

ECONOMICS 395 (3)—Mathematical Economics

Prerequisites: Economics 101, 102, and at least junior standing. Economic theory with emphasis on the calculus as the vehicle of exposition. The economic analysis includes models from welfare economics, production and distribution theories, the theory of the firm, macro-economic fiscal and monetary theories, growth models, and dynamic input-output models. Students undertaking graduate work in economics without this background would be at a distinct disadvantage. *Cline, Kaiser, Winfrey.*
Winter, Spring

ECONOMICS 396 (6)—Supervised Study Abroad

Prerequisites: Economics 101, 102, at least junior standing, permission of the instructor(s), other prerequisites as specified by the instructor(s), and approval of the Foreign Study Committee. For advanced students, the course covers a topic of current interest for which foreign travel provides a unique opportunity for significantly greater understanding. Emphasis changes from year to year and will be announced each year well in advance of registration. May not be repeated. *Staff.*
Spring

ECONOMICS 399 (3)—Special Topics in Economics

Prerequisites: Economics 101, 102, and at least junior standing. For advanced students, the course covers the most interesting current topics in economics. Emphasis changes from year to year, and will be announced each year during the winter term before registration. May be repeated for a maximum of nine credits with the permission of the department head. *Staff.*
Spring

ECONOMICS 401 (1), 402 (2), 403 (3), 406 (6)—Directed Individual Study

Prerequisites: Six credits in economics courses numbered 200 or above, either a cumulative grade-point average of 3.000 or of 3.000 in all economics courses, and permission of the instructor. The objective is to permit students to follow a course of directed study in some field of economics not presented in other courses, or to emphasize a particular field of interest. May be repeated for degree credit with permission for different topics. *Staff.*

ECONOMICS 493 (3-3)—Honors Thesis

This course is required of Honors candidates in addition to the 21 credits in economics (courses numbered 200 and above) required of all economics majors.
Fall-Winter

ENGINEERING

(Department of Physics and Engineering)

PROFESSORS AKINS, VAN NESS

MAJOR

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), 240 (Physics 240), 301, 311, 351; Mathematics 242, 332; and Physics 111, 112, 113, 114
2. Six credits from 300- or 400-level courses in chemistry, computer science, engineering, geology, mathematics, or physics with no more than three credits at the 400 level
3. Six credits from the following:
Chemistry 111, 112, or those numbered 200 or above
Computer Science 111, 112, 120 or those numbered 200 or above
Engineering numbered 200 or above
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** leading to a Bachelor of Science degree requires completion of 50 credits including the following:

1. Chemistry 111, 112; Computer Science 120; Engineering 203, 301; Mathematics 101, 102, 221, 242, 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, 242, 243, 261; Engineering 203, 204, 240 (Physics 240), 311; Mathematics 221, 332; and Physics 111, 112, 113, 114
2. Eight additional credits chosen from the following: Chemistry courses numbered 200 or above; Physics courses numbered 200 or above; all Engineering courses. 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** leading to a Bachelor of Science degree requires completion of 50 credits including the following:

1. Chemistry 242, 261; Computer Science 120; Engineering 203, 204; and Mathematics 221
2. 11 additional credits in engineering and/or physics

Additional courses required as prerequisites for completion of the above include Chemistry 111, 112, and 241 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. *Akins and Williams.*

Fall

★ENGINEERING 160 (3)—Descriptive Geometry and Computer-aided Drafting

Prerequisite: Mathematics 102 with C or better. An introduction to the use of analysis and graphics in engineering. Descriptive geometry, computer graphics, engineering drawings, and modeling as applied to simple engineering problems are introduced. Primarily for freshmen. Laboratory course. *Akins.*

Spring

ENGINEERING 203 (3)—Mechanics I: Statics

Prerequisite: Mathematics 102. 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 (force, mass, acceleration, work, energy) and mechanical vibrations. A student may not receive degree credit for both Engineering 204 and Physics 230. *Akins.*

Winter

ENGINEERING 207 (Physics 207) (4)—Electrical Circuits

Prerequisite: Physics 112 and 114. A detailed study of the methods used in the analysis of electrical circuits. The laboratory acquaints the student with fundamental electronic diagnostic equipment while investigating the behavior of basic circuit elements and devices such as operational amplifiers. Laboratory course. *Donaghy.*

Fall

[ENGINEERING 208 (Physics 208) (3)—Electronics]

(Offered when interest is expressed and departmental resources permit.) Prerequisite: Physics 112 and 114 and Engineering/Physics 207. An introduction to basic analog and digital electronics. The laboratory acquaints the student with the design of basic analog and digital circuits, and with the diagnostic techniques used to study these circuits. Laboratory course. *Donaghy.*

ENGINEERING 240 (Physics 240) (3)—

Thermodynamics

Prerequisites: Physics 112 and 114 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 (Computer Science 251) (3)—Laboratory Computer Application

Techniques and applications of digital data acquisition and automated experimental control. The course is intended for any science major interested in the use of computers in experimental work. Laboratory course. *Akins.*

Fall

ENGINEERING 260 (3)—Materials Science

Prerequisite: Physics 112 and 114. An introduction to the relations between both physical and mechanical properties and the microstructures of such diverse solid materials as metals, polymers, ceramics, and composites. *Van Ness.*

Winter

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

Prerequisite: 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. *Akins.*

Fall

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. *Akins.*

Winter

ENGINEERING 312 (3)—Heat Transfer

Prerequisites: Engineering 311, Engineering/Physics 240. Basic principles of heat transmission by conduction, convection, and radiation. Application of these principles to selected problems in engineering. *Akins.*

Winter

[ENGINEERING 330 (3)—Mechanical Vibrations]

(Spring 2000 and alternate years)

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. *Williams.*

ENGINEERING 331 (3)—Rigid Body Dynamics

(Alternate years)

Prerequisites: Engineering 204 or Physics 230, Mathematics 332. Kinematics and kinetics of three-dimensional motion of rigid bodies. Topics covered include principle axes and moments of inertia, Euler's equations, introduction to energy methods, Lagrange's equations, generalized coordinates and constraint equations. *Akins.*

Spring

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; torsion. Laboratory course. *Van Ness.*

Fall

[ENGINEERING 360 (Physics 360) (3)—Physical Metallurgy]

(Offered when interest is expressed and departmental resources permit.) Prerequisite: Engineering/Physics 240 or Chemistry 261 or permission of the instructor. An advanced discussion of structure-property relations of solid materials. Topics include phase equilibria for single and multi-component systems, diffusion, theory of dislocations, nucleation, solid solution theory, strengthening mechanisms for metals, alloys, elastic and plastic deformation. *Van Ness.*

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

(Offered when interest is expressed and departmental resources permit.) 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. Production and characterization. Chain statistics and rubber elasticity. Time and temperature dependent properties of polymers. Engineering applications. *Van Ness.*

Spring

[ENGINEERING 395 (3)—Special Topics in Engineering]

(Offered when interest is expressed and departmental resources permit.) Prerequisite: Junior standing. Advanced work in solid mechanics, fluid mechanics, 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.*

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