

SCHOOL OF ENGINEERING AND COMPUTER SCIENCE

DEAN/STAFF

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ECS-2014, 278-6366

SUPPORT PROGRAMS

Center for Academic Success

The Center for Academic Success serves students by providing information about School programs, student professional organizations, career opportunities, campus support services, and School and University policies and procedures. Referrals are made to direct students to the most appropriate department when further information is required. Additionally, academic support is provided through study groups directed by student tutors. Establishing good study habits and working with other students are essential for success in technical fields. The groups are organized by the Center for a variety of engineering, computer science, math and science courses.

The School of Engineering and Computer Science is committed to providing support that will help ensure students' academic progress. Establishing a connection to

DEPARTMENTS/PROGRAMS

Programs of instruction leading to the following degrees offered by the School are listed in this catalog in separate sections.

BS in Computer Science	page 199
BS in Civil Engineering	page 289
BS in Computer Engineering	page 297
BS in Electrical & Electronic Engineering	page 301
BS in Mechanical Engineering	page 310
MS in Biomedical Engineering	page 285
MS in Civil Engineering	page 289
MS in Computer Science	page 199
MS in Electrical & Electronic Engineering	page 301
MS in Mechanical Engineering	page 310
BS in Engineering Technology:	
Construction Management	page 317
Mechanical Engineering Technology	page 321

the profession when students are in the early stages of their careers will help them succeed at the University and will ensure continued success upon graduation. The Center is housed in RR-3, 278-5956.

Career Development

Career planning services are available through the School of Engineering and Computer Science including career classes, workshops, student engineering positions, job fairs, and guest speakers from industry and government. Students in engineering and computer science are encouraged to take advantage of career classes and student engineering positions available with a wide range of business, industry and government organizations in the greater Sacramento area. Through these opportunities students gain valuable information about how engineering and computer science principles are applied in the real world.

Cici Mattiuzzi, *Assistant to Dean, Career Programs*, 278-7091

Computing Services

The School has a highly integrated Ethernet-based network linking together state-of-the-art systems from Apple, AT&T, DEC, HP, NEC, Sun and other major computer manufacturers. Built around high-performance RISC architectures, as well as high-end Pentium and PowerPC servers, the School's computing facilities provide students, faculty and staff unrivaled access to current computing environments, applications software, the World Wide Web and extensive Internet resources. Operating systems currently running on ECS computer systems such as DOS/Windows 3.1, HPUX (UNIX), MacOS, Ultrix (UNIX), VMS, Windows 95 and Windows NT provide access to applications ranging from basic spreadsheets to advanced modeling and design software.

The two Engineering and Computer Science buildings have numerous computer labs for student use. The School also has a central computer room for mini-mainframes and server systems. Some specific student computing facilities include:

EGR-1208	CSCProgramming Lab
EGR-1218	MEComputer-Aided Drafting Lab
EGR-1234	ECSOpen PC Lab
ECR-1235	ECS MEP Study Lab
ECS-1013	CSC X Terminal Lab
ECS-2001	CSC Systems Lab
ECS-2003	CSC Architecture Lab

ECS-2005	CSC Network Lab
ECS-2009	CSC Graduate Lab
ECS-2011	ECS Open Advanced Workstation/ Computing Services Lab
ECS-2013	CSC Programming Lab
ECS-3001	EEEC Computer Research Lab
ECS-3009	EEEDigital Systems Lab
ECS-4003	CE Construction Engineering Management Lab
ECS-4005	EEERobotics Lab

Additional information, documentation check-out, account forms, centralized printer/plotter output, lab support and user consulting are available in the main Computing Services Lab, ECS-2001, 278-6690.

Mike Wimple, *Network and Systems Manager*, 278-7351

Capitol Center MESA

Capitol Center MESA is a pre-college program serving over 5,000 students in high schools, middle/junior high schools, and elementary schools in the greater Sacramento area. MESA students are selected from historically underrepresented minority groups who are interested in preparing for and majoring in math-based careers such as Engineering and Computer Science. The goal of the MESA program is to have high school students complete four years of college preparatory mathematics and English in addition to chemistry and physics in order to successfully compete in college math-based majors.

The Center provides tutoring/study skills, academic and college advising, enrichment programs including summer school, scholarship incentive awards, and career advising.

Capitol Center MESA is a sponsored organization of CSU, Sacramento and UC Davis. The program operates from offices in the CSUS School of Engineering and Computer Science. The MESA staff works directly with MESA students and their teachers/advisors in Sacramento-area schools.

James Harold, *Director*, 923-0844

Cooperative Education Program

The School strongly endorses cooperative education (Co-op) as a means to enrich the student's education. Cooperative education relates theory to practice, provides "learning by doing" and connects students with industry. The Co-op program provides alternate periods of university study with paid work experience in the student's major field of study. Students are encouraged to participate in the Co-op plan by completing two six- to seven-month work periods before obtaining their degree. Credit is granted for successful completion of the Co-op requirements. Students interested in the Cooperative Education Program should apply in the Satellite Office, EGR-1204, or main office in Lassen Hall 2008.

Ann Adams, *ECS Coordinator*, 278-5137

Minority Engineering Program (MEP)

Participation in the Minority Engineering Program (MEP) doubles the probability that students will be successful in their engineering or computer science college studies. The program focuses on the recruitment, retention and academic success of African American, Chicano-Latino and American Indian students.

The MEP provides an on-campus "home" for its members with a large 24 hour/day study center/computer lab. MEP has extended its successful model of academic excellence workshops, tutoring and study groups and now helps in the coordination of these retention services for all students in the School of E&CS. MEP offers: scholarships, part-time and summer job referrals, freshman orientation course, academic advising and Co-op placements (financial support and professional experience).

MEP also offers a paid internship program to competitively selected students. These Project Success Industry Fellows are offered full-time paid positions during summers and school breaks from their freshman through senior years. The incoming students' earnings, coupled with the financial aid they receive, allow them to attend school full-time and eliminate the need to work when classes are in session.

Madeleine Fish, *Director*, 278-6699

Office of Water Programs

The Office of Water Programs administers and monitors the US Environmental Protection Agency's field study operator training program. Training materials and programs are provided worldwide for persons entering or wishing to improve their knowledge and skills in the fields of operation and maintenance of drinking water and wastewater facilities and also pretreatment facility inspection. The training programs are recognized by every operator licensing board in the United States and in most of the Canadian provinces as a means of preparing and qualifying for operator certification examinations.

Kenneth Kerri, *Director*, 278-6142

Women's Programs

The Women's Programs Office is an umbrella for projects, conferences, and special activities to increase awareness of and interest in technical careers and educational opportunities for women. Services provided include a Student Mentor and Industry Mentor programs, career and scholarship information, industry speakers and tours and outreach to community colleges and K-12 students.

The Student Mentor program matches freshmen and transfer students with upper division students who are available to answer questions, give class/scheduling tips and provide networking and support. The Industry Mentor program introduces students to women engineering and computer science professional who are available for informational interviews, job shadowing and company tours.

Information about Women's Programs is in EGR-1204.

Sally Leake, *Coordinator*, 278-7877

JoAnne Mahaney, *Coordinator*, 278-7877

ENGINEERING PREPARATION

High School

Students entering as freshmen build primarily upon the foundations that were begun in high school mathematics, the physical sciences and means of expression and communication. High school study for all majors should include:

Algebra	2 years
Plane Geometry	1 year
Trigonometry	1/2 year
Chemistry	1 year
Physics	1 year
Mechanical Drawing	1 year

Computer literacy, analytic geometry and calculus are desirable.

Transfer

Students transferring from community colleges with at least 65 transferable units including 12 units of physics for engineering and science students, 15 units of calculus and differential equations, 5 units of chemistry, 2 units of computer programming, 14-15 units of lower division engineering (computer graphics, statics, circuits, and properties of materials), and necessary general education units may complete their engineering bachelor of science degree programs with four semesters of additional full-time study. Articulation agreements with most of the community colleges in Northern California state exact course equivalencies. Community college counseling staffs are prepared to answer questions regarding articulation.

Engineering students are encouraged to become acquainted with the functions and the branches of engineering in order to evaluate their own interests and abilities more carefully. For this purpose student chapters of national organizations have been established in the School. It is to the students' advantage to become affiliated with the technical society in their interest area soon after enrolling in the University. Students with high scholastic achievement may be invited to join Tau Beta Pi, the National Engineering Honor Society.

Whenever possible, students should consider summer and part-time employment in a professional office or an industry related to their major interest. The main value of this practical experience for the undergraduate engineering student is to provide intimate contact with engineering problems. The School's Career Development Office, working with the faculty and local industry, will endeavor to assist the student in securing employment.

For the undergraduate interested in civil, electrical and electronic or mechanical engineering, deferment of a choice of curriculum until the second semester of the sophomore year is possible. The lower division program is substantially the same for the three professional branches and it has been arranged to provide this latitude.

BACHELOR OF SCIENCE

Bachelor of Science degree programs are offered in Computer Science, Civil Engineering, Computer Engineering, Electrical and Electronic Engineering, Mechanical Engineering, and Engineering Technology. The engineering curricula are accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology, and the technology curriculum is accredited by the Technology Accreditation Commission of the Accreditation Board for Engineering and Technology.

Details of the curricula offered by the School are given in the appropriate sections of this catalog.

Enrollment in upper division courses offered by the School is normally restricted to students who have satisfactorily completed all lower division requirements and who have been admitted to one of the majors in the School.

Within each program, different patterns of study are possible through a judicious choice of electives.

Students in the School of Engineering and Computer Science are required to meet the general education requirements of the University.

Engineering students must satisfy the 16-unit humanities and social science requirement of the Accreditation Board for Engineering and Technology.

Engineering Technology students must satisfy the 24-unit humanities, social science, communication requirement of the Accreditation Board for Engineering and Technology.

Students should consult with their advisers to determine which courses meet ABET requirements for social sciences and humanities. By choosing carefully, the student can satisfy the University's GE requirements with these classes.

While the objective of a broad liberal education is served through independent humanities and social science courses, it is recommended that some courses in these subject areas be at an advanced level rather than a selection of unrelated beginning courses. Courses treating such subjects as accounting, industrial management, finance, personnel administration, introductory language, and ROTC studies do not fulfill the ABET humanities-social science requirement. Students planning to transfer from community colleges or four-year institutions with advanced standing are advised to parallel closely the appropriate CSUS engineering, engineering technology, construction management, or computer science program in the lower division. Completion of general education requirements before transfer is NOT recommended or desirable, but rather, emphasis should be placed on taking prescribed basic science and engineering courses.

MINOR IN ENGINEERING

Non-majors in engineering may elect to minor in this field. Minor requirements may be satisfied by completing 18 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 School of Engineering and Computer Science. The program should normally include: ENGR 17, 30, 45, 110, 112, 124, 132.

MASTER OF SCIENCE

While graduates of baccalaureate programs enjoy successful careers in many aspects of engineering, graduate study is becoming more desirable for qualified students who expect to practice in research and development, teaching, management and many areas of design.

The MS degree programs offered in the School of Engineering and Computer Science include biomedical engineering, civil engineering, computer science, electrical and electronic engineering, and mechanical engineering.

In addition, special interdisciplinary studies are possible in selected areas chosen by the student in consultation with the faculty of the School.

The Master of Science programs require a minimum of 30 units of approved graduate study. The option availability of Plan A, B or C is indicated with each specialization. Refer to the appropriate sections for detailed information concerning admission and degree requirements.

General information on admission requirements and general graduate study regulations are listed in the section, "Graduate Degree Curricula," of this catalog.

Note: Each engineering course is administered by one of the engineering departments. Information on these courses may be obtained in any of the engineering department offices.

LOWER DIVISION COURSES

4. Descriptive Geometry and CAD. In depth graphic analysis and solution of typical three dimensional space problems through the application of the principles of orthogonal projection. Fundamentals of interactive computer aided design and drafting. Preparation of civil and mechanical engineering drawings utilizing the CAD system. Laboratory six hours. 2 units. (CAN ENGR 2)

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. **Prerequisites:** PHYS 11C, MATH 45; either the math or physics may be taken concurrently, but not both. 3 units. (CAN ENGR 12)

30. Analytic Mechanics: Statics. Statics of particles. Equivalent systems of forces. Equilibrium of rigid bodies. Centroids, centers of gravity and forces on submerged surfaces. Analysis of trusses including use of computer programs. Analysis of frames and machines. Forces in beams including shear and moment diagrams. Friction. Moments of inertia. **Prerequisites:** PHYS 11A, MATH 31, ENGR 4. 3 units. (CAN ENGR 8)

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. **Prerequisites:** PHYS 11A, CHEM 1A. 3 units. (CAN ENGR 4)

60. MEP Orientation and Problem Solving. A 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. Not for use as an engineering major technical elective or for baccalaureate credit. Lecture one hour, activity two hours. Graded Credit/No Credit. 2 units.

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. May be repeated for credit with permission of advisor. 1-4 units.

UPPER DIVISION COURSES

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. **Prerequisites:** ENGR 30, MATH 32, 45. 3 units.

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. **Prerequisites:** ENGR 30, 45, MATH 45. 3 units.

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. **Corequisite:** MATH 31. 2 units.

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. **Prerequisites:** MATH 32, PHYS 11A. 3 units.

132. Fluid Mechanics. Lectures and problems in the fundamental principles of incompressible and compressible fluid flow. **Prerequisites:** ENGR 110. 3 units.

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, 30, or CSC 130. 2 units.

150. Technical Communications. Course provides an overview of communication skills required for the technical professional. Technical writing and oral presentation skills will be developed through the case method of instruction. Topics include written and verbal forms of communication, including oral presentations, developing effective visual aids, group dynamics and customer relations; organizing and writing proposals, reports and feasibility studies; documentation of projects, specifications and procedures; and correspondence and technical resumes. Emphasis will be placed on clear, concise written and verbal communications. Use of a computer for word processing, editing and graphics will be included. 3 units.

194. Career Development in Engineering and Engineering Technology. This course is 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. Graded Credit/No Credit. **Prerequisite:** senior status. 1 unit.

196. Experimental Offerings in Engineering. When a sufficient number of qualified students apply, one of the staff will conduct a proseminar in some topic of engineering. May be repeated for credit with permission of advisor. 3 units.

GRADUATE COURSES

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. Spring only. 3 units.

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. Fall only. 3 units.

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. 3 units.

204. Operations Research I. Operations research as applied to engineering and organizational problems. Use of linear algebra, matrix algebra, linear programming and dynamic programming used to solve allocation, replacement, sequencing and competitive strategy problems. **Prerequisite:** MATH 32. Not offered every semester. 3 units.

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. May be repeated for credit with permission of advisor. 1-4 units.