

COLLEGE OF ENGINEERING MINORS

Students in consultation with the coordinator of the minor are to develop a program of study to meet undergraduate minor requirements. A "Request for Award of Minor" form will be completed towards the completion of the minor course work and indicated on a student's permanent record (transcript) upon achieving at least a 2.0 for all minor work completed. This form is available in departments which offer minors. The form must be turned in to the Registrar's Office for proper processing. Minors cannot be awarded subsequent to the granting of a bachelor's degree. All minors, consist of 24 or more quarter units, 12 of which must be upper division units. All 24 units must be taken outside of the major core requirements

ENERGY ENGINEERING MINOR

John R. Biddle, Coordinator of the Minor, Mechanical Engineering

Ali R. Ahmadi, Aerospace Engineering
 A. George Stoll, Chemical and Materials Engineering
 Donald G. Wells, Civil Engineering
 Alexander E. Koutras, Electrical and Computer Engineering
 Farouk Darweesh, Industrial and Manufacturing Engineering

The purpose of this minor is to provide students in the programs of the College of Engineering and the Physics department of the College of Science a flexible, interdisciplinary program of study in the emerging and important field of energy engineering. The minor is designed to encourage engineering study and applied research directed toward society's energy needs. The multidisciplinary scope of the minor includes study of all energy sources (fossil, solar, geothermal, nuclear and others), energy conversion and transfer systems, efficient energy utilization (including conservation strategies) and environmental implications.

There is an increasing need for technically qualified and informed graduates in the utilization and development of new sources of energy for society. Currently there are many courses in the various engineering disciplines related to this field. By having these courses offered together in a minor program, the graduate will be able to emphasize this important technical area and be better able to accept meaningful technical positions in energy industries.

Completion of the following courses is required:

Thermodynamics	ME	301	(4)
or Chemical and Materials Engineering			
Thermodynamics I	CHE	302	(4)
or Thermal Physics	PHY	333	(4)
Energy Management	ME	306	(4)
Alternative Energy Systems	ME	307	(4)

The remainder of the 24 units required for the minor will be selected from:

Air Pollution Control	ARO	418	(4)
Solid Waste Management	CE	457	(3)
Chemical Engineering Thermodynamics II	CHE	303	(4)
Pollution Abatement and Hazardous Matls. Mgmt	CHE	432/433L	(4)
Ocean Engineering	EGR	430	(4)
Capital Allocation Theory	EGR	403	(4)
Control Systems Engineering	ECE	309	(4)
Thermodynamics	ME	302	(4)
Solar Thermal Engineering	ME	407	(4)
Nuclear Engineering	ME	408	(4)
Kinetic Theory/Statistical Thermodynamics	ME	409	(4)
Energy and the Environment	PHY	340	(4)
Advanced Nuclear Physics	PHY	404	(4)
Production Engineering I	MFE	324L	(3)
Production Engineering II	MFE	325L	(3)
Industrial Engineering Design	IE	429L	(4)
Industrial Engineering Systems	IE	437	(3)

ILLUMINATION ENGINEERING MINOR

R. Frank Smith, Coordinator of the Minor, Electrical and Computer Engineering
 Kamran Abedini, Industrial and Manufacturing Engineering
 Michael T. Shelton, Mechanical Engineering
 Ram Ronen, Electrical and Computer Engineering

The purpose of the minor in Illumination Engineering is to help meet the need for advanced lighting expertise in the state of California, both for professionals in the field and engineers who want to provide advanced expertise so sorely needed. Lighting is a significant part of the energy being used in the state. Training engineers with expertise in lighting will provide a healthy basis for the myriad of lighting applications where energy efficient designs and technologies are important. The minor is designed to be appropriate for students in the physical sciences and engineering and engineering technology. The required course in area V is an approved elective in all engineering disciplines.

Completion of one course from each of Areas I through IV and two courses from Area V is required with a minimum unit requirement of 24 units.

AREA I (Human Factors)

Fundamentals of Human Factors Engineering/Laboratory	IE	225/L	(3/1)
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AREA II (Optics/Light)

General Physics/Laboratory	PHY	234/234L	(3/1)
Applied Optics	PHY	344	(4)

AREA III (Energy Conservation)

Energy Management	ME	306	(4)
Applied Heating and Air Conditioning	ETM	334	(4)

AREA IV (Lighting Design)

Interior Design II	HE	320/320A	(3/3)
Stage Lighting	TH	332/L	(2/1)

AREA V (Lighting Technology)

Illumination Engineering (required)	ECE	490/L	(4/1)
Lamp Design and Manufacture	MTE	490	(4)
Lighting Controls/Design	ECE	492/L	(5)
Luminaries Design/Manufacture	IE	490/L	(3/1)

MATERIALS ENGINEERING MINOR

Vilupanur A. Ravi, Coordinator of the Minor, Chemical and Materials Engineering
 Donald L. Edberg, Aerospace Engineering
 Phyllis Nelson, Electrical and Computer Engineering
 Victor Okhuysen, Industrial and Manufacturing Engineering
 Hassan M. Rejali, Mechanical Engineering

Materials Engineering is a field that studies the interrelationships among the properties, processing, structure, and performance of materials. The minor in Materials Engineering is available to students who satisfactorily complete the 24-unit requirement. The minor is appropriate for all engineering and science majors.

The goal of the materials engineer is to understand the structure of materials (at the micro or the nano level) to improve their properties and ultimately their performance. Materials engineers apply this knowledge in the production, selection and utilization of materials. Since engineers and scientists are called upon to work with new ideas and materials, the engineering or science graduate with a minor in materials engineering is very well prepared to respond to such a challenge and thus have a career advantage.