

Department Chair: Jorge Talamantes
Program Office: Science Building III, 307
Telephone: (661) 654-2664
email: engineering@csub.edu
Website: www.csub.edu/engineering
Faculty: A. Dzyubenko, V. Gasparyan, J. Lewis, R. Negrini, T. Meyer, J. Talamantes

Program Description

Engineering Science is a broad-based general engineering degree program. As such, it provides the graduate flexibility, breadth of technical knowledge, and communication skills so important in today's rapidly changing multidisciplinary and multicultural work environment. The student may opt for a BS in Engineering Science with an Emphasis on Engineering Management by the appropriate choice of electives.

The Engineering Science program provides a curriculum and course of training that prepares the student not only for today's challenges, but also for future ones in a fast-paced, global, and diverse society. The program emphasizes the fundamentals of engineering and modern methods, processes and technologies, and also gives the students the tools to learn by themselves and to pursue life-long learning. Furthermore, the program and the faculty strive to ensure that graduates also attain a global understanding of the environmental, ethical and societal impacts of the technologies they help develop.

The program offers opportunities for team-based design projects in collaboration with local industries and public institutions, thus preparing students for careers in for-profit and non-profit organizations, or to further their education in graduate school. Faculty members of the Department of Physics and Engineering will be pleased to advise any students who may wish to pursue this major. For student learning objectives and more information, visit our website at www.csub.edu/engineering.

Requirements for the Bachelor of Science Degree in Engineering Science

Total Units Required to Graduate	180 units
Major Requirements	113 units
ENGR Courses	64
Cognates	49
Other University Requirements	62-67 units
CSUB 101	2
American Institutions	5
Area A1, A2	10*
Area B2	5*,**
Area C	15
Area D	10***
Theme 1	0*
Theme 2	5****

Theme 3	5
GRE	5
GWAR (Exam) or Class	0-5

*A3, B1, B3, Theme 1 satisfied in major or cognate. **BIOL 103 is required for Area B2. ***Assumes PLSI 101 is taken to double-count American Institutions and Area D3. ****PHIL 316 is required for Theme 2.

Major Requirements for the Bachelor of Science Degree in Engineering Science

- 1. Lower Division (17 units):**
ENGR 161, 207, 240, 244
- 2. Upper Division Required (24 units):**
ENGR 300, 310, 320, 330, 490A, 490B, 490C
- 3. Upper Division Electives (23 units):**
PHYS/ENGR 307 ENGR 340, 410, 420, 422, 424, 426, 430, 477
- 4. Cognate Requirements (49 units):**
MATH 201 or 231, 202 or 232, 203 or 233, 204 or 234, PHYS 221,222, 223, CHEM 211, CMPS 150, 221

Information on General Education Courses

- CSUB 101 Roadrunner RUSH-A seminar is required for entering Freshman with no transfer credit.
- Any of the required Physics courses (PHYS 221, 222,223) or CHEM 221 will satisfy Areas B1 and B3.
- Any of the required calculus courses (MATH 201, 202, 203, 204, 231, 232, 233, 234) will satisfy Area B4.
- Area A3 is substituted by ENGR 207 for Engineering Sciences
- PHIL 316 Professional Ethics must be taken and will satisfy Theme 2.

COURSE DESCRIPTIONS

Lower Division

ENGR 161 Introduction to Engineering Design (2)
 Introduces students to real-life engineering projects. Students design, build, tests and present engineering projects designed to solve specified problems within given constraints. Primarily for students planning to major in one of the fields of engineering. Two hours of lecture/discussion.

ENGR 207 Electric Circuits (5)
 Circuit laws and analysis of DC and AC circuits. Physical properties, electrical characteristics and circuits of discrete and integrated electrical and electronic devices. Design and construction of circuits with instrumentation applications. Three hours lecture/discussion and two three-hour laboratories per week. Prerequisites: PHYS 222, MATH 202/222 (MATH 203 recommended).

ENGINEERING SCIENCE

ENGR 240 Analytic Mechanics, Statics (5)

Fundamental principles of force systems acting on particles and rigid bodies in static equilibrium. Applications to structural and mechanical problems, both two-dimensional and three-dimensional. Five hours lecture/discussion/ Prerequisites: PHYS 221, Co-requisite MATH 202.

ENGR 244 Properties of Materials (5)

Structure of matter. Physical and mechanical properties of materials including metals, polymers, ceramics, composites, and electronic materials. Equilibrium diagrams. Materials selection, corrosion phenomena. Heat treatment, cold deformation, brittle-ductile fracture behavior. Three hours lecture/discussion, two three-hour laboratories. Prerequisites: MATH 201, PHYS 221, and CHEM 211.

Upper Division

ENGR 300 Engineering Modeling and Analysis (5)

Formulation of mathematical models for engineering systems; applying mass, momentum, and energy balances to derive governing differential equations; solution of differential equations and eigenvalue problems typically encountered within an engineering context; solving equations with the use of spreadsheets and other numerical computing environments such as MATLAB; fitting linear and nonlinear models to experimental data; concepts in probability and statistics. Four hours lecture/discussion and one three-hour laboratory per week. Prerequisites: PHYS 222, CMPS 221.

ENGR 307 Principles of Electronics (5)

Circuit laws, theorems, equivalent circuits. Physical properties, electrical characteristics and circuits of electrical and electronic devices, discrete and integrated. Design and construction of analog and digital circuits with instrumentation applications. Three hours lecture/discussion and two three-hour laboratories per week. Prerequisites: ENGR 207 and PHYS 223 (MATH 205 recommended).

ENGR 310 Thermodynamics (4)

Properties of working fluids and fundamental relations for processes involving the transfer of energy. First and second laws of thermodynamics, irreversibility and availability. Four hour lecture/discussion per week. Prerequisites: PHYS 222.

ENGR 320 Fluid Mechanics (5)

Hydrostatics and fluid dynamics. Viscous flow, boundary layer concepts, lift and drag, laminar and turbulent flow, compressible flow. Experiments involving flow measurement and control, conservation equations, pressure and velocity distributions, dimension analysis for lift and drag. Four hours lecture/discussion, one three hour laboratory. Prerequisite: ENGR 300

ENGR 330 Heat Transfer (4)

Introduces the analysis of steady and transient heat conduction, forced and natural convection, radiation heat transfer, and design of heat exchangers. Analytical and numerical methods in heat transfer and fluid mechanics. Topics include heat conduction and convection, gaseous radiation, boiling and condensation, general aspects of phase change, mass transfer principles, multimode heat transfer and the simulation of thermal fields, and the heat transfer process. Four hours lecture/discussion per week. Prerequisites: ENGR 310, 320.

ENGR 340 Soil and Water Resource Management (4)

Soil and water management systems and practices including hydrology, surface drainage, open channels, and erosion, subsurface drainage, impoundments and irrigation. Four hours lecture/discussion per week. Prerequisites: PHYS 222.

ENGR 410 Power Systems Analysis (4)

Fundamentals, power transformers, transmission lines, power ow, fault calculations, power system controls. Unbalanced networks, symmetric and unsymmetrical faults, transient transmission line modeling, system protection. Four hours lecture/discussion per week. Prerequisite: ENGR 207.

ENGR 420 Operations Research (4)

Introduction to deterministic optimization modeling and algorithms in operations research. Emphasis on formulation and solution of linear programs, networks ows, and integer programs. Introduction to probabilistic models in operations research. Emphasis on Markov chains, Poisson processes, and their application to queueing systems. Four hours lecture/discussion per week. Prerequisites: ENGR 300.

ENGR 422 Project Management (4)

Projects are unique, strategically important, complex endeavors with definite beginning and ending dates. The course develops the skills required to manage the component processes of a project throughout its life cycle: scope, time and sequencing, cost, quality, human resources, communications, risk, procurement, and project integration management. The project life cycle encompasses development of the initiative out of strategic planning activities, articulation of project goals and objectives, planning project components and their integration, execution and control, project close out, and follow-up activities. Four hours lecture/discussion per week. Prerequisites: Senior standing in Engineering Sciences.

ENGR 424 Quality Management (4)

An overview of management literature relating to quality planning, quality control, quality assurance, and quality improvement. A consideration of the core principles and methods common to most quality improvement programs and their relationship to management principles. Comparison of prevalent quality improvement programs such as ISO9004: 2008, SixSigma, and TQM and the Malcolm Baldrige Standards. Case studies. Four hours lecture/discussion per week. Prerequisites: Senior standing in Engineering Sciences.

ENGR 426 Economics of Engineering Design (4)

Cost measurement and control in engineering studies. Basic accounting concepts, income measurement, and valuation problems. Manufacturing cost control and standard cost systems. Capital investment, engineering alternatives, and equipment replacement studies. Four hours lecture/discussion per week. Prerequisites: ENGR 300.

ENGR 430 Biological Systems Applications (4)

Principles of heat and mass transfer in the context of biological (biomedical/bioprocessing/bioenvironmental) systems. Physical understanding of transport processes and simple reaction rates with application to examples from plant, animal, and human biology. Four hours lecture/discussion per week. Prerequisites: ENGR 300, 320.

ENGR 477 Special Topics in Engineering Science (1-4)

This course will often be used to supplement other courses with additional work at a more advanced level. May be repeated in different topics. Prerequisite: permission of instructor.

ENGR 490A Senior Seminar A (2)

Selection and initiation of an engineering design project under faculty supervision. Collaborative projects with local industry partners are encouraged. Projects are presented in a formal report and in a formal presentation. Two hours lecture/discussion per week. Prerequisite: Open only to senior Engineering Sciences majors.

ENGR 490B Senior Seminar B (2)

Project under faculty supervision. Collaborative projects with local industry partners are encouraged. Projects are presented in a formal report and in a formal presentation. This course is a continuation of ENGR 490A. Two hours lecture/discussion per week. Prerequisite: Open only to senior Engineering Sciences majors, ENGR 490A.

ENGR 490C Senior Seminar C (2)

Completion of a project under faculty supervision. Collaborative projects with local industry partners are encouraged. Projects are presented in a formal report and in a formal presentation. This course is a continuation of ENGR 490B. Two hours lecture/discussion per week. Prerequisite: Open only to senior Engineering Sciences majors, ENGR 490B.