ENGINEERING (ENGR)

ENGR 1. Introduction to Engineering. 1 Unit
Prerequisite(s): Engineering major status or instructor permission
General Education Area/Graduation Requirement: Understanding Personal Development (E)
Term Typically Offered: Fall, Spring

Engineering study skills, fundamentals of the engineering design process and problem solving, current engineering challenges. Distinctions and similarities of different engineering disciplines. The engineering profession, ethics, teamwork, communication skills. Course helps students make an informed choice of their engineering majors.
Credit/No Credit

ENGR 1A. Fundamentals of Engineering. 3 Units
Prerequisite(s): Algebra and trigonometry or instructor permission.
Term Typically Offered: Fall, Spring

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.

Credit/No Credit

ENGR 2. Robotics Explorations. 3 Units
Prerequisite(s): Algebra and Trigonometry.
Term Typically Offered: Fall, Spring

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.

ENGR 6. Engineering Graphics and CADD (Computer Aided Drafting and Design). 3 Units
General Education Area/Graduation Requirement: Understanding Personal Development (E)
Term Typically Offered: Fall, Spring, Summer

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.

ENGR 6W. Engineering Graphics and CADD Workshop. 1 Unit
Corequisite(s): ENGR 6.
Term Typically Offered: Fall, Spring, Summer

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.
Credit/No Credit

ENGR 7. 3-D CAD Solid Modeling. 3 Units
Prerequisite(s): ENGR 4 or ENGR 6.
Term Typically Offered: Fall, Spring

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.

ENGR 17. Introductory Circuit Analysis. 3 Units
Prerequisite(s): PHYS 11C, MATH 45; either the math or physics may be taken concurrently, but not both.
Term Typically Offered: Fall, Spring, Summer

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.

ENGR 17P. Peer-Assisted Learning ENGR 17. 1 Unit
Corequisite(s): ENGR 17
Term Typically Offered: Fall, Spring

Students concurrently enrolled in ENGR 17P work through faculty-designed problems sets under the guidance of a trained student facilitator to improve their understanding of ENGR 17P content. Pedagogical strategies that encourage active, engaged learning are employed to facilitate student success. Discussion, 2 hours.
Credit/No Credit

ENGR 17W. Circuits Workshop. 1 Unit
Corequisite(s): ENGR 17.
Term Typically Offered: Fall, Spring, Summer

Elaborates on fundamentals and enhances students' understanding of circuits.
Note: Not for degree credit.

Credit/No Credit

ENGR 30. Analytic Mechanics: Statics. 3 Units
Prerequisite(s): PHYS 11A and MATH 31
Term Typically Offered: Fall, Spring, Summer

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.

ENGR 30P. Peer-Assisted Learning ENGR 30. 1 Unit
Corequisite(s): ENGR 30
Term Typically Offered: Fall, Spring

Students concurrently enrolled in ENGR 30 work through faculty-designed problems sets under the guidance of a trained student facilitator to improve their understanding of ENGR 30 content. Pedagogical strategies that encourage active, engaged learning are employed to facilitate student success. Discussion, 2 hours.
Credit/No Credit

ENGR 45. Engineering Materials. 3 Units
Prerequisite(s): CHEM 1E and MATH 30. CHEM 1E may be taken concurrently.
Term Typically Offered: Fall, Spring, Summer

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.
Note: Fee course.

Fee course.

ENGR 45P. Peer-Assisted Learning ENGR 45. 1 Unit
Corequisite(s): ENGR 45
Term Typically Offered: Fall, Spring

Students concurrently enrolled in ENGR 45 work through faculty-designed problems sets under the guidance of a trained student facilitator to improve their understanding of ENGR 45 content. Pedagogical strategies that encourage active, engaged learning are employed to facilitate student success. Discussion, 2 hours.
Credit/No Credit

ENGR 45W. Engineering Materials Workshop. 1 Unit
Term Typically Offered: Fall, Spring, Summer

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.

Credit/No Credit

ENGR 50. Computational Methods and Applications. 3 Units
Prerequisite(s): Math 30 and PHYS 11A; Physics 11A may be taken concurrently
Term Typically Offered: Fall, Spring

Computational methods for solving problems in analysis and design. Introduces lower division students to the use of computer technology for the computations required to solve real world problems in science and engineering. Includes introduction to numerical techniques, introduction to structured programming, and graphic visualization. Practical applications of analysis and design using tools such as MATLAB and C++. Emphasis is on developing confidence and skill in finding computational solutions to practical science and engineering problems. Portable computer recommended. Lecture three hours.

ENGR 50P. Peer-Assisted Learning ENGR 50. 1 Unit
Corequisite(s): ENGR 50
Term Typically Offered: Fall, Spring

Students concurrently enrolled in ENGR 50 work through faculty-designed problems sets under the guidance of a trained student facilitator to improve their understanding of ENGR 50 content. Pedagogical strategies that encourage active, engaged learning are employed to facilitate student success. Discussion, 2 hours.
Credit/No Credit

ENGR 60. MEP Orientation and Problem Solving. 2 Units
Term Typically Offered: Fall, Spring

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.

Field trip(s) may be required.

ENGR 70. Engineering Mechanics. 3 Units
Prerequisite(s): PHYS 11A.
Term Typically Offered: Fall, Spring

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.

ENGR 96A. Interdisciplinary Topics in Engineering. 1 Unit
Term Typically Offered: Fall, Spring

Course will enable students to make an informed choice of their engineering majors, engage on interdisciplinary discussions between engineering fields, and equip them with relevant study skills. An introduction to engineering and the fundamentals of problem solving. Distinctions between different disciplines within engineering as well as other similarities. The engineering profession and ethics. Study skills for an engineering education.
Credit/No Credit

ENGR 105. Sustainable Design and Construction. 3 Units
Prerequisite(s): Upper division standing or instructor permission.
General Education Area/Graduation Requirement: GE AREA D
Term Typically Offered: Fall, Spring

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.

ENGR 106. Energy and Modern Life. 3 Units
General Education Area/Graduation Requirement: Upper Division Further Studies in Area B5, Further Studies in Area B (B5)
Term Typically Offered: Fall, Spring, Summer

Our modern life is intimately and increasingly intertwined with energy utilization. This course deals with where energy comes from, how it is converted to desirable forms, where it is consumed, and what the consequences of this consumption are. In each case, historical prospective, current status, and future projections will be discussed. The ultimate objective of this course is to help students to make informed decisions on energy-related issues in their personal life and as responsible citizens of the society.

ENGR 110. Analytic Mechanics - Dynamics. 3 Units
Prerequisite(s): Student must pass ENGR 30, MATH 45, and MATH 32 or MATH 35 or MATH 100 with a minimum grade of C- or better.
Term Typically Offered: Fall, Spring, Summer

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.

ENGR 110P. Peer-Assisted Learning ENGR110. 1 Unit
Corequisite(s): ENGR 110
Term Typically Offered: Fall, Spring

Students concurrently enrolled in ENGR 110 work through faculty-designed problems sets under the guidance of a trained student facilitator to improve their understanding of ENGR 110 content. Pedagogical strategies that encourage active, engaged learning are employed to facilitate student success.
Credit/No Credit

ENGR 110W. Analytic Mechanics-Dynamics Workshop. 1 Unit
Corequisite(s): ENGR 110.
Term Typically Offered: Fall, Spring, Summer

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.

Credit/No Credit

ENGR 112. Mechanics Of Materials. 3 Units
Prerequisite(s): ENGR 30; ENGR 45; MATH 45; and either CE 4 or ENGR 6 (CE 4 or ENGR 6 may be taken concurrently).
Term Typically Offered: Fall, Spring, Summer

Stresses, strains and deformations in elastic behavior of axial force, torsion and bending members, and design applications. Statically indeterminate problems. Strain energy. Column stability.

ENGR 112P. Peer-Assisted Learning ENGR 112. 1 Unit
Corequisite(s): ENGR 112
Term Typically Offered: Fall, Spring

Students concurrently enrolled in ENGR 112 work through faculty-designed problems sets under the guidance of a trained student facilitator to improve their understanding of ENGR 112 content. Pedagogical strategies that encourage active, engaged learning are employed to facilitate student success. Discussion, 2 hours.
Credit/No Credit

ENGR 115. Statistics For Engineers. 3 Units
Prerequisite(s): MATH 31, may be taken concurrently.
Term Typically Offered: Fall, Spring

Application of statistical methods to the analysis of engineering and physical systems. Data collection, characteristics of distributions, probability, uses of normal distribution, linear and nonlinear regression analysis, hypothesis testing, and decision-making under uncertainty.

ENGR 117W. Networks Workshop. 1 Unit
Corequisite(s): EEE 117.
Term Typically Offered: Fall, Spring

Elaborates on fundamentals and enhances students' understanding of networks.
Note: Not for degree credit.

Credit/No Credit

ENGR 120. Probability and Random Signals. 3 Units
Prerequisite(s): EEE 180; may be taken concurrently.
Term Typically Offered: Fall, Spring

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.

ENGR 124. Thermodynamics. 3 Units
Prerequisite(s): CHEM 1E, PHYS 11A, and MATH 32 or MATH 35 or MATH 100.
Term Typically Offered: Fall, Spring, Summer

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.

ENGR 124W. Thermodynamics Workshop. 1 Unit
Corequisite(s): ENGR 124.
Term Typically Offered: Fall, Spring, Summer

Problem solving and discussion of topics in thermodynamics to enhance students' understanding of subject matter. Activity two hours.
Credit/No Credit

ENGR 132. Fluid Mechanics. 3 Units
Prerequisite(s): ENGR 110 (may be taken concurrently)
Term Typically Offered: Fall, Spring, Summer

Lectures and problems in the fundamental principles of incompressible and compressible fluid flow.

ENGR 140. Engineering Economics. 2 Units
Prerequisite(s): ENGR 17 or ENGR 30
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.

ENGR 150. Technical Communication. 3 Units
Prerequisite(s): Recommendation based on the results of the WPG or instructor permission
Term Typically Offered: Fall, Spring

Practical technical communication for engineers and computer scientists. Topics covered include practical technical writing, improving technical writing style, development of strategies to improve writing, oral presentations, running effective meetings, and the use of visual aids. The use of appropriate communication technology is emphasized throughout the course.

ENGR 181. Electronic Materials. 3 Units
Prerequisite(s): CHEM 1A, PHYS 11A, MATH 45.
Term Typically Offered: Fall, Spring

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.

ENGR 193. STEM Leadership, Ethics, and Social Change. 3 Units
Prerequisite(s): WPJ Score of 70+ or equivalent.
General Education Area/Graduation Requirement: Writing Intensive Graduation Requirement (WI), Humanities (Area C2)
Term Typically Offered: Fall, Spring

A writing intensive exploration leadership and ethical theory applied to literature, film, and history with special attention to the kinds of leadership and ethical dilemmas experienced by STEM leaders. Students will employ critical thinking and writing skills to apply leadership and ethical theory to humanities texts; to inquire into specific problems and dilemmas in leadership; and to critically reflect on one¿s own values and ethics in one¿s own development as a leader.
Cross listed: NSM 193.

ENGR 194. Career Development Seminar. 1 Unit
Term Typically Offered: Fall, Spring

This course is designed for all ECS majors making career decisions and developing a job search strategy. Instruction will include: effective career planning strategies and techniques including skill assessment, interests, values, job search organization and strategies, goal setting, and time management as well as professional image development including interview techniques, resume writing, employment related correspondence and portfolio construction. Guest speakers from industry will be featured.
Credit/No Credit

ENGR 196B. Energy and Modern Life. 3 Units
Term Typically Offered: Fall, Spring

Our "modern life" is intimately and increasingly intertwined with energy utilization. This course deals with where energy comes from, how it is converted to desirable forms, where it is consumed, and what the consequences of this consumption are. In each case, historical prospective, current status, and future projections will be discussed. The ultimate objective of this course is to help students to make informed decisions on energy-related issues in their personal life and as responsible citizens of the society.

ENGR 196G. Advancing Leaders in STEM. 1 Unit
Prerequisite(s): ENGR 193 or NSM 193.
Term Typically Offered: Fall, Spring

This course continues the in-depth leadership training for professional STEM success introduced in ENGR/NSM 193. Students will apply and evaluate various strategies for effective leadership. Students will increase their capacity to recognize various situations and best leadership practices for each. Topics include setting personal and professional goals, becoming a productive team member, stepping into a leadership role, motivating team members, and developing productive work-flow processes.

ENGR 197. Seminar in Peer-Assisted Learning. 2 Units
Prerequisite(s): Instructor Permission
Corequisite(s): Acceptance as PAL Facilitator
Term Typically Offered: Fall, Spring

Classroom training and support for students concurrently serving as ECS Peer-Assisted Learning (PAL) facilitators. Classroom training will focus on facilitating problem-solving within groups, communicating effectively, and mentoring peers from diverse backgrounds. Action research on learning theory as applied to a classroom setting with culminating research presentation.

ENGR 199. Special Problems. 1 - 3 Units
Term Typically Offered: Fall, Spring, Summer

Individual projects or directed study.
Credit/No Credit

ENGR 201. Engineering Analysis I. 3 Units
Prerequisite(s): MATH 45.
Term Typically Offered: Fall, Spring

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.

ENGR 202. Engineering Analysis II. 3 Units
Prerequisite(s): MATH 45.
Term Typically Offered: Fall, Spring

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.

ENGR 203. Engineering Statistics. 3 Units
Prerequisite(s): ENGR 115 or equivalent.
Term Typically Offered: Fall, Spring

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.

ENGR 296. Experimental Methods for Fluids. 3 Units
Prerequisite(s): ENGR 132, and either MATH 32 or ENGR 202
Term Typically Offered: Spring only

Experimental methods for flow and transport phenomena are studied in the lecture and applied in the lab/field. Topics include planar laser induced fluorescence, acoustic velocimetry, and sediment transport.

ENGR 296A. Quality Management Systems for Engineers. 3 Units
Prerequisite(s): Graduate Standing
Term Typically Offered: Fall, Spring

Designed to equip students with understanding of basic terms and definitions related to quality, a brief history and basic quality concepts, understanding measurement systems and tools, understanding differences of quality control (QC), quality assurance (QA) and quality management (QM), getting familiar with the applications of different tools, systems and standards and how to select proper tools for different quality requirements. Understanding basic inspection, auditing, assessment and evaluation techniques.