING

COLLEGE OF ARTS AND SCIENCES

Faculty

Jeannette Herring Russ (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). 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 at Urbana-Champaign; P.E.

Staff

Christine Rowland (2006). Academic Secretary–Engineering, Physics, Math, and Computer Science.

Ethan Wilding (2015). Lab Systems Engineer. B.S., University of Memphis; B.S.E., Union University; M.S., University of Tennessee.

Objectives

1. Graduates will make contributions through engineering practice, graduate school, or other professional pursuits.
2. Graduates will solve problems through inventive thinking.
3. Graduates will participate in continuing education.
4. Graduates will exemplify Christian principles and ethical standards.

Curriculum

Union offers the Bachelor of Science in Engineering, BSE, with concentrations in electrical and mechanical engineering. The curriculum is designed to expose students to a broad base of engineering knowledge and the basic science and math upon which that knowledge rests. In addition, the curriculum at Union includes a strong general education component that provides a greater understanding of the world in which engineering products will ultimately be used.

Because engineering courses build upon one another, the prerequisite sequences that exist in the curriculum must be closely followed. Incoming freshmen will ideally be ready to begin the calculus sequence in their first semester in order to satisfy the various prerequisites and complete the degree in four years.

The engineering major must complete all General Core Requirements to include CHE 111 and MAT 211. The major must also complete the BSE Specific Core comprised of MAT 212, 213, 314 (11 hours); MAT 208 or 315 (3); CSC 255 (3) or CHE 113 (2) plus at least 1 hr. of EGR Elective and PHY 231-32 (10).

The student with an acceptable bachelor's degree seeking the BSE as his second baccalaureate will complete CHE 111, MAT 211 and the BSE Specific Core as prerequisites to the major as well the major requirements described below.

The minor in engineering will benefit non-engineering students who are interested in applied science or fields that involve instrumentation and technology. It can also be useful for students who intend to pursue graduate work in related disciplines not offered at Union.

The minor in computational engineering science will benefit science, engineering, and mathematics students who are interested in the intersection of these three fields. It combines Union's existing strengths in these disciplines to offer an innovative program of study that introduces students to the field of computational modeling and simulations.

The Union BSE program is accredited by the EAC Accreditation Commission of ABET, . Accreditation is a consideration for professional licensure in many states and for admission to some engineering graduate schools. ABET does not accredit minors.

I. Major in Engineering–61 hours
   - A. Major core requirements–47 hours + a Concentration
     1. EGR 101, 105, 109, 210, 240, 250, 261, 262
     2. EGR 330, 342, 360, 375, 391
     3. EGR 475, 491, 492, 498
   - B. Mechanical Engineering Concentration–14 hours
     1. EGR 320, 352, 355
     2. EGR 455, 456
   - C. Electrical Engineering Concentration–14 hours
     1. EGR 361, 365
     2. EGR 405, UL EEC Elective

II. Minor in Engineering – 18 hours

EGR coursework to exclude EGR 391, 491, 492, and 498 (must include 6 upper level hours).

III. Minor in Computational Engineering Science–18 hours
   - A. EGR 109, 209, 325
   - B. CSC 255, 329
   - C. MAT 315, 360
   - D. If a student has taken all required courses but needs additional credits for the minor as the courses above count toward other degrees, students can (with advisor approval) count any other math, science, computer science, or engineering course that does not already fulfill a major/minor degree requirement.

Major in Engineering with Discipline-specific Honors

The discipline-specific honors program in engineering offers students an opportunity to go beyond the basic curriculum through taking engineering contract courses with expanded requirements, completing an original honors project, and attending colloquia sponsored by the Honors Community. Specific program requirements are outlined below, and additional details can be found on the engineering website.

Application Requirements

- At least three full semesters, preferably four, must remain before graduation.
- The applicant must first meet with the Chair of the Engineering Department. If approval to proceed is granted at the departmental level, the student must submit an application to the Office of the Director of the Honors Community.

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

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 first and second laws, properties of a pure substance, and energy analysis; also introduces hydrostatics and fluid dynamics, including pressure distribution, relations for fluid 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
Prerequisites: PHY 232; MAT 212; Pre- or Corequisite: EGR 109.
Fundamental concepts of circuits and electronics, including basic concepts, theorems, and laws of ds and ac circuits. Introduces power sources, passive circuit devices, op amps, and selected semiconductor devices. Includes weekly lab.

320. Mechanics of Materials (3) S
Prerequisites: EGR 210, 240; MAT 314.
The relationship between internal stresses and changes of form produced by external forces acting on solid bodies; also covers normal and shear stresses, strain, elasticity and plasticity, deformations, and loading.

325. Computational Analysis of Structures – Finite Element Methods (3) S – Even Years
Pre-requisites: EGR 109, MAT 212
Finite element methods will be introduced as a means to solve physical phenomena governed by partial differential equations through 1-D and 2-D examples from structural analysis, which will be implemented in Matlab, providing students with a "behind-the-scenes" glimpse of Computational Engineering. Further, this course will explore the most common mistakes made by users of Finite Element Methods in order to teach students how to recognize and avoid those mistakes.

330. Engineering Economy (3) S
Prerequisite: 7 EGR credit hours at the 200 level.
Presents basic principles of economic analysis related specifically

391. Major Project Design Preparation (1) S