

**Education 303 (3)—Teaching and Learning in the Content Area**

*Prerequisites: Education 200, 210, and junior standing.*

This is a course specifically for those who wish to teach on the middle- or secondary-school level. The course examines research on instruction in all content areas. Students practice and critique instructional strategies for developing reading comprehension and critical thinking across the curriculum. The major learning theories of educational psychology are reviewed and then integrated into the organization of instructional materials that students design and field test. Required for teacher licensure. *Ojure.*

*Fall*

**Education 401 (1), 402 (2), 403 (3)—Directed Individual Study**

*Prerequisites: Senior class standing and permission of the Director of Teacher Education. Students must have completed at least one course in professional studies and have had relevant field experience. May be completed in the Lexington area. Students investigate current issues in education through research and work in the field and have opportunities to put educational theory into practice in elementary and secondary school settings. May be repeated for degree credit with permission and if the topics are different. *Ojure.**

**ENGINEERING (ENGN)**

(Department of Physics and Engineering)

PROFESSORS REESE, VAN NESS  
ASSOCIATE PROFESSOR SUKOW  
ASSISTANT PROFESSORS EASON, KUEHNER,  
MAZILU

**MAJORS**

A major in **physics-engineering** leading to a Bachelor of Science degree requires the completion of 50 credits, no more than six credits of which may be from 400-level courses, and including the following:

1. Engineering 160, 203, 204, 207 (Physics 207), 225 (Physics 225), 240 (Physics 240), 301, 311, 351; Mathematics 332; and Physics 111, 112, 113, 114
2. Six credits from 300- or 400-level courses in biology, chemistry, computer science, engineering, geology, mathematics, or physics, with no more than three credits at the 400 level
3. Six credits from the following:  
Biology 111 or biology numbered 200 or above  
Chemistry 111 and 112 or chemistry numbered 200 or above  
Computer Science 111 and 112, or those numbered 200 or above  
Engineering numbered 200 or above  
Geology 100, 101 or geology numbered 200 or above  
Mathematics numbered 300 or above  
Physics numbered 200 or above.

Additional courses required as prerequisites for completion of the above include Mathematics 101, 102 and 221.

The **3-2 plan in physics-engineering** (see "Dual Degree Program," page 62) leading to a Bachelor of Science degree requires completion of 50 credits including the following:

1. Chemistry 111, 112; Engineering 203, 225 (Physics 225), 301; Mathematics 101, 102, 221, 332; and Physics 111, 112, 113, 114
2. Six credits in engineering and/or physics numbered 200 or above.

A major in **chemistry-engineering** leading to a Bachelor of Science degree requires completion of 50 credits including the following:

1. Chemistry 241 or 241S
2. Chemistry 242; Engineering 203, 204, 240 (Physics 240), 311; Mathematics 221, 332; Physics 111, 112, 113, 114
3. Chemistry 260 or 261
4. Eleven additional credits chosen from the following: Chemistry courses numbered 200 or above; Physics courses numbered 200 or above; Engineering courses numbered 160 and above; Biology 111 or Biology courses numbered 200 or above. No more than three of these credits may be numbered 400 or above.

Additional courses required as prerequisites for completion of the above include Chemistry 111 and 112 and Mathematics 101 and 102.

The **3-2 plan in chemistry-engineering** (see “Dual Degree Program,” page 62) leading to a Bachelor of Science degree requires completion of 50 credits including the following:

1. Chemistry 242, 261; Engineering 203, 204; and Mathematics 221
2. Eleven additional credits in engineering and/or physics.

Additional courses required as prerequisites for completion of the above include Chemistry 111 and 112 and 241 or 241S and Mathematics 101 and 102.

*HONORS: An Honors Program in engineering is offered for qualified students; see department head for details.*

### **Engineering 100 (Physics 100) (1)—Computing in Physics and Engineering**

*Pass/Fail only. Prerequisite: Permission of the instructor.* An introduction to the use of computing tools essential to degree work in physics and engineering. Students are instructed in the use of microcomputers, the university network, word processing, spreadsheets, computer algebra packages, and advanced symbolic mathematics tools. *Staff.*

*Fall*

### **Engineering 101 (3)—How It Works, How It's Made**

*Designed for non-science and non-major students.* An introduction to the engineering and science behind devices that students use or are exposed to everyday. Contemporary equipment and technology along with their applications are presented first, gaining familiarity with a subject before studying the underlying scientific aspects. By investigating “how it works,” students become aware of fundamental physical principles. Examining “how it's made,” students are exposed to the engineering design criteria which govern all manufactured objects. (SC, GE5c) *Kuehner.*

*Fall 2008 and alternate years*

### **Engineering 160 (3)—CADD: Computer-Aided Drafting and Design**

*Prerequisite: Mathematics 102 with C or better.* An introduction to engineering and architectural drawing using a CADD program. Basic orthographic projection, pictorials, and assembly drawings. Introduction to the use of solid modeling in three dimensions. (SC, GE5c) *Kuehner.*

*Spring*

### **Engineering 203 (3)—Mechanics I: Statics**

*Prerequisite: Mathematics 102. Pre- or corequisite: Physics 111.* The science of mechanics is used to study bodies in equilibrium under the action of external forces. Emphasis is on problem solving: trusses, frames and machines, centroids, area moments of inertia, beams, cables, and friction. *Van Ness.*

*Fall*

### **Engineering 204 (3)—Mechanics II: Dynamics**

*Prerequisite: Engineering 203.* A study of kinetics of particles and rigid bodies including force, mass, acceleration, work, energy, momentum. A student may not receive degree credit for both Engineering 204 and Physics 230. *Kuehner.*

*Winter*

### **Engineering 207 (Physics 207) (4)—Electrical Circuits**

*Prerequisite: Engineering/Physics 225.* A detailed study of electrical circuits and the methods used in their analysis. Basic circuit components, as well as devices such as operational amplifiers, are investigated. The laboratory acquaints the student both with fundamental electronic diagnostic equipment and with the design and behavior of useful circuits. Laboratory course. *Sukow or Eason.*

*Fall*

### **Engineering 208 (Physics 208) (3)—Electronics**

*Prerequisite: Engineering/Physics 207.* An introduction to basic analog and digital electronics. Topics may include diodes, transistors, logic gates, flip-flops, counters and timers, and phase-locked loops. The integrated laboratory component of this course acquaints the student with the design of basic analog and digital circuits, and with the diagnostic techniques used to study these circuits. Laboratory course. *Sukow or Eason.*

*Offered when interest is expressed and departmental resources permit.*

### **Engineering 225 (Physics 225) (3)—Mathematical Methods for Physics and Engineering**

*Prerequisites: Physics 112, Mathematics 221.* Study of a collection of mathematical techniques particularly useful in upper-level courses in physics and engineering: vector differential operators such as gradient, divergence, and curl; functions of complex variables; Fourier analysis; orthogonal functions; matrix algebra and the matrix eigenvalue problem. *Mazilu.*

*Winter*

### **Engineering 240 (Physics 240) (3)—Thermodynamics**

*Prerequisites: Physics 112 and Mathematics 221.* A study of the fundamental concepts of thermodynamics, thermodynamic properties of matter, and applications to engineering processes. *Van Ness.*

*Winter*

### **Engineering 251 (Physics 251) (4)—Experimental Methods in Physics and Engineering**

*Prerequisite: Physics 112 or permission of the instructor.* An introduction to the design and implementation of experimental methods. Execution of the methods focuses on current data acquisition techniques, along with a study of standard data reduction and analysis. Results are examined in order to review the experimental method employed and to redesign the method for future experiments. This course is intended for any science major interested in performing experimental research on campus or in graduate school. *Kuehner.*

*Fall 2007 and alternate years*

**Engineering 255 (Physics 255) (3)—C++ for Engineering and Physics**

*Prerequisite:* *Physics 112*. An introduction to the C++ computing language, with applications characteristic of computation-intensive work in engineering and physics. Difference approximations to differential equations, stochastic methods, graphical presentation, and nonlinear dynamics are among the topics covered. Students need not have previous experience with C++.

*Spring*

**Engineering 260 (Physics 260) (3)—Materials Science**

*Prerequisite:* *Physics 112*. An Introduction to Solid State Materials. A study of the relation between microstructure and the corresponding physical properties for metals, ceramics, polymers, and composites.

*Van Ness*  
*Winter*

**Engineering 265 (Biology 265) (6)—Integrative Science: Cardiovascular Disease**

*Prerequisites:* *Biology 111 or Physics 112*. This course integrates biology, physics, engineering and mathematical modeling through the study of the cardiovascular system and cardiovascular disease. A variety of cardiovascular disease states are used to reinforce basic mechanical and electrical principles of cardiovascular physiology. Treatments using these physiological and/or engineering principles are also considered, such as cardiovascular drugs and drug delivery systems, heart and blood vessel transplantation, defibrillators and heart monitors, etc. Laboratories provide an opportunity to investigate fluid dynamics, cardiovascular monitoring using physiological transducers, computer heart/vessel modeling software, diagnostic imaging (ultrasound/MRI), etc. Speakers and site visits highlight cardiovascular medicine (clinical and/or veterinary), epidemiology, FDA medical device approval and testing, vascular stent design, etc., to provide a wider relevance to our discussions. Laboratory course.

*Eason, l'Anson*  
*Spring 2008 and alternate years*

**Engineering 295 (3)—Intermediate Special Topics in Engineering**

*Prerequisites:* *Physics 111 and 112*. Intermediate work in bioengineering, solid mechanics, fluid mechanics or materials science. May be repeated for a maximum of six credits with permission and if the topics are different.

*Staff*  
*Offered when interest is expressed and departmental resources permit.*

**Engineering 301 (3)—Solid Mechanics**

*Prerequisite:* *Engineering 203*. Internal equilibrium of members; introduction to mechanics of continuous media; concepts of stress, material properties, principal moments of inertia; deformation caused by axial loads, shear, torsion, bending and combined loading.

*Van Ness*  
*Fall*

**Engineering 302 (3)—An Introduction to the Finite Element Method**

*Prerequisites:* *Engineering 301 and Mathematics 332*. An introduction to the finite element method using a variational approach to obtain numerical solutions of differential equations governing physical problems. Examples will be drawn from solid mechanics, fluid mechanics and electrostatics.

*Staff*  
*Offered when interest is expressed and departmental resources permit.*

**Engineering 311 (4)—Fluid Mechanics**

*Prerequisite:* *Engineering 204 or Physics 230*. Fluid statics; application of the integral mass, momentum, and energy equations using control volume concepts; introduction to viscous flow and boundary layer theory. Laboratory course.

*Kuehner*  
*Winter*

**Engineering 330 (3)—Mechanical Vibrations**

*Prerequisites:* *Engineering 204 or Physics 230, Mathematics 332*. Analysis of lumped parameter and continuous systems (free and forced, damped and undamped, single- and multi-degree-of-freedom); transient response to shock pulses; simple linear systems; exact and approximate solution techniques; and solution to continuous systems using partial differential equations.

*Staff*  
*Offered when interest is expressed and departmental resources permit.*

**Engineering 351 (1)—Solid Mechanics Laboratory**

*Corequisite:* *Engineering 301*. Experimental observation and correlation with theoretical predictions of elastic behavior of structures under static loading; statically determinate and indeterminate loading of beams and trusses; shear; and torsion. Laboratory course.

*Van Ness*  
*Fall*

**Engineering 361 (Physics 361) (3)—Polymer Science and Engineering**

*Prerequisite:* *Engineering/Physics 240 or Chemistry 261 or permission of the instructor*. Science and engineering of large molecules. Physical and chemical structure of polymers correlated with mechanical properties. Crystal morphology. Theory of rubber elasticity. Time and temperature dependent properties of polymers. Relevance to polymer physics and chemical and mechanical engineering.

*Van Ness*  
*Spring*

**Engineering 395 (3)—Special Topics in Engineering**

*Prerequisite:* *Junior standing*. Advanced work in solid mechanics, fluid mechanics, heat transfer, or materials science. Topics selected based on student interest. May be repeated for a maximum of six credits with permission and if the topics are different.

*Staff*  
*Offered when interest is expressed and departmental resources permit.*

**Engineering 401 (1), 402 (2), 403 (3)—  
Engineering Problems**

*Prerequisites: Junior standing and approval of the instructor.* A special course of instruction, reading and investigation designed to serve the needs of individual students in a selected field of proposed engineering endeavor. May be repeated for degree credit with permission. *Staff.*

**Engineering 421 (1), 422 (2), 423 (3)—Directed  
Individual Research**

*Prerequisite: Permission of the instructor.* Directed research in engineering. May be repeated for degree credit with permission of the instructor. *Staff.*

**Engineering 493 (3-3)—Honors Thesis**

*Prerequisites: Permission of the instructor and departmental honors candidacy. Staff.*

*Fall-Winter*

**ENGLISH (ENGL)**

PROFESSORS **WHEELER**, CRAUN, DOBIN, KEEN, WARREN  
ASSOCIATE PROFESSORS ADAMS, CONNER, SMOUT  
ASSISTANT PROFESSORS BRAUNSCHNEIDER, GERTZ, MIRANDA, PICKETT, SOLOMON

**MAJOR**

A major in **English** leading to a Bachelor of Arts degree requires 36 credits, exclusive of English 101, 105, and 201. The credits must include:

1. English 299 (should be completed in the sophomore year)
2. Three to nine credits chosen from English 203, 204, 230, 231, 232, 233, 234, 235, 236, 250, 251, 252, 253, 260, 261, 262, 291, 292, 293, and 294
3. 24-30 additional credits from courses numbered at the 300 level or above
4. Completion of the capstone writing requirement with either English 413 (3) or 493 (3-3)
5. At least nine credits must be chosen from each of the following areas, with no more than one 200-level course counting in each. English 236 and 370 can be used in any area, but both cannot be used in the same area.
  - a. *Early British Literature*—English 250, 251, 252, 312, 313, 314, 316, 318, 319, 320, 326, 330, 333, 334, 335, 358, and when the topic is appropriate, 203, 204, 230, 231, 235, 261, 291, 292, 299, 380, 403, 413, and 493
  - b. *Later British Literature and World Literature in English*—English 251, 333, 334, 335, 341, 345, 348, 350, 351, 352, 353, 354, 355, 359, and when the topic is appropriate, 203, 204, 230, 231, 232, 233, 234, 235, 261, 262, 291, 292, 294, 299, 380, 403, 413, and 493
  - c. *American Literature*—English 253, 293, 354, 359, 362, 363, 364, 365, 366, 367, 368, 369, and when the topic is appropriate, 203, 204, 230, 231, 232, 233, 234, 260, 261, 262, 291, 294, 299, 380, 403, 413, and 493.

The English faculty urges majors to craft their courses of study to include lyric poetry, narrative, nonfiction prose, and drama.

*HONORS: An Honors Program in English is offered for qualified students; see department head for details.*

**English 101 (3)—Expository Writing**

*Sections limited to 15 students each.* Concentrated work in English composition, emphasizing rhetoric, style, and structure, and giving some attention to methods of documentation. The course focuses primarily on the students' own compositions and includes regular conferences with the instructor. (FW, GE1) *Staff.*

*Fall*