Engineering

College of Engineering and Computer Science

Minor

PROGRAM DESCRIPTION

Non-majors in Engineering may elect to minor in this field. Minor requirements may be satisfied by completing 21 approved units, of which 12 must be upper division. Students who have not completed the lower division requirements in calculus, including differential equations, physics, chemistry, and a few engineering courses will find it difficult to complete this minor in the four-year program due to the prerequisite requirements of upper division engineering courses.

Students wishing to minor in engineering must have their minor program approved by the Dean of the College of Engineering and Computer Science.

Minor • Requirements

Total units required for Minor: 21

Courses in parentheses are prerequisites.

The program should normally include:

(3)	ENGR 17	Introductory Circuit Analysis (PHYS 11C, MATH 45; either the math or physics may be taken concurrently, but not both)
(3)	ENGR 30	Analytic Mechanics: Statics (PHYS 11A, MATH 31, CE 4, or ENGR 6)
(3)	ENGR 45	Engineering Materials (PHYS 11A, CHEM 1A; CHEM 1A may be taken concurrently)
(3)	ENGR 110	Analytic Mechanics - Dynamics (ENGR 30, MATH 32, MATH 45)
(3)	ENGR 112	Mechanics of Materials (ENGR 30, ENGR 45, MATH 45)
(3)	ENGR 124	Thermodynamics (MATH 32, PHYS 11A, CHEM 1A)
(3)	ENGR 132	Fluid Mechanics (ENGR 110)

Faculty

Faculty will be drawn from the College of Engineering and Computer Science.

Contact Information

John Oldenburg, Associate Dean
Cynda Dart, Administrative Support Coordinator
Riverside Hall 2014
(916) 278-6366
www.ecs.csus.edu

Lower Division Courses

ENGR 1. Introduction to Engineering. Provide problem-solving skills needed in all areas of engineering offered at Sacramento State. Students will be exposed to different areas of engineering and will understand the relationship between them. Statics and dynamics, materials testing, surveying, fluid mechanics, analog circuits and digital circuits, and robotics will be introduced. Computers will be used throughout. Laboratory three hours. **Note:** Not for degree credit. **Prerequisite:** Algebra and Trigonometry, or instructor permission. **Graded:** Credit / No Credit. **Units:** 1.0.

ENGR 1A. Fundamentals of Engineering. Problem solving skills needed in all areas of engineering offered at Sacramento State. Exposure to the different areas of engineering, and understanding of the relationship between them. Students will work in teams and complete hands-on engineering laboratory experiments and projects. Development of effective communication skills by presenting periodic oral and written reports. Computers will be used throughout. Lecture two hours, laboratory three hours. **Note:** Not for degree credit. **Prerequisite:** Algebra and trigonometry or instructor permission. **Graded:** Credit / No Credit. **Units:** 3.0.

ENGR 2. Robotics Explorations. Introduction to robotics. History of robotics, recent advances in the field, common devices such as sensors and actuators. Use of modular robotic kits. Students will be assigned competition based projects. **Prerequisite:** Algebra and Trigonometry. **Units:** 3.0.

ENGR 6. Engineering Graphics and CADD (Computer Aided Drafting and Design). In-depth graphical analysis and solution of typical three-dimensional space problems by applying the principles of orthogonal projection. Fundamentals of interactive computer aided design and drafting. Preparation of engineering drawings utilizing the CAD system. Lecture two hours; laboratory three hours. **Units:** 3.0.

ENGR 6W. Engineering Graphics and CADD Workshop. Problem solving and discussion of topics in Engineering Graphics and CADD (Computer Aided Drafting and Design) to enhance students' understanding of subject matter. Not for degree credit. Technical activity and laboratory, two hours. **Corequisite:** ENGR 6. **Graded:** Credit / No Credit. **Units:** 1.0.

ENGR 7. 3-D CAD Solid Modeling. Applications of three-dimensional representation techniques as used in a typical CAD (computer aided drafting) software package (AutoCAD). Fundamentals employed in creating, modifying, analyzing and filing engineering drawings. This course will have a mechanical emphasis. Lecture two hours; laboratory three hours. **Prerequisite:** ENGR 4 or ENGR 6. **Units:** 3.0.

ENGR 17. Introductory Circuit Analysis. Writing of mesh and node equations. DC and transient circuit analysis by linear differential equation techniques. Application of laws and theorems of Kirchoff, Ohm, Thevenin, Norton and maximum power transfer. Sinusoidal analysis using phasors, average power. **Prerequisite:** PHYS 11C, MATH 45; either the math or physics may be taken concurrently, but not both. **Units:** 3.0.

ENGR 17W. Circuits Workshop. Elaborates on fundamentals and enhances students' understanding of circuits. **Note:** Not for degree credit. **Corequisite:** ENGR 17. **Graded:** Credit / No Credit. **Units:** 1.0.

ENGR 30. Analytic Mechanics: Statics. Statics of particles. Equivalent systems of forces. Equilibrium of rigid bodies. Centroids, centers of gravity and forces on submerged surfaces. Analyzes trusses including use of computer programs. Analyzes frames and machines. Forces in beams including shear and moment diagrams. Friction. Moments of inertia. **Prerequisite:** PHYS 11A, MATH 31, ENGR 4 or ENGR 6. **Units:** 3.0.

ENGR 30W. Statics Workshop. Problem solving and discussion of topics in statics to enhance students' understanding of subject matter. Activity two hours. **Corequisite:** ENGR 30. **Graded:** Credit / No Credit. **Units:** 1.0.

ENGR 45. Engineering Materials. Basic principles of mechanical, electrical and chemical behavior of metals, polymers and ceramics in engineering applications; topics include bonding, crystalline structure and imperfections, phase diagrams, corrosion, and electrical properties. Laboratory experiments demonstrate actual behavior of materials; topics include metallography, mechanical properties of metals and heat treatment. Lecture two hours; laboratory three hours. **Prerequisite:** PHYS 11A, CHEM 1A; CHEM 1A may be taken concurrently. **Units:** 3.0.

ENGR 45W. Engineering Materials Workshop. Problem solving and discussion of topics in materials science to enhance students' understanding of subject matter. Activity two hours. **Note:** Can not be used for the degree requirement. **Graded:** Credit / No Credit. **Units:** 1.0.

ENGR 60. MEP Orientation and Problem Solving. Mandatory class for MEP freshman students on orientation to the University, its resources, facilities and faculty. Students will be encouraged to form a group atmosphere where they can freely interact with each other and value each other as resources. Students will be provided with instruction and materials on study skills, note taking, time management, preparing for tests and dealing with stress. Presentation by working engineers and field trips to engineering firms will be taken. Personal and professional development will also be part of the freshman orientations with leadership, public speaking and career planning being topics of discussion. Lecture one hour; activity two hours. **Note:** Not for use as an engineering major technical elective and is not applicable to the baccalaureate degree. **Graded:** Remedial Grade Basis. **Units:** 2.0.

ENGR 70. Engineering Mechanics. Statics of particles. Equivalent systems of forces. Equilibrium of rigid bodies. Centroids, centers of mass and gravity. Analyzes trusses, frames and machines. Friction. Moments of inertia. Fundamental principles of kinematics and kinetics, study of motion and force analysis of particles and rigid bodies. **Prerequisite:** PHYS 11A. **Units:** 3.0.

ENGR 96. Experimental Offerings in Engineering. When a sufficient number of qualified students are interested, one of the staff will conduct a seminar on some topic of engineering. **Note:** May be repeated for credit with permission of advisor. **Units:** 1.0-4.0.

Upper Division Courses

ENGR 105. Sustainable Design and Construction. Strategies, analysis methods, and processes of environmentally conscious planning, design, construction, operation, deconstruction, and assessment of engineered facilities. Presents a systematic framework for problem solving, decision making, design, and construction using the principles of sustainability as guiding objectives. Tools, and techniques for gathering information, generating, analyzing, and evaluation alternatives, and developing implementation strategies are presented and demonstrated. **Prerequisite:** Upper division standing or instructor permission. **Units:** 3.0.

ENGR 110. Analytic Mechanics - Dynamics. Fundamental principles of kinematics and kinetics, study of motion and force analysis of particles and rigid bodies, application to idealized structures and physical systems, introduction to free and forced vibrations. **Prerequisite:** ENGR 30, MATH 32, MATH 45. **Units:** 3.0.

ENGR 110W. Analytic Mechanics-Dynamics Workshop. Problem solving and discussion of topics in dynamics to enhance students' understanding of subject matter. Activity two hours. **Note:** Can not be used for degree requirement. **Corequisite:** ENGR 110. **Graded:** Credit / No Credit. **Units:** 1.0.

ENGR 112. Mechanics of Materials. Stresses, strains and deformations in elastic behavior of axial force, torsion and bending members, and design applications. Statically indeterminate problems. Strain energy. Column stability. **Prerequisite:** ENGR 30, ENGR 45, MATH 45. **Units:** 3.0.

ENGR 115. Statistics for Engineers. Application of statistical methods to the analysis of engineering and physical systems. Data collection, characteristics of distributions, probability, uses of normal distribution, regression analysis, and decision-making under uncertainty. **Prerequisite:** MATH 31, may be taken concurrently. **Units:** 2.0.

ENGR 117W. Networks Workshop. Elaborates on fundamentals and enhances students' understanding of networks. **Note:** Not for degree credit. **Corequisite:** EEE 117. **Graded:** Credit / No Credit. **Units:** 1.0.

ENGR 120. Probability and Random Signals. Probability and random signals and their application in engineering systems. Topics include the random sample space model, concept of axiomatic probability, conditional probability, discrete and continuous random variables, probability density and distribution functions, functions and statistics of random variables, random vectors multivariate distributions, and correlation and covariance of random vectors. Applications include estimation, risk, signal detection, random signals and noise in linear systems, reliability, and estimation. **Prerequisite:** EEE 180; may be taken concurrently. **Units:** 3.0.

ENGR 124. Thermodynamics. Study of thermodynamic principles and their applications to engineering problems. Includes a study of the first and second laws, the properties of pure substances and ideal gas, gas/vapor mixtures, and an introduction to thermodynamic cycles. **Prerequisite:** MATH 32, PHYS 11A, CHEM 1A. **Units:** 3.0.

ENGR 124W. Thermodynamics Workshop. Problem solving and discussion of topics in thermodynamics to enhance students' understanding of subject matter. Activity two hours. **Corequisite:** ENGR 124. **Graded:** Credit / No Credit. **Units:** 1.0.

ENGR 132. Fluid Mechanics. Lectures and problems in the fundamental principles of incompressible and compressible fluid flow. **Prerequisite:** ENGR 110. **Units:** 3.0.

ENGR 140. Engineering Economics. Evaluation of economic consequences of engineering design proposals on projects. Emphasis on marginal or incremental economic analysis using Net Present Value, Annual Equivalence, Rate of Return and Benefit-Cost methods including multiple alternatives, taxes, uncertainty, inflation, organizational constraints and money market factors. **Prerequisite:** ENGR 17, ENGR 30, or MET 30, or instructor permission. **Units:** 2.0.

ENGR 167. Robotics I Laboratory. Units: 1.0.

ENGR 181. Electronic Materials. Basic principles of materials behavior pertaining to electronics applications. Topics include electrical conductivity, bonding, crystal structures, optical properties, magnetic properties, energy transfer, and the fundamentals of some simple electronic devices. Lecture 3 hours. **Prerequisite:** CHEM 1A, PHYS 11A, MATH 45. **Units:** 3.0.

ENGR 194. Career Development in Engineering and Engineering Technology. Designed for engineering and engineering technology students making career decisions. Instruction will include effective career planning strategies and techniques including skill assessments, interest, values, employment search strategy, goal setting, time management, interview techniques, and resume writing. Lecture one hour. **Prerequisite:** Senior status. **Graded:** Credit / No Credit. **Units:** 1.0.

ENGR 196. Experimental Offerings in Engineering. When a sufficient number of qualified students apply, one of the staff will conduct a seminar in some topic of engineering. **Note:** May be repeated for credit with permission of advisor. **Units:** 3.0.

ENGR 198. Co-Curricular Activities in Engineering and Computer Science. Designed for Engineering and Computer Science majors. Activities which expand and enhance a student's educational experiences including tutoring, peer advising, mentoring, leadership roles in engineering and computer science student organizations, and other activities related to the subject matter and concerns of the major and program. **Note:** May be repeated for credit. **Prerequisite:** Instructor permission. **Graded:** Credit / No Credit. **Units:** 1.0-3.0.

Graduate Courses

ENGR 201. Engineering Analysis I. Mathematical methods for the solution of advanced engineering problems. Vector analysis, tensors and matrix algebra, complex variable techniques. The applications of these methods to practical engineering problems are demonstrated. **Prerequisite:** MATH 45. **Units:** 3.0.

ENGR 202. Engineering Analysis II. Mathematical methods for the solution of advanced engineering problems. Solutions of ordinary and partial differential equations, Fourier series and Laplace transforms and operational calculus. The applications of these methods to practical engineering problems are demonstrated. **Prerequisite:** MATH 45. **Units:** 3.0.

ENGR 203. Engineering Statistics. Applications of statistics to engineering problems. Collection and analysis of data, sampling methods, design of experiments, probability theory, decision theory, analysis of variance, regression analysis, and mathematical curve fitting. **Prerequisite:** ENGR 115 or equivalent. **Units:** 3.0.

ENGR 296. Experimental Offerings in Engineering. When a sufficient number of qualified students are interested, one of the staff will conduct a seminar in some advanced topic in engineering. **Note:** May be repeated for credit with permission of advisor. **Units:** 1.0-4.0.