Information is provided in five separate sections on California community college energy programs for students interested in selecting a program and for college personnel interested in beginning or improving a program. Contents of most sections are arranged alphabetically according to the name of the college, project, or organization. Section I outlines degree and certificate programs, including requirements and course/program descriptions. Section II identifies individual course offerings, and Section III lists non-credit workshops, forums, and seminars available through community education and community services. Section IV contains information about programs and resources that for the most part are not linked to instructional programs at community colleges in California but may be of interest to community college personnel. The last section identifies information sources for technical and other assistance. (Author/DC)
A Guide to Energy - Related Curriculum at
California Community Colleges and
Certain Other Programs

SEPTEMBER 1980

COMPILED BY STAFF AT MONTEREY PENINSULA COLLEGE
AND FUNDED BY VEA, SUBPART III AS ADMINISTERED BY
THE CHANCELLOR'S OFFICE, CALIFORNIA COMMUNITY COLLEGES
The activity which is the subject of this report was supported in whole or in part by the Department of Education (P.L. 94-146). However, the opinions expressed herein do not necessarily reflect the position or policy of the Department of Education, and no official endorsement by the Department of Education should be inferred.

Edited By Philip C. Nash and Robert H. Schaefer

Compiled by Randall Calvert and Robert H. Schaefer

Typing and Clerical by Claudia Hutchinson and Nel Lowney

Graphics by Brad Smith and Mary Burr

Project Director Philip C. Nash
Dear Reader:

Just a few years ago our community college was challenged by the global problem of energy alternatives and what we could do for our community and nation to educate people to appropriate technologies which may relieve the tremendous pressure we all feel in this continuing frustration.

The report you have before you is the fruition of a full-year's work which we have endeavored on behalf of all the California Community Colleges—work which was continually guided by our desire to provide an instrument which would make it easier for you to make your mark for your community, if you are just starting up an energy program, or seeking to improve on what you already have.

Our project has sent to each Dean of Instruction in the California Community College system a copy of the Solar Installer's Training Program by Werner Schmidt of the Governor's Office of Appropriate Technology. Additionally, we have purchased for each college a full-year's subscription to the Alternative Energy News beginning October, 1980.

You will find the enclosed information most helpful in examining what's going on at each California Community College in energy programs, whether it be certificate programs, associate degree programs, CETA funded programs, or Community Education/Services programs. There's abundant help for you, and generally just a few miles away.

We have included the names, addresses, and telephone numbers of your colleagues and, indeed, pertinent agencies who can provide you with answers to problems which you may have in fostering energy programs.

We trust that this will be a helpful manual for you to use time and again, and we should like to indicate here the tremendous assistance we have had from the Chancellor's Office and State Department of Education who jointly funded this project through Subpart 3 of the Vocational Education Act.

Sincerely,

Philip C. Nash
Monterey, California
September 30, 1980
CONTENTS

SECTION I  Degree and Certificate Programs  1-40
SECTION II  Course Offerings  41-55
SECTION III  Community Education/Services Workshops, Seminars, or Forums on Energy (non-credit)  56-62
SECTION IV  Other Programs of Note  63-94
SECTION V  Information Sources  95-97

SECTIONS I - III
Contains information about energy courses/programs at California community colleges organized alphabetically by college name. The chart on the following page can be used as a quick reference in locating the specific item of interest to you: columns 1 and 2 list colleges that have Associate Degree and Certificate Programs and descriptions of these programs will be found in Section I of the Guide; column 3 indicates colleges offering energy-related courses and specific information regarding these courses can be found in Section II; column 4 indicates those colleges offering non-credit workshops, forums, or seminars through Community Education or Community Services, and descriptions of these offerings are provided in Section III of the Guide; column 5 indicates colleges that have CETA funded training programs in Solar/Energy Technology, and information about these programs appears in Section I of the Guide.

SECTION IV
Contains information about programs and resources that for the most part are not linked to instructional programs at community colleges in California, yet might be of interest to community college personnel. These include: training programs offered by Community Based Organizations (CBOs); descriptions of noteworthy programs at community colleges in other states; programs funded by the California Energy Extension Service (CEES); and programs that offer curriculum/information regarding Alcohol Fuels Production and Consumer Homemaking Education.

SECTION V
Contains a list of INFORMATION SOURCES to which you might turn for technical and other assistance.
CHART OF ENERGY COURSES/PROGRAMS AT CALIFORNIA COMMUNITY COLLEGES

| COLLEGES                          | ALAMEDA | ALLAN HANCOCK | AMERICAN RIVER | ANTIOCH VALLEY | BAKERSFIELD | BARSTOW | BUTTE | CABRILLO | CANADA | CANTON'S | CERES | CHIB ROCOSO | CHABOT | CHAFFEE'S | CITRIS | COASTLINE | COLUMBIA | COMPTON | CONTRA COSTA | COLUMBUS RIVERS | CRAYFORD HILLS | CUESTA | CUYMAMACA | CYPRESS | DI ANZA | DESERT | DIABLO VALLEY | EAST LOS ANGELES | EAST SAN CARLOS | EVERGREEN VALLEY | Feather River | LOM DEAN | FREMONT CITY | FULLERTON | GAVELIA | GLENDALE | GOLDEN WEST | GROSSMONT | HARTINE | IMPERIAL VALLEY | INDIAN VALLEY | LAKES TAHOL | LANEY | LASSAN | LION BLICE CITY | LOS ANGELES CITY | LOS ANGELES MARINOR | LOS ANGELES MISSION | LOS ANGELES PIKE | LOS ANGELES SOUTHHILL | LOS ANGELES TRADE TECH | LOS ANGELES VALLEY | LOS ALTADENA | MARIN | MENDOCINO | MERCED | MERRITT | MIKAWA | MODESTO | MONTEREY PENINSULA | MOUNTAINEER | MT SAN ANTONIO | MT SAN JACINTO | NAPA'S | ONTARIO | ORANGE COAST | OXNARD | PALO VERDE | PALOMAR | PASADENA CITY | PORTERVILLE | REDWOODS | RIVIERA | SAN BERNARDINO VALLEY | SAN DIEGO CITY | SAN DIEGO EVENING | SAN DIEGO MESA | SAN DIEGO MIRAMAR | SAN FRANCISCO CITY | SAN JOAQUIN DELTA | SAN JOSE CITY | SAN MATEO | SANTA ANA | SANTA BARBARA CITY | SANTA MONICA | SANTA ROSA | SEQUOIAS | REDWOODS | SISKITIOUS | SKYLINE | SOUTHERN CALIFORNIA | SOUTHWESTERN | SU TSL | VENTURA | VICTOR VALLEY | VISTA | WEST HILLS | WEST LOS ANGELES | WEST VALLEY | YUCA | ZO LA |...
SECTION 1
GREEE AND CERTIFICATE PROGRAMS
SOLAR TECHNOLOGY – CERTIFICATE AND ASSOCIATE DEGREE PROGRAM

The purpose of the Solar Energy Technology program is to prepare students for careers in the emerging field of solar energy as designers, builders, installers and marketers.

CURRICULUM

Requirements for Certificate:

<table>
<thead>
<tr>
<th>Course</th>
<th>Code</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fundamentals of Solar Energy</td>
<td>SET 50</td>
<td>3</td>
</tr>
<tr>
<td>Solar Tech &amp; Fabrication I</td>
<td>SET 51</td>
<td>4</td>
</tr>
<tr>
<td>Solar Tech &amp; Fabrication II</td>
<td>SET 52</td>
<td>4</td>
</tr>
<tr>
<td>Solar Architecture</td>
<td>SET 54</td>
<td>3</td>
</tr>
<tr>
<td>Solar Remodeling I</td>
<td>SET 55</td>
<td>2</td>
</tr>
<tr>
<td>Solar Energy in Agriculture</td>
<td>SET 57</td>
<td>4</td>
</tr>
<tr>
<td>Solar Electronics</td>
<td>SET 59</td>
<td>2</td>
</tr>
<tr>
<td>Special Studies or S. E. Community Education</td>
<td>SET 10S</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>SET 61</td>
<td>2</td>
</tr>
</tbody>
</table>

Additional courses in SET 60 30

Requirements for Associate Degree:

Certificate Requirements 30

General Education Requirements:

<table>
<thead>
<tr>
<th>Subject</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>English Composition</td>
<td>3</td>
</tr>
<tr>
<td>Learning Skills</td>
<td>3</td>
</tr>
<tr>
<td>U.S. History or Political Science</td>
<td>3</td>
</tr>
<tr>
<td>Social Science Elective</td>
<td>3</td>
</tr>
<tr>
<td>Natural Science Elective</td>
<td>3</td>
</tr>
<tr>
<td>Humanities Elective</td>
<td>3</td>
</tr>
<tr>
<td>Health Science Elective</td>
<td>2-3</td>
</tr>
</tbody>
</table>

Total General Education Electives 20

CORE ENERGY CLASSES

SET 50 Fundamentals of Solar Energy 3 units

Fundamentals of solar energy collection, conversion and use, energy flow and energy conservation, solar radiation, heat transfer and storage methods. Survey of renewable energy systems using solar, wind, water and biofuels. Class hours: 3 hours lecture.
CABRILLO COLLEGE cont'd.

SET 51  Solar Technology & Fabrication I  4 units
A general introduction to active solar systems including the collection, circulation, storage, and sizing of low-mid-high temperature devices. Emphasis will be on practical applications to residential hot water, swimming pool and space heating systems. Laboratory includes selection of materials, design and fabrication of solar energy equipment. Class hours: 3 hours lecture, 3 hours laboratory.

SET 52  Solar Technology & Fabrication II  4 units
Continued studies in the technical aspects of the design and fabrication of active solar systems. Emphasis will be on appropriate design, materials selection, and fabrication of actual working systems geared to the specific needs of Santa Cruz County's varied microclimates. Class hours: 3 hours lecture, 3 hours laboratory.

SET 53  Solar Home Design  3 units
Survey of solar energy applications to home design and construction. Energy conservation, direct gain, passive, active and hybrid systems for solar heating and natural cooling will be introduced. Class hours: 3 hours lecture.

SET 54  Solar Architecture  3 units
A course focusing on the use of architecture to modify the effects of climate on building interiors. Emphasis will be on the design, construction and testing of small scale passive and hybrid structures to determine solar heating and natural cooling effects. Class hours: 2 hours lecture, 3 hours laboratory.

SET 55  Solar Remodeling I  2 units
Designed for the renter and homeowner. The course deals with the principles and practices of solar tempering and weatherizing existing residential structures. Attention will be given to low cost mobile solar devices, their design and construction. Class hours: 1 hour lecture, 3 hours laboratory.

SET 56  Solar Remodeling II  2 units
Continuing studies in solar retrofit techniques for existing dwellings. The course will include thermal analysis and redesign of structural components to produce economically feasible modification. Attention will be given to both active and passive solutions to solar remodeling problems. Class hours: 1 hour lecture, 3 hours laboratory.
SET 57  
**Solar Energy in Agriculture**  
4 units  
A survey of solar energy systems in agriculture including solar design  
theory, solar heated greenhouses, bioconversion systems (methane, alcohol,  
pyrolysis, biomass farms, etc.), solar crop dryers, solar irrigation  
systems and solar space heating of agricultural structures. Class hours:  
2 hours lecture; 2 hours discussion.

SET 58  
**Applications of Solar Energy in Agriculture**  
2 units  
This course is an extension of SET 57 for the advanced student. Attention  
will be given to the design, maintenance and monitoring of solar heated  
greenhouses, solar crop dryers, and other solar tempered agricultural  
facilities. Class hours: 1 hour lecture, 3 hours laboratory.

SET 59  
**Solar Electronics**  
2 units  
This course applies basic electronic principles to solar energy systems.  
Topics include generation of electric power with solar cells, installation  
and operation of solar controls, and the use of electronic instruments  
for testing and monitoring solar systems. Emphasis will be on experi-  
mental projects. Class hours: 1 hour lecture, 3 hours laboratory.

SET 60  
**Wind Energy**  
2 units  
A course intended to give a technical understanding of wind energy systems.  
Topics will include wind characteristics, the history of wind turbines,  
and the appropriate design of wind energy systems. Students will build  
anemometers, electrical circuits, and small wind turbines. Class hours:  
1 hour lecture, 3 hours laboratory.

SET 61  
**Solar Energy - Community Studies**  
2 units  
This course is intended for the advanced solar student who is articulate  
and knowledgeable in solar principles and applications. Students will  
present basic information on solar energy, and give demonstrations of  
solar devices to schools, community groups and fairs in the Santa Cruz  
area. Class hours: 6 hours arranged.

SET 62AB  
**Solar Field Studies**  
2-1 units  
This course will explore applications of solar energy as they are found  
in industrial, commercial, and residential systems. Selected field  
trips and conferences in the western United States to be attended.  
Dates and locations to be listed for Summer and Intersession. Class  
Hours: A: 1 hour lecture, 3 hours laboratory; B: 3 hours laboratory.
CABRILLO COLLEGE cont'd.

SET 10S  Special Studies  2-2 units

Class hours: 6 hours arranged.
ASSOCIATE OF SCIENCE DEGREE - SOLAR ENERGY TECHNOLOGY
CERTIFICATE PROGRAM - SOLAR ENERGY TECHNOLOGY

CURRICULUM

<table>
<thead>
<tr>
<th>Course</th>
<th>Code</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction to Solar Energy</td>
<td>SET 55</td>
<td>2</td>
</tr>
<tr>
<td>Collectors &amp; Energy Storage</td>
<td>SET 56</td>
<td>2</td>
</tr>
<tr>
<td>Solar Sizing, Design &amp; Retrofit</td>
<td>SET 57</td>
<td>2</td>
</tr>
<tr>
<td>Materials &amp; Materials Handling</td>
<td>SET 58</td>
<td>3</td>
</tr>
<tr>
<td>Operational Diagnosis</td>
<td>SET 59</td>
<td>3</td>
</tr>
<tr>
<td>Non Residential Application and Future Technology</td>
<td>SET 62</td>
<td>3</td>
</tr>
<tr>
<td>Technical Survey of Energy Sources</td>
<td>SET 63</td>
<td>2</td>
</tr>
<tr>
<td>Economics, Codes, Legal, Consumerism</td>
<td>SET 64</td>
<td>2</td>
</tr>
<tr>
<td>Occ./Career Work Exper. Seminar</td>
<td>SET 60a</td>
<td>1</td>
</tr>
<tr>
<td>Occ./Career Work Experience</td>
<td>SET 61a</td>
<td>1-3</td>
</tr>
</tbody>
</table>

CORE ENERGY CLASSES

SET 55 Introduction to Solar Energy 2 units

History of solar energy; an overview of collector types; converting solar radiation to thermal energy; the effects of alternate types of energy efficient construction; traditional and non-traditional solar applications and a general solar vocabulary. Two hours lecture.

SET 56 Collectors & Energy Storage 3 units

Collecting solar energy for home heating and cooling; detailed study of collector types; hands-on experience with common collectors; chemical compatibility of different collector materials and collector fluids; comparison of current systems; exotic collection and storage systems. Two hours lecture, three hours laboratory.

SET 57 Solar Sizing, Design & Retrofit 2 units

Solar system installation for total environmental control; control systems for heating, cooling and domestic hot water. Integration of solar with conventional systems; sizing of systems and system components, heating and cooling load will be studied. Two hours lecture.
SET 58. Materials & Materials Handling 3 units
The properties and handling of materials which are utilized in construction of a solar system. The basics of plumbing, sheetmetal, carpentry, roofing, glazing, concrete work, soldering, welding and material compatibility. Two-hour lecture, three-hour laboratory.

SET 59. Operational Diagnosis 3 units
Instrumentation and measurements to correctly set up and evaluate a solar system. Examination and identification of common problems likely to be encountered in a malfunctioning solar system. Intentionally introduced system problems will be identified and repaired. Two hours lecture, three hours laboratory.

SET 62. Non-Residential Applications and Future Technology 3 units
Application of solar technology for uses other than home heating and cooling. Open-ended course materials will be added or deleted as new technologies are developed, come into use, or are discarded. Two hours lecture, three hours laboratory.

SET 63. Technical Survey of Energy Sources 2 units
Supply capabilities of traditional energy resources and the capabilities of future energy resources, energy conservation and environmental problems. Two hours lecture.

SET 64. Economics, Codes, Legal and Consumerism 2 units
Economics of solar energy systems and how they are affected by governmental action. Methods of calculating economic costs and benefits related to both active and passive solar systems. Solar system financing, customer relations, guarantees and consumer protection. Two hours lecture.
ASSOCIATE IN SCIENCE DEGREE - SOLAR TECHNOLOGY
SOLAR TECHNOLOGY INSTALLATION CERTIFICATE

The Solar Technology program has been developed to provide solar vocational/technical training in a new and dynamic career field. The two-year degree program will provide the knowledge competencies and skills required of solar technicians by the solar industry at large.

The certificate program is designed to meet two needs: To train solar installer mechanics to work in the solar industry; and secondly, with the exception of C.E. 183, to assist the layman in installing his own home solar system.

CURRICULUM

ASSOCIATE IN SCIENCE DEGREE:

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction to Solar Technology</td>
<td>S.T. 500</td>
</tr>
<tr>
<td>Solar Hydronic Systems</td>
<td>S.T. 502</td>
</tr>
<tr>
<td>Solar Air Systems</td>
<td>S.T. 504</td>
</tr>
<tr>
<td>Solar Heat Transfer</td>
<td>S.T. 520</td>
</tr>
<tr>
<td>Solar Sizing</td>
<td>S.T. 522</td>
</tr>
<tr>
<td>Blueprint Reading</td>
<td>S.T. 524</td>
</tr>
<tr>
<td>Solar Energy Seminar</td>
<td>S.T. 526</td>
</tr>
<tr>
<td>Mechanical Drafting I</td>
<td>Draft 120</td>
</tr>
<tr>
<td>Blueprint Reading: Building</td>
<td>Draft 510</td>
</tr>
<tr>
<td>Intro. to Industrial Electricity</td>
<td>Elec 510</td>
</tr>
<tr>
<td>Intro. to Electronics</td>
<td>Elec 501 (RS)</td>
</tr>
<tr>
<td>Career Field Studies Work Exp.</td>
<td>C.E. 183</td>
</tr>
</tbody>
</table>

Suggested:

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fundamentals of Physics</td>
<td>Physics 110</td>
</tr>
<tr>
<td>Business</td>
<td>Bus. 118</td>
</tr>
<tr>
<td>Public Draft</td>
<td>C.A. 102</td>
</tr>
</tbody>
</table>

SOLAR TECHNOLOGY INSTALLATION CERTIFICATE:

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intro. to Solar Technology</td>
<td>S.T. 500</td>
</tr>
<tr>
<td>Solar Hydronic Systems</td>
<td>S.T. 502</td>
</tr>
<tr>
<td>Solar Air Systems</td>
<td>S.T. 504</td>
</tr>
<tr>
<td>Career Field Studies Work Exp.</td>
<td>C.E. 183</td>
</tr>
</tbody>
</table>

CORE ENERGY CLASSES

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>S.T. 50</td>
<td>Orientation to Solar Technology</td>
</tr>
</tbody>
</table>

A survey of Solar Technology courses and programs, of skills needed for success, and of the career opportunities within the field. Designed to provide the student with information needed to make appropriate course and career choices.
S.T. 500 Introduction to Solar Technology 4 units

Emphasis on solar energy utilization, past, present, and future. Survey of all other energy alternatives: wind, hydrogen, biomass, synthetic fuels, methane, tidal, geothermal, fusion and conservation technologies.

S.T. 502 Solar Hydronic Systems 3 units

Introduction to the skills required to install solar plumbing, pumps, controls, heat exchangers, storage vessels, and collectors in solar hydronic systems for pools, domestic hot water, and space conditioning.

S.T. 504 Solar Air Systems 3 units

Introduction to the skills required to install solar ductwork, blowers, controls, heat exchangers, storage vessels, and collectors in solar air systems for space conditioning. Additional emphasis on auxiliary backup systems typically used in both air and hydronic space conditioning.

S.T. 520 Solar Heat Transfer 4 units

Introduction to conduction, convection, and radiation heat transfer in solar collectors, buildings, and heat exchangers. Emphasis on problem solving by using given quantitative formulas and equations.

S.T. 522 Solar Sizing 4 units

Quantitative and qualitative aspects of sizing and designing solar heating and cooling system components for domestic hot water, pools and space conditioning.

S.T. 524 Blueprint Reading and Sketching 2 units

Reading residential and commercial blueprints. The various symbols, techniques, and conventional practices; orthographic projection and the ability to make freehand pencil sketches of job layouts or duct work. Wiring schematics.

S.T. 528 Solar Energy Seminar 2 units

Individual, in-depth research into alternative energy topics of interest to the student of solar technology.
COASTLINE COMMUNITY COLLEGE
10231 Slater Avenue
Fountain Valley, CA 92708

Art Martinez
Associate Dean
(714) 898-9871

CERTIFICATE PROGRAM - ENERGY MANAGEMENT

Energy Management trains technicians who can apply a knowledge of energy systems, energy management principles, energy conservation, and energy planning.

CURRICULUM

<table>
<thead>
<tr>
<th>Course</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy Management</td>
<td>Eng. Mgmt. 100 3</td>
</tr>
<tr>
<td>Practical Energy Economics</td>
<td>Eng. Mgmt. 101 3</td>
</tr>
<tr>
<td>Energy Mgmt./Human Behavior</td>
<td>Eng. Mgmt. 103 3</td>
</tr>
<tr>
<td>Environmental Equipment</td>
<td>Eng. Mgmt. 210 3</td>
</tr>
<tr>
<td>Lighting Systems Design</td>
<td>Eng. Mgmt. 230 3</td>
</tr>
<tr>
<td>Introduction to Computers</td>
<td>BUS 100 or</td>
</tr>
<tr>
<td>Technical Report Writing</td>
<td>English 105 or</td>
</tr>
<tr>
<td>Introduction to Supervision</td>
<td>Supv. 804 3</td>
</tr>
<tr>
<td>Electives</td>
<td></td>
</tr>
<tr>
<td>TOTAL UNITS</td>
<td>24</td>
</tr>
</tbody>
</table>

CORE ENERGY CLASSES

Energy Mgmt. 100 Principles of Energy Management 3 units

This course is designed for "energy managers" and to give them an overview of primary energy forms, their history, present and future worth, as it relates to public, commerce and industry. Energy as it relates to other disciplines, such as architecture, engineering and government agencies. Serves as an aid in determining energy sources, costs and application. Three hours lecture per week.

Energy Mgmt. 101 Practical Energy Economics 3 units

Course includes life cycle costs of basic energy and how it is affected by socio-political actions, regulatory agencies and business plans. Three hours lecture per week.

Energy Mgmt. 102 Systems Analysis for Energy Mgmt 3 units

Course is designed to provide students with the basic skills needed to effectively identify and analyze organizational energy problems. A creative approach to the application of systematic, quantitative methods and techniques in an attempt to obtain preferred solutions. Course includes field application of classroom theory and a review of current energy conservation products, service and procedures. Three hours lecture per week.
Energy Mgmt. 103  Energy Management & Human Behavior  3 units

Course seeks to apply knowledge and techniques of the social and behavioral sciences to the solution of practical problems encountered by energy management specialists. "Human Factors" explored include: Attitudes toward energy consumption, sources of resistance to energy-conserving measures and techniques for modifying energy-related behavior. Students to design and carry out group field research projects. Three hours lecture per week.

Energy Mgmt. 210  Environmental Equipment  3 units

This course is a practical introduction to air-conditioning systems and their application in commercial, industrial and residential buildings. The primary emphasis of the course will be on conservation from an engineering viewpoint. Three hours lecture per week.

Energy Mgmt. 220  Energy Management Planning  3 units

Course is designed to provide students with the knowledge to identify energy-using equipment, analyze its operation and prepare recommendations for conserving energy and/or improving efficiencies. Emphasis will be placed on developing energy management plans. Three hours lecture per week.

Energy Mgmt. 230  Lighting Systems Design  3 units

This course provides students with the knowledge to design commercial and industrial lighting systems and to recommend conservation and other energy management techniques. Three hours lecture per week.
TYPE OF PROGRAM:  
(Certificate Program) Solar Energy Technology

NUMBER OF STUDENTS:  
14

DATES OF OPERATION:  
June 1979 - June 1980

SOURCE OF FUNDS:  
CETA

PROGRAM DESCRIPTION:  
One-year training program which granted a Certificate in Solar Energy Technology to the 14 persons who completed training. Training included one semester each of the following:

- Introduction to Construction
- Industrial Blueprint Reading
- Construction Blueprint Reading
- Vocational Arithmetic
- Vocational Geometry
- Warm Air Heating and Air Conditioning
- Hydronics
- Refrigeration and Gas Burners
- Electricity and Controls
- Active Solar Systems
- Passive Solar Systems
- On-the Job Training
ASSOCIATE OF SCIENCE DEGREE IN ENVIRONMENTAL DESIGN
Solar and Alternative Energy Systems Option

The solar energy applications option introduces students to building design facilitating solar energy utilization. The program provides training and activities in solar energy appliance construction, installation, and maintenance, energy conservation, alternate energy systems, and small business procedures. The program emphasizes entry level job skills.

CURRICULUM

<table>
<thead>
<tr>
<th>First Year:</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Env. Des. 3, 30</td>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Env. Des. 5, 4</td>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Env. Des. 6, 18</td>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Env. Des. 7</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Env. Des. 1, 16</td>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>English 1A, 50 or Sec. Pract. 50</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Learning Skills</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Physical Education</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Electives</td>
<td></td>
<td>1</td>
<td>30</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Second Year:</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Env. Des. 32, 52</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Env. Deg. 35, 71</td>
<td>6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Env. Des. 46</td>
<td>1½</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Env. Des. 80</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Env. Des. 47</td>
<td>1½</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Health Education 1</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Natural Science</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>U.S. History/ Govt.</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Social Science</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Electives</td>
<td>5</td>
<td></td>
<td>30</td>
</tr>
</tbody>
</table>

CORE ENERGY CLASSES

ENV. DES. 31 Introduction to Solar Energy Systems 2 units

A design/drafting course to apply solar energy to building construction. Study of building design to facilitate solar energy utilization; space heating and cooling using solar energy; passive solar systems; active solar systems; new solar architectures; retrofitting of existing structures; systems in use in today's solar design; and consideration for new applications.
**ENV. DES. 32**  
**Solar Heated Water Systems for the House**  
Learning to use solar energy to heat domestic hot water systems and swimming pools. Will explore site analysis of the system, amortization of costs, building code requirements, and purchase of components. Each student will be encouraged to design a system for their own residence.

**ENV. DES. 33**  
**Introduction to Solar Collector Construction**  
An introductory experience in the design and construction of a flat plate solar collector. Major areas of concern will include tools, materials, constructing and evaluating a solar energy collector.

**ENV. DES. 34**  
**Alternate Energy Systems**  
A study of the various alternate energy systems. Emphasis on solar design. Comprehensive overview of alternative energy systems, with emphasis on solar design, heat load calculations, system design, economic feasibility of domestic hot water heating, space heating and space cooling utilizing solar energy.

**ENV. DES. 71**  
**Solar Energy Appliances Construction and Installation**  
A hands-on laboratory experience which will involve students in design, construction and installation of solar collector systems. Major subject areas will include tools and their uses, appropriate materials, construction techniques, storage systems, switching electrical systems and installation procedures. The skills developed may be used for commercial or private installations.
TYPE OF PROGRAM: (Certificate Program) Alternate Energy Technician Training

DATES OF OPERATION: Program initiated March 1980

NUMBER OF STUDENTS: 15 - 18

SOURCE OF FUNDS: CÉTA

PROGRAM DESCRIPTION: Nine month training program, 40% classroom and 60% hands-on, with 18 additional weeks of OJT. Curriculum covers alcohol production, wind and geothermal energy, in addition to active and passive solar systems. First class completed coursework on August 15, 1980, and presently doing OJT. Second training class begins November 1, 1980.

Note. The Department of Energy’s East Mesa Test Facility has been given to the college for the establishment of an engineering training center for geothermal energy (graduate and undergraduate levels) that is scheduled to open July 1, 1981. The college recently received a State Food and Agriculture grant and will be conducting a series of 3-4 short-term courses (6-8 weeks) on Alcohol Fuels Production (how to build solar stills, operate them, etc.).
ASSOCIATE OF SCIENCE DEGREE-SOLAR ENGINEERING TECHNOLOGIST (SET)

The Solar Engineering Technologist (SET) program is a combination of courses selected from Air Conditioning and Refrigeration, Electronic Engineering Technologist, and Electro-Mechanical Engineering Technologist. These, coupled with appropriate Solar courses, will prepare the student for employment as a solar technician in research laboratories, test facilities, solar companies, and other energy related organizations. The program is scheduled for implementation by Fall 1981.

CURRICULUM

Requirements for Associate of Science Degree

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Solar 1</td>
<td>Introduction to Solar Energy</td>
<td>2</td>
</tr>
<tr>
<td>Solar 2</td>
<td>Collectors &amp; Energy Storage</td>
<td>3</td>
</tr>
<tr>
<td>Solar 3</td>
<td>Solar Sizing, Design, &amp; Retrofit</td>
<td>3</td>
</tr>
<tr>
<td>Solar 4</td>
<td>Materials &amp; Materials Handling</td>
<td>2</td>
</tr>
<tr>
<td>Solar 5</td>
<td>Operational Diagnosis I</td>
<td>4</td>
</tr>
<tr>
<td>Solar 6</td>
<td>Operational Diagnosis II</td>
<td>4</td>
</tr>
<tr>
<td>Solar 7</td>
<td>Heat Pump Theory</td>
<td>1</td>
</tr>
<tr>
<td>Solar 8</td>
<td>Non-Residential Applications</td>
<td>2</td>
</tr>
<tr>
<td>Solar 9</td>
<td>Economics, Codes, Legal, Consumerism</td>
<td>2</td>
</tr>
<tr>
<td>Solar 81</td>
<td>Solar Projects Laboratory</td>
<td>2</td>
</tr>
<tr>
<td>Eng Tek 25</td>
<td>Industrial Safety</td>
<td>1</td>
</tr>
<tr>
<td>Eng Tek 35</td>
<td>Programming for Computer Technicians</td>
<td>2</td>
</tr>
<tr>
<td>Eng Tek 49</td>
<td>Technical Mathematics II</td>
<td>3</td>
</tr>
<tr>
<td>Eng Tek 50</td>
<td>Technical Mathematics III</td>
<td>3</td>
</tr>
<tr>
<td>Air Con 1</td>
<td>Refrigeration Servicing I</td>
<td>4</td>
</tr>
<tr>
<td>Air Con 2</td>
<td>Refrigeration Servicing Lab I</td>
<td>2</td>
</tr>
<tr>
<td>Draft 16</td>
<td>Blueprint Reading I</td>
<td>2</td>
</tr>
<tr>
<td>Draft 17</td>
<td>Blueprint Reading II</td>
<td>2</td>
</tr>
<tr>
<td>Draft 16</td>
<td>Projects Laboratory</td>
<td>2</td>
</tr>
<tr>
<td>Phys 81</td>
<td>Projects Laboratory</td>
<td>2</td>
</tr>
<tr>
<td>Phys 81</td>
<td>Introductory Physics</td>
<td>4</td>
</tr>
<tr>
<td>Chem 4</td>
<td>Basic Chemistry</td>
<td>4</td>
</tr>
</tbody>
</table>

General Education Requirements 11
Total Units for Associate of Science Degree 65
CORE ENERGY CLASSES

SOLAR 1  Introduction to Solar Energy  2 units

This course explores: History of Solar Energy, supply capabilities of traditional energy resources, energy conservation and environmental problems. Included is an overview of collector types; the process of converting solar insulation into thermal energy units; the effects on collector efficiency when using alternate types of collector construction; traditional and non-traditional solar applications. Class hours: 2 hours lecture.

SOLAR 2  Collectors & Energy Storage  3 units

Topics to be covered are heat load calculations; passive solar heating principles and applications; active solar systems, hybrid (active and passive) systems; collection of solar energy for home heating and cooling, detailed studies of collector types, chemical compatibility of different collector materials and collector fluids. In addition to the appropriate integration of the above topics, the laboratory will also emphasize "hands-on" experience with related physical material. Class hours: 2 hours lecture, 3 hours laboratory.

SOLAR 3  Solar Sizing, Design and Retrofit  3 units

This course covers the solar system installation for total environment control, control systems for heating, cooling, and domestic hot water. The subject of integration of solar energy with conventional systems, sizing of systems and systems components; heating and cooling load studies will be examined. Class hours: 3 hours lecture.

SOLAR 4  Materials and Materials Handling  2 units

This course covers the procedures for properly identifying and handling of materials that are used in the construction of a solar system. Properties of materials are also investigated. This course also examines the basics of plumbing, sheetmetal, carpentry, roofing, glazing, masonry, soldering; welding, and material compatibility. Class hours: 1 hour lecture, 3 hours laboratory.

SOLAR 5  Operational Diagnosis I  4 units

This is an integrated course of elementary electrical, electronic, and solar instrumentation theory. Sufficient material is covered so that the student may make simple measurements on individual components in a laboratory environment. Class hours: 3 hours lecture, 3 hours laboratory.
This is an integrated course of advanced electrical, electronic, and solar instrumentation theory. Material from SOLAR 5 is used to reinforce the concepts of measurements and troubleshooting techniques. The student is now capable of performing a complete solar system check-out and is shown how to detect a system malfunction. Common problems that occur in a typical solar system are analyzed.

Class hours: 3 hours lecture, 3 hours laboratory.

The refrigeration cycle is again investigated. The course concentrates on how it is used to move hot and cold fluids (air or liquid) to achieve a reasonably pleasant and stable atmosphere. Well water and shallow pond low grade heat extraction techniques are also examined. Class hours: 1-hour lecture.

Applications of Solar Technology for use other than home heating and cooling are studied. Alternate Energy Sources are also covered. Class hours: 2 hours lecture.

Economics of solar energy systems and how they are affected by governmental action; methods of calculating economic cost and benefits related to both active and passive solar systems; solar system financing; lenders attitudes, customer relations, warranties, and consumer protection. Class hours: 2 hours lecture.

This course provides additional laboratory experience in the maintenance of test equipment; the design and construction of electronic and solar apparatus. A project paper is required. Class hours: 3-3 hours laboratory.
CERTIFICATE OF COMPLETION - SOLAR TECHNICIAN

CURRICULUM

<table>
<thead>
<tr>
<th>Course</th>
<th>Code</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agriculture Mechanics</td>
<td>MA 30</td>
<td>3</td>
</tr>
<tr>
<td>Industrial Safety</td>
<td>IT 31</td>
<td>1</td>
</tr>
<tr>
<td>Energy Systems &amp; Conservation</td>
<td>IT 39</td>
<td>3</td>
</tr>
<tr>
<td>Solar Energy - Residential Applications</td>
<td>IT 40</td>
<td>3</td>
</tr>
<tr>
<td>Refrigeration and Air Cond.</td>
<td>Refrig/Air 50</td>
<td>3</td>
</tr>
<tr>
<td>Service and Maintenance</td>
<td>WT 6</td>
<td>2</td>
</tr>
<tr>
<td>Fundamentals of Arc &amp; Oxy-Acetylene Welding</td>
<td>DT 44</td>
<td>2</td>
</tr>
<tr>
<td>Print Reading &amp; Sketching</td>
<td>DT 44</td>
<td>2</td>
</tr>
<tr>
<td>General Electricity - Electronic ET 50</td>
<td></td>
<td>3</td>
</tr>
</tbody>
</table>

CORE ENERGY CLASSES

IT 39  Energy Systems & Conservation  3 units

This course is designed for all who need to better understand this vital topic. Energy sources, resources, supplies, electricity generation, fossil fuel engines, energy conversion and conservation will be reviewed. Solar, nuclear, tidal, geothermal, wind, ocean thermal, oil and coal are the principal topics. Three hours lecture.

IT 40  Solar Energy - Residential Applications  3 units

This is an introductory course to include direct and indirect techniques of heating and cooling a home. Energy conservation is stressed in the topics of water heaters, pool heaters, building air or liquid collectors, heat storage, heat distribution plus financial constraints and attractions. Three hours lecture.
CERTIFICATE PROGRAM - ALTERNATE ENERGY TECHNICIAN

This program is presently an experimental one year full-time (40 hrs./week) CETA training project. The curriculum covers all areas of alternative energy with an emphasis on solar. The certificated technician is familiar with all aspects of the solar field including: sales, site evaluation, installation, and maintenance. Preliminary evidence indicates that this project will manifest in an abbreviated project in terms of both hours per week and the number of weeks required for student certification.

CURRICULUM

**First Semester:**
- Solar & Alternate Energy Systems  CTEC 200 3
- Solar Systems & Energy Cons.  CTEC 295-1 6
- Alternate Energy Practicum  CTEC 295-2 3
- Basic Skills/Alternate Energy  CTEC 295-3 4
- Applied Technical Mathematics  MATH 697-4 4
- English Skills/Success in Language  ENG 271-8 4

**Interession:**
- Architectural Blueprint Reading  Drafting 212 2
- Technical Blueprint Reading  Drafting 211 2

**Second Semester:**
- Solar & Alternate Energy Systems  CTEC 200-1 3
- Solar Systems & Energy Cons.  CTEC 295-1 6
- Alternate Energy Practicum  CTEC 295-2 3
- Basic Skills/Alternate Energy  CTEC 295-3 4
- Applied Technical Mathematics  MATH 697 4
- English Skills/Success in Language  ENG 271-10 4

CORE ENERGY CLASSES

**CTEC 200**  Solar and Alternative Energy Systems  3 units

Basic energy theory applied to the energy flow in buildings. Relevant principles of thermodynamics and practical design of solar systems for residential and commercial applications. Three hours lecture.

**CTEC 295-1**  Solar Systems and Energy Conservation  6 units

The study of design, fabrication and installation of flat-plate and bread box collectors used for space and water heating. Twelve hours lecture/laboratory.
CTEC 295.2  Alternate Energy Practicum  3 units
Installing alternate energy devices on public and/or private buildings.
Eight hours lecture/laboratory.

CTEC 295.3  Basic Skills/Alternate Energy  4 units
Reading, writing, calculating, and communication practices as related to the field of alternate energy. Sixteen hours lecture.

MATH 697  Applied Technical Mathematics  4 units
Basic mathematical ideas of whole numbers, fractions, decimals, percents and integers and their practical applications. Application of technical and industrial formulae involving concepts of algebra, geometry and trigonometry. Four hours lecture/discussion.
CERTIFICATE IN POWER ENGINEERING
CERTIFICATE IN SOLAR ENGINEERING

CURRICULUM

Power Engineering Option:
- Refrigeration Principles: ENERGY 100, 2 units
- Air Cond. Principles: ENERGY 101, 2 units
- Air Cond. Service & Repair: ENERGY 103, 2 units
- Air Cond. Controls: ENERGY 105, 3 units
- Steam Plant Operation & Maintenance: ENERGY 107, 3 units
- Applied Electricity: ENERGY 120, 3 units

Select nine (9) units from the following which included with the fifteen (15) units core requirements totals twenty (20) for a certificate:
- Absorption Air Cond. Systems: ENERGY 102
- Air Distribution Balancing: ENERGY 104
- Centrifugal Refrigeration: ENERGY 106
- Steam Plant Operation & Maintenance: ENERGY 108
- Solar Installation/Operation: ENERGY 115
- Solar System Design: ENERGY 117
- Energy Audit Technology: ENERGY 119

Solar Engineering Option:
- Solar Installation/Operation: ENERGY 115
- Solar System Design: ENERGY 117
- Energy Audit Technology: ENERGY 119
- Applied Electricity: ENERGY 120

Select eight (8) units from the following which included with the twelve (12) units core requirements totals twenty (20) for a certificate:
- Refrigeration Principles: ENERGY 100
- Air Cond. Principles: ENERGY 101
- Air Cond. Service & Repair: ENERGY 103
- Air Distribution Balancing: ENERGY 104
- Air Cond. Controls: ENERGY 105

CORE ENERGY CLASSES

ENERGY 107 Steam Plant Operation & Maintenance I

Basic steam cycle, boilers and accessories, water and water treatment, turbines, heat balance and performance monitoring, nuclear powered steam plants. Three hours lecture.
ORANGE COAST COLLEGE cont'd.

ENERGY 115  Solar-Heating & Cooling  3 units
System design and application of solar equipment to heat and air condition for comfort and industrial processes. Three hours lecture.

ENERGY 117  Solar II  3 units
Solar heating and cooling of residential buildings. Sizing, installation and operation of systems. Three hours lecture.

ENERGY 119  Energy Audit Technology  3 units
The course will provide knowledge and techniques for measuring energy consumption in building envelopes, and means of conserving energy. Two hours lecture, four hours laboratory.
ASSOCIATES IN ARTS DEGREE - MECHANICAL-ELECTRICAL TECHNOLOGY

ALTERNATIVE ENERGY OPTION

The AA degree may be obtained by completion of a major as outlined plus General Education requirements, plus sufficient MET evening program electives to meet a 60 unit total.

CURRICULUM

Basic Technical Math MET 102
Electrical Controls MET 113
Alternative Energy Conservation MET 150
Basic Active Solar Heating - MET 151
- Cooling Systems
- Basic Solar Photovoltaic and - Wind Energy Systems
- Basic/Electric Vehicle Operation MET 153
- and Maintenance

Suggested Electives:
- Mathematics of Refrigeration MET 112
- and Air Conditioning
- Heating and Power Machinery MET 121
- Electronic Controls MET 123
- Air Conditioning MET 131
- Pneumatic Controls MET 133
- Applied Technical Communication TECH 60

Along with standard General Education Requirements

CORE ENERGY CLASSES

MET 150 Alternative Energy Conservation 3 units

Basic energy theory and principles; fossil fuels, nuclear, geothermal, hydro, wind, solar, biomass, fuel-cell, co-generation energy sources and systems; energy storage systems; energy conservation practices in residential, commercial and industrial structures; energy costs.

MET 151 Basic Solar Heating-Cooling Systems 3 units

Solar energy theory; basic residential, commercial, and industrial solar heating and cooling systems; collectors - flat plate, high efficiency, concentrating and photovoltaic heat and energy storage; freeze protection; corrosion protection; maintenance, controls and accessories; pumps; tanks; piping; sizing of components; economic considerations; standards and codes.
SACRAMENTO CITY COLLEGE cont'd.

MET 152
Basic Solar Photo-Voltaic and Wind Energy Systems
3 units

Basic solar theory; energy overview; basic photovoltaic and wind energy theory; photovoltaic cells; charging modules, battery theory, care, and storage; inverter and cycle modules; switching devices; circuits and loads; wind energy equipment; energy storage, cycle, and switching equipment; circuits and loads; current energy laws and codes.

MET 153
Basic Electric Vehicles
3 units

Energy overview; typical electric passenger, commercial passenger, and commercial work vehicles; typical components of electric vehicles; DC electric motors; electric vehicle drive motors; power transmission; motor controllers; vehicle circuits and controls; battery theory and care; battery charging and protection; dynamic motor and vehicle braking; auxiliary electric vehicle devices.

MET 141
Basic Solar Heating-Cooling Systems
3 units

Solar energy theory; basic residential, commercial, and industrial solar heating and cooling systems; collectors - flat plate, high efficiency, concentrate and photo-voltaic; heat and energy storage; freeze protection; corrosion protection; maintenance; controls and accessories; pumps; tanks; piping; sizing of components; economic considerations; standards and codes.
This program is designed to train people to become solar installers and solar maintenance technicians. Students will be able to perform the plumbing, sheetmetal, electrical, and carpentry tasks associated with installation of solar collectors, water storage tanks, and connecting pipes and ducts. They will be able to perform calculations and interpret blueprint specifications on piping, duct work, and wiring. They will also be able to perform maintenance and testing of solar equipment, including diagnosis of common problems, and recognizing components that need cleaning, repairing or replacing. At the completion of this training, students will be able to assemble, operate, test and maintain solar equipment that heats water and spaces in homes, apartments, and commercial buildings.

**ENERGY COURSES**

**SOLAR TECH 100**  
Introduction to Solar Energy  
2 units

This course is designed to acquaint the student with the history and basic technology of solar energy utilization. The course will utilize lectures, demonstrations, practical laboratory exercises and field trips. One hour lecture/three hours laboratory.

**SOLAR TECH 101**  
Solar Construction I  
2 units

Students will learn basic construction techniques and the proper use of appropriate specialized tools and equipment. Practical construction projects and demonstrations will blend with lectures. One hour lecture/three hours laboratory.

**SOLAR TECH 102**  
Solar Construction II  
2 units

Students will learn advanced techniques in solar construction and the use of specialized tools and equipment. The course will provide practical laboratory experience in advanced design and construction of solar installations. One hour lecture/three hours laboratory.

**SOLAR TECH 103**  
Domestic Hot Water Systems  
2 units

Students will learn to properly size, place, and install solar collectors, storage tanks and heat exchange equipment for solar domestic water heating systems. Lab exercises will provide students with the opportunity to demonstrate competence in domestic solar hot water system installation. One hour lecture/three hours laboratory.
SADDLEBACK COLLEGE, cont'd.

SOLAR TECH 104 Pool and Space Heating 2 units
This course will provide basic information and practical experience in installation techniques for swimming pool solar heating equipment. Installation techniques for space heating devices such as heat pumps will be demonstrated. One hour lecture/three hours laboratory.

SOLAR TECH 105 Solar Controls and Sensors 2 units
This course will provide information on the correct use, maintenance, and installation of solar controls and sensors. Students will learn the proper use of test equipment for testing solar equipment typically encountered in domestic solar installations. One hour lecture/three hours laboratory.
TYPE OF PROGRAM: (Certificate Program) Solar Energy Systems Installer

NUMBER OF STUDENTS: 15

DATES OF OPERATION: Program initiated May 1980

SOURCE OF FUNDS: CETA

PROGRAM DESCRIPTION:

Six month training program that permits students the option of an additional three months of OJT. 25% of time devoted to classroom lecture, 75% to laboratory (hands-on).

The program is designed to train people to become solar installers and solar maintenance technicians. Students will be able to perform the plumbing, sheetmetal, electrical, and carpentry tasks associated with installation of solar collectors, water storage tanks, and connecting pipes and ducts. They will be able to perform calculations and interpret blueprint specifications on piping, duct work, and wiring. They will be able to perform maintenance and testing of solar equipment, including diagnosis of common problems, and recognizing components that need cleaning, repairing or replacing. At the completion of this training, students will be able to assemble, operate, test and maintain solar equipment that heats water and spaces in homes, apartments, and commercial buildings.

The Solar Energy Systems Installer Certificate will be granted upon completion of the following courses that carry 18 credit units:

Solar Tech 100 Introduction to Solar Energy 2 units
Solar Tech 101 Solar Construction I 2 units
Solar Tech 102 Solar Construction II 2 units
Solar Tech 103 Domestic Hot Water Systems 2 units
Solar Tech 104 Pool and Space Heating 2 units
Solar Tech 105 Solar Controls and Sensors 2 units
Construction Tech 150 Construction Supervision and Safety 3 units
Construction Tech 135 Building Code and Law 3 units
ASSOCIATE OF SCIENCE DEGREE - SOLAR TECHNOLOGY
CERTIFICATE PROGRAM - SOLAR TECHNOLOGY

Provides the skills and knowledge necessary for employment in heating, cooling, and solar industries. Includes courses in refrigeration, air conditioning, solar maintenance technology, and related instruction, to provide students with the necessary background to effectively function as a technician in the energy field.

CURRICULUM

Courses required for the certificate and for the degree:
Air Conditioning, Heating, Refrigeration and Solar Technology 201, 203, 205, 215, 220, 226
Total 23

Additional Requirements for the A.S. degree:
Natural Sciences
Social Sciences
Humanities
Learning Skills
Select at least one course in each of the above areas.
American Institutions 15
Health Education 101 3-6
Physical Education (if required) 2

CORE ENERGY CLASSES

TECH 201 Introduction to Heating and Air Conditioning 4 units
Fundamental terms and principles of applied solar theory, comfort cooling, refrigerant piping, remote air conditioning, and gas-fired forced air heating, including general service and test procedures. Can be taken concurrently with Air Conditioning, Heating, Refrigeration, and Solar Technology 205. Three hours lecture, three hours laboratory.

TECH 210 Electrical Controls 4 units
To impart the concept of solid state controls for heating and air conditioning systems, terms, symbols, logic diagrams, memory elements, typical devices, and to survey current commercial systems. Can be taken concurrently with Air Conditioning, Heating, Refrigeration and Solar Technology 201 and/or 205, and/or 215. Three hours lecture, three hours laboratory.
TECH 225  Solar Service, Maintenance & Technology  3 units
An introduction to solar energy with emphasis on the concepts, installation, and services related to residential solar, potable hot water, and swimming pool, spa and space heating systems. The course includes familiarity with the plumbing, electrical and mechanical component systems, and the relationship of each component to the total system. Can be taken concurrently with Air Conditioning, Heating, Refrigeration, and Solar Technology 220. Three hours lecture.

TECH 226  Advanced Solar Service Maintenance and Technology  3 units
Training in solar trouble-shooting techniques and design alterations, with emphasis on concepts of solar efficiency and cost estimating for solar heating systems. The course includes an introduction to electro/mechanical support equipment and future system design for space heating and maintenance.
ASSOCIATE OF SCIENCE DEGREE - SOLAR TECHNICIAN

A technical program designed to develop knowledge and skills in the field of solar energy. The program will give the student the necessary entry level skills for employment. Teaches electrical schematics, air conditioning and refrigeration theory as it applies to solar applications, brazing, blueprint reading, installation, maintenance and design of solar systems, and related mathematics. A student completing the suggested curriculum may seek employment as a solar technician, estimator or sales engineer.

CURRICULUM

**Associate in Science Degree:**

<table>
<thead>
<tr>
<th>Course</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>English 92, 92 IA or ESL 92</td>
<td>3</td>
</tr>
<tr>
<td>Hist. 55 &amp; Govt. 55 (or 21), or Hist. 17AB</td>
<td>6</td>
</tr>
<tr>
<td>Humanities</td>
<td>3</td>
</tr>
<tr>
<td>Ethnic Studies</td>
<td>3</td>
</tr>
<tr>
<td>Speech 10, 20, 21, 40, 41, 45 or 55 (one class)</td>
<td>3</td>
</tr>
<tr>
<td>Health Ed. 11 - Issues</td>
<td>2</td>
</tr>
<tr>
<td>P.E. - Activity</td>
<td>1</td>
</tr>
<tr>
<td>Physics 20 - Technical Physics</td>
<td>3</td>
</tr>
<tr>
<td>Phy. Sci. 22 - Alternate Energy Sources</td>
<td>3</td>
</tr>
<tr>
<td>Math. 12 - Algebra I or Math. 101 - Technical Math</td>
<td>3</td>
</tr>
<tr>
<td>A.C. 102A - Refrigeration &amp; Heat Transfer</td>
<td>4</td>
</tr>
<tr>
<td>A.C. 101AB - Air Cond. Principles</td>
<td>8</td>
</tr>
<tr>
<td>Drafting 10 - Basic Drawing</td>
<td>3</td>
</tr>
<tr>
<td>Solar 110 - Active Systems</td>
<td>5</td>
</tr>
<tr>
<td>Solar 112 - Passive Systems</td>
<td>4</td>
</tr>
<tr>
<td>Environ. Studies 30 - Energy &amp; Natural Resources</td>
<td>3</td>
</tr>
</tbody>
</table>

**Certificate of Achievement:**

<table>
<thead>
<tr>
<th>Course</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physics 20 - Technical Physics</td>
<td>3</td>
</tr>
<tr>
<td>A.C. 101AB - Air Cond. Principles</td>
<td>8</td>
</tr>
<tr>
<td>A.C. 102A - Refrigeration Principles</td>
<td>4</td>
</tr>
<tr>
<td>Drafting 10 - Basic Drawing</td>
<td>3</td>
</tr>
<tr>
<td>Solar 110 - Active Systems</td>
<td>5</td>
</tr>
<tr>
<td>Solar 112 - Passive Systems</td>
<td>4</td>
</tr>
</tbody>
</table>

**CORE ENERGY CLASSES**

**ENV. STUD. 30**  Non-Renewable Energies & Resources  3 units

An introduction to non-renewable energy and resource issues, including the historical development of America's resource wealth and the current dilemma over dwindling conventional energies and building materials faced by our nation.
SAN JOSE CITY COLLEGE cont'd

PHY. SCI. 19  Solar Energy Concepts  3 units

Basic concepts of solar energy utilization; solar energy availability, heat transfer and storage, and active and passive solar energy systems. Introductory course for solar technician majors.

PHY. SCI. 22  Alternate Energy Sources  3 units

Theory and application of nonconventional sources of energy: alternative fuels, solar energy concentrators, water and wind electrical generation, electric storage, photovoltaic devices, solar ponds, and other contemporary topics.

SOLAR 110  Active Systems  5 units

Theory and application of active solar energy systems; design of systems for residential, pool, and hot water heating. Analysis of various types of collectors. Emphasis on practical applications. Three hours theory; six hours laboratory.

SOLAR 112  Passive Systems  4 units

Theory and application of passive solar energy systems. Design of a passive system for a residential application. Three hours theory; three hours laboratory.
ENVIRONMENTAL STUDIES - Energy Technology Degree (249) and Certificate (499) Option

The associate degree and certificate curriculum in energy technology prepare students for entry into the field of alternate energy technicians in installation and service, and as basic solar design technicians.

CURRICULUM

Major requirements for the associate in science degree and requirements for the certificate:

Solar Energy Technology I Env. St. 151 3
Solar Energy Technology II Env. St. 152 3
Solar Energy, Sources & Principles Env. St. 153 3
Wiring, Circuitry, and Control for Solar Applications Env. St. 154 3
Energy Resources, Present and Future Env. St. 155 3
Plumbing, Ducting & Installation Env. St. 156 3

Recommended electives: eight (8) chosen from the following list:

Power Generation & Transmission Env. St. 157 3
Geothermal Energy Resources Env. St. 160 3
Aquaculture & Hydroponics Env. St. 161 2
Biomass & Energy Production Env. St. 162 1
Energy: Problems & Decisions Env. St. 163 2
Topics in Environmental Studies Env. St. 198 1
Environment of Man Env. St. 200 3
Wastewater Management Env. St. 107 3
Introduction to Management Management 050 3
Public Works Administration Public Works 060 3
Water Mathematics & Hydraulics Env. St. 050 3
Water Sources & Conservation Env. St. 207 3

CORE ENERGY CLASSES

Environmental Studies 151 Solar Energy Technology 1 3 units

Environmental Studies 152  Solar Energy Technology II  3 units
Insulation and thermal storage calculations for active and passive structures. Design and construction of attached passive greenhouse for home heating. Not offered every semester. Class hours: 3 lecture.

Environmental Studies 153  Solar Energy, Sources and Principles  3 units
Introduction to the basic principles of solar energy. Information as to how the sun's energy may be utilized directly in active, passive, and photovoltaic systems, or indirectly as with wind, tidal, and biomass energy. Efficient cost and environmental impacts of various solar systems will be studied. Not offered every semester. Class hours: 3 lecture.

Environmental Studies 154  Wiring, Circuitry, and Control for Solar Applications  3 units
Solar energy system operations. Provides necessary theory and practice to perform basic design, operations, maintenance, and repair of electrical circuitry. Not offered every semester. Class hours: 3 lecture.

Environmental Studies 155  Energy Resources, Present and Future  3 units
An introduction to present and future energy resources. A survey of present fossil fuels and future energy resources, such as solar, nuclear, geothermal, and synfuel. Economic, social, political, and environmental impacts of each resource will be discussed. Not offered every semester. Class hours: 3 lecture.

Environmental Studies 156  Plumbing, Ducting, and Installation  3 units
Design, installation, maintenance, and repair of piping and ducting for active and passive systems. Not offered every semester. Class hours: 3 lecture.

Environmental Studies 157  Power Generation and Transmission  3 units
Present and future energy sources for direct use and for electrical power generation. Transmission of energy by grids, pipelines, and other methods. Not offered every semester. Class hours: 3 lecture.
Environmental Studies 160  Geothermal Energy Resources  3 units

Origin, occurrence, and movement of hot water, steam, and associated minerals in geothermal areas. Uses of geothermal energy and its environmental and economic costs. Not offered every semester. Class hours: 3 lecture.

Environmental Studies 162  Biomass and Energy Production  1-3 units

An introduction to the use of biological materials as energy sources. Included will be information on how methane, alcohol, and other fuels could be produced from plant and animal materials. Not offered every semester. Class hours: 1-3 lecture.

Environmental Studies 163  Energy - Problems and Decisions  4-2 units

A humanistic approach to the energy issue, its effects on the way we live, its policy options and trade-offs as viewed by historians, social scientists and natural scientists. Includes a public hearing, a field trip, and discussion of local issues. Not offered every semester. Class hours: 9 weeks, 3 lecture.
ENERGY MANAGEMENT TECHNICIAN -- CERTIFICATE AND ASSOCIATE DEGREE PROGRAM

The Energy Management Technician Curriculum was designed: (1) to provide students with technical competencies to gain employment as an energy manager or technician in entities, private or public, that desire reduced consumption or conservation of energy sources; (2) to upgrade skills of those currently employed in positions of building maintenance, facilities control, or energy consumption control; and (3) to provide energy consumers with the competencies to reduce energy use in their private lives.

CURRICULUM

Requirements for Certificate:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>E.M. 10</td>
<td>Energy Management Principles</td>
<td>3</td>
</tr>
<tr>
<td>E.M. 20</td>
<td>Applied Energy Economics</td>
<td>3</td>
</tr>
<tr>
<td>E.M. 30</td>
<td>Energy Management and Human Behavior</td>
<td>3</td>
</tr>
<tr>
<td>C.T.R. 64</td>
<td>Low Cost Low Energy Housing</td>
<td>3</td>
</tr>
<tr>
<td>D.T. 8</td>
<td>Blueprint Reading and Sketching</td>
<td>3</td>
</tr>
<tr>
<td>Physics, 10</td>
<td>Descriptive Physics</td>
<td>3</td>
</tr>
<tr>
<td>Wat. Tech. 1</td>
<td>Introduction to Domestic Water Supplies</td>
<td>3</td>
</tr>
</tbody>
</table>

Requirements for Associate Degree:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>E.M. 10</td>
<td>Energy Management Principles</td>
<td>3</td>
</tr>
<tr>
<td>E.M. 20</td>
<td>Applied Energy Economics</td>
<td>3</td>
</tr>
<tr>
<td>E.M. 30</td>
<td>Energy Management and Human Behavior</td>
<td>3</td>
</tr>
<tr>
<td>C.T.R. 40</td>
<td>Building Industry Analysis</td>
<td>3</td>
</tr>
<tr>
<td>C.T.R. 60</td>
<td>Residential House Wiring</td>
<td>3</td>
</tr>
<tr>
<td>C.T.R. 64</td>
<td>Low Cost Low Energy Housing</td>
<td>3</td>
</tr>
<tr>
<td>Wat. Tech. 1</td>
<td>Introduction to Domestic Water Supplies</td>
<td>3</td>
</tr>
<tr>
<td>D.T. 8</td>
<td>Blueprint Reading and Sketching</td>
<td>3</td>
</tr>
<tr>
<td>Ag. 35A or Ag. 35B or Ag. 120A or Ag. 120B</td>
<td>Identification and Ecology of Ornamental and Native Plant Materials</td>
<td>3</td>
</tr>
</tbody>
</table>

Recommended Electives for Associate Degree:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physics 10</td>
<td>Descriptive Physics</td>
<td>3</td>
</tr>
<tr>
<td>Physics 28</td>
<td>Special Problems in Physics</td>
<td>2-6</td>
</tr>
<tr>
<td>C.T.R. 62</td>
<td>Plumbing Installation and Design</td>
<td>3</td>
</tr>
<tr>
<td>C.T.R. 66</td>
<td>Solar Energy Housing</td>
<td>3</td>
</tr>
<tr>
<td>C.S. 10</td>
<td>Introduction to Computing</td>
<td>3</td>
</tr>
<tr>
<td>E.T. 10</td>
<td>Basic Passive Circuits</td>
<td>5</td>
</tr>
<tr>
<td>Int. 1</td>
<td>The Environment and the Human Impact</td>
<td>3</td>
</tr>
<tr>
<td>Math A</td>
<td>Elementary Algebra</td>
<td>3</td>
</tr>
</tbody>
</table>
SIERRA COLLEGE, cont'd.

Engl. A Mechanics and Basic Composition or
Engl. 1A Composition and Literature ............................. 3
Bys. 85 Oral Communication for Business or
Pub. Spk. 1A Fundamentals of Public Speaking .................. 3
Psych. 1 Introduction to Psychology or
Psych. 12 Contemporary Psychology .............................. 3

CORE ENERGY CLASSES

EGY. MGT. 10 ENERGY MANAGEMENT PRINCIPLES .......................... 3 units
An overview of primary energy forms, their history present and future worth, as relates to public, commerce and industry. Energy as it relates to architecture, engineering and public agencies. For beginning students and those who are now in energy-related occupations.
Class hours: 3 hours lecture

EGY. MGT. 20 APPLIED ENERGY ECONOMICS ................................ 3 units
Course includes life cycle costs of basic energy and how it is affected by socio-political actions, regulatory agencies, and business plans.
Class hours: 3 hours lecture

EGY. MGT. 30 ENERGY MANAGEMENT AND HUMAN BEHAVIOR .................. 3 units
Application of knowledge and techniques of the social and behavioral sciences to the solution of practical problems encountered in energy management. Includes study of attitudes toward energy consumption, sources or resistance to energy-conserving measures and techniques for modifying energy-related behavior. Field research projects.
Class hours: 3 hours lecture

C.T.R. 64 LOW COST LOW ENERGY HOUSING ................................. 3 units
A study of the various methods of conserving home energy; heating, cooling, weatherization, building standards, low energy systems, etc.
Class hours: 3 hours lecture

C.T.R. 66 SOLAR ENERGY HOUSING ........................................ 3 units
A study of heating, cooling and solar systems; building standards, wind power, low energy systems, and alternate forms of energy.
Class hours: 3 hours lecture
ASSOCIATE OF SCIENCE DEGREE IN ENERGY TECHNOLOGIES
WITH AN OPTION IN SOLAR OR CONSERVATION TECHNOLOGIES

This program will go into effect Fall, 1980.

CURRICULUM

Major requirements for the A.S. Degree with a solar option:

<table>
<thead>
<tr>
<th>Course</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ecology 5</td>
<td>3</td>
</tr>
<tr>
<td>ET 51: Energy Options</td>
<td>3</td>
</tr>
<tr>
<td>Chemistry 1A</td>
<td>5</td>
</tr>
<tr>
<td>ET 53: Solar Energy I</td>
<td>3</td>
</tr>
<tr>
<td>Chemistry 1B</td>
<td>5</td>
</tr>
<tr>
<td>Math 1A</td>
<td>4</td>
</tr>
<tr>
<td>ET 54: Solar Energy Systems II</td>
<td>3</td>
</tr>
<tr>
<td>ET 56: Energy Auditing</td>
<td>2</td>
</tr>
<tr>
<td>Ecology 30</td>
<td>3</td>
</tr>
<tr>
<td>ET 99A: Field Studies</td>
<td>1-5</td>
</tr>
<tr>
<td>ET 57: Shelter Design</td>
<td>3</td>
</tr>
<tr>
<td>ET 58: Construction/Design and Maintenance of Solar Devices</td>
<td></td>
</tr>
<tr>
<td>ET 99B: Field Studies.</td>
<td>1-5</td>
</tr>
<tr>
<td>General Education/Electives</td>
<td>2</td>
</tr>
</tbody>
</table>

Major requirements for the A.S. Degree with a conservation option:

<table>
<thead>
<tr>
<th>Course</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ecology 5</td>
<td>3</td>
</tr>
<tr>
<td>ET 51: Energy Options</td>
<td>3</td>
</tr>
<tr>
<td>Chemistry 1A</td>
<td>5</td>
</tr>
<tr>
<td>ET 53: Solar Energy I</td>
<td>3</td>
</tr>
<tr>
<td>Chemistry 1B</td>
<td>5</td>
</tr>
<tr>
<td>Math 1A</td>
<td>4</td>
</tr>
<tr>
<td>ET 54: Solar Energy Systems II</td>
<td>3</td>
</tr>
<tr>
<td>ET 56: Energy Auditing</td>
<td>2</td>
</tr>
<tr>
<td>Ecology 30</td>
<td>3</td>
</tr>
<tr>
<td>ET 99A: Field Studies</td>
<td>1-5</td>
</tr>
<tr>
<td>ET 57: Resource Dev. Adm.</td>
<td>3</td>
</tr>
<tr>
<td>LUM 54: Env. Impact Report</td>
<td>3</td>
</tr>
<tr>
<td>Chemistry 10</td>
<td>3</td>
</tr>
<tr>
<td>ET 99B: Field Studies.</td>
<td>1-5</td>
</tr>
<tr>
<td>General Education/Electives</td>
<td>2</td>
</tr>
</tbody>
</table>

ENERGY COURSES

**ET 51**  
**Energy Options**  
3 units

According to many energy experts, oil and gas reserves will last for another 25 years at the most. This course will survey the many alternatives to our traditional energy style as well as examine the validity of the energy crisis itself and the need for national energy policy. Three hours lecture.
Solar Energy Systems I

Introduction to the theory of solar energy capture and conversion and methods for its use in the heating and cooling of homes, and in the heating of domestic water supply. Topics will include basic solar concepts and engineering principles, sizing systems, operation and construction of water heating systems, passive and active systems for heating and cooling, attached greenhouses, cost considerations, choosing the commercial system appropriate to your application. Three hours lecture.

Solar Energy Systems II

An advanced course in the design, engineering, installation and monitoring of solar energy systems for heating homes, domestic water supply and swimming pools. Topics include system selection, heat loss calculations, engineering methods, installation procedures, and methods to monitor thermal performance of system. This course is intended for students interested in pursuing employment in the solar energy field. Three hours lecture.

Solar Energy Systems III

An advanced course in the design, engineering, installation and monitoring of solar energy systems for the heating, cooling, and water supplies of institutions, office buildings and apartment complexes. Recommended for students pursuing a major or certificate in Energy Technologies (Solar option). Three hours lecture.

Energy Auditing

An intensive examination of household energy usage, conservation, design and rehabilitation. Topics covered include energy concepts, heat loss calculations, basic solar concepts, site selection, design improvements, appliances and utility systems. Two hours lecture.

Shelter Design

An introduction to the techniques and technologies of home construction and renovation from the point of view of resource conservation and solar energy employment. Topics include siting of a new home or determining the value of an existing home, basic design considerations of floor plans, material usage, structural engineering, fenestration, etc. Passive use of solar energy will be emphasized. Methods of tailoring design to building codes will be discussed. Three hours lecture.

Construction/Design & Maintenance of Solar Devices

The techniques of design, construction and maintenance of solar devices. Required for those students pursuing either a certificate or a degree in Energy Technologies (Solar option). Four hours lecture/six hours laboratory.
ET 60 Resource Development and Administration

An introduction into the decision-making and enforcement apparatus which is concerned with the administration of our energy resources. This course is required for those students who are pursuing either a degree or certificate in Energy Technologies (Conservation option). Three hours lecture.

ET 61 Politics of Energy

An examination of the administrative rules, regulations, procedures and politics which influence the use of energy. Recommended for students pursuing a certificate or a major in the Conservation option. Three hours lecture.

ET 63 Solar Electronics

The application of basic electronic principles to solar systems. Topics include generation of electric power with solar systems. Topics include generation of electric power with solar cells, installation and operation of solar controls and the use of electronic instruments for testing and monitoring solar systems. Offered jointly with Laney College. Two hours lecture/three hours laboratory.

ET 80 Solar Greenhouse Design

Practical course in the design and management of solar greenhouses for homesite, community and commercial production of food plants. Recommended for solar greenhouse construction. Three hours lecture.

ET 81 Solar Greenhouse Construction

Practical course in the construction of a solar greenhouse for homsites, community and commercial production of food plants and ornamentals. This course is a follow-up to solar greenhouse design and management. Three hours lecture.

ET 83 Wind Energy Systems I

An introduction to wind energy systems. Class will learn about the history of wind-powered devices, their evolution and refinements. Technical aspects of wind-generator design through such parameters as power-coefficients, tip-speed ratio, and drag vs. lift designs. Further topics include wind siting, details of water pumping systems and wind-electric generators in detail.
VISTA COLLEGE cont'd.

ET 84 Wind Energy Systems II 1 unit
An advanced course on wind energy systems. Class will learn in greater detail the technical aspects of generator design through the interrelation of power-coefficients and tip speed ratio. Testing and evaluating the performance of various air foils on a wind generator main frame utilizing compressor, hydraulic pumps, and alternators as a load. Further discussion of sail wind designs, introduction to the Darrieus and Giromill rotor. Eighteen hours total.

ET 90 House Tuning 1 unit
Instruction in methods of energy, water and production of wastes in the homes. Topics include weatherizing, insulation, appliance efficiency checks, plumbing checks, reducing waste at the market and in the kitchen, grey water recycling and composting. Three hours lecture.

ET 91 Institutional Energy Auditing 1 unit
This course is designed to provide assistance for improving the energy efficiency of existing equipment and for identifying and implementing cost effective energy saving in buildings and equipment. Sources of funds to assist in implementing changes will be identified. Three hours lecture.

ET 98 Selected Topics 5 units
Designed to permit investigation in depth of topics not covered by regular catalog offerings. Course content, hours, and unit credit to be determined by the appropriate department in relation to community-student interest and/or available staff. May be offered as a seminar, lecture, or laboratory class.

ET 99AB Field Studies 2-10 units
Directed studies for students working in the Energy Technologies field. Required for students majoring in Energy Technologies.
<table>
<thead>
<tr>
<th>College Name</th>
<th>Course Title</th>
<th>Catalog Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>College of Alameda</td>
<td>No applicable courses offered 1979/80</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Allan Hancock College</td>
<td>Solar Energy</td>
<td>(X)</td>
<td>(X)</td>
</tr>
<tr>
<td>Ted S. Sypolt, Assoc. Dean</td>
<td>Solar Energy</td>
<td>Natural Science</td>
<td>3</td>
</tr>
<tr>
<td>American River College</td>
<td>Everyday Energy</td>
<td>PHY SCI 52</td>
<td>3</td>
</tr>
<tr>
<td>Antelope Valley College</td>
<td>Solar Heating and Cooling of Residential Buildings</td>
<td>Solar I</td>
<td>3</td>
</tr>
<tr>
<td>Bakersfield College</td>
<td>Introduction to Residential Solar Energy</td>
<td>PHY SCI 5</td>
<td>4</td>
</tr>
<tr>
<td>Butte College</td>
<td>Solar Energy Systems - TECH 280</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*(X) - Information not available.*
<table>
<thead>
<tr>
<th>College</th>
<th>Address</th>
<th>Courses</th>
</tr>
</thead>
</table>
| Cabrillo College             | * Cabrillo College  
6500 Soquel Drive  
Aptos, CA 95003  
David Burton, Coordinator  
Solar Energy Tech. Program  
(408) 425-6235  
Jack Snyder, Dean  
Occupational Education  
(408) 425-6000 | Fundamentals of Solar Energy  
Solar Tech. & Fab. I SET 51  
Solar Tech. & Fab. II SET 52  
Solar Home Design SET 53  
Solar Architecture SET 54  
Solar Remodeling I SET 55  
Solar Remodeling II SET 56  
Solar Energy in Agriculture  
Solar Electronics SET 59  
Wind Energy SET 60  
Solar Energy - Comm. Studies SET 61  
Solar Field Studies SET 62AB  
Special Studies SET 10S |
| Canada College               | * Canada College  
4200 Farm Hill Blvd.  
Redwood City, CA 94061  
John H. Rhoads, Director  
Administrative Services  
(415) 364-1212 | Intro. to Solar Heat. (X) SET 50  
Solar Heat. Install. - Solar I SET 51  
Solar Heat. Design - Solar II SET 52  |
| College of the Canyons       | * College of the Canyons  
26455 N. Rockwell Canyon Rd.  
Valencia, CA 91355 | No applicable courses offered 1979/80 |
| Cerritos College             | * Cerritos College  
11110 East Alondra Blvd.  
Norwalk, CA 90650  
Dean Paige, Assoc. Dean  
Science, Eng., & Math. Division  
(213) 860-2451 | Solar Heat. Install. - Solar I SET 51  
Solar Heat. Design - Solar II SET 52  |
| Cerro Coso College           | * Cerro Coso College  
Ridgecrest, CA 93555  
Robert L. Takacs, Campus Coordinator  
Solar Energy Technology Program  
(714) 375-5001 | Intro. to Solar Energy SET 50  
Collectors & Energy SET 51  
Storage SET 52  
Solar Sizing Design & Retrofit SET 53  
Materials & Mat. Handling SET 54  
Operational Diagnosis SET 55  
Non-Res. Appli. Future Technology SET 56  
Tech. Survey of Energy Sources SET 57  
Eco., Codes, Legal, Consumerism SET 58 |

*Refer to Section I of syllabus for more information.
Chabot College  
Hayward Campus  
25555 Hesperian Blvd.  
Hayward, CA 94545  
Richard Avelar  
Arch. Instructor  
(415) 786-6854  

Chabot College  
Valley Campus  
3033 Collier Canyon Rd.  
Livermore, CA 94545  
Barbara Hertes, Dean  
(415) 455-5300  

Chaffey College  
5885 Haven Avenue  
Alta Loma, CA 91701  
William D. Hunt  
Solar Program Coordinator  
(714) 987-1737  
Ext. 412 or 405  

Citrus College  
18824 E. Foothill Blvd.  
Azusa, CA 91702  
George Bratt  
(213) 335-0521, ext. 379  

Coastline Community College  
10231 Slater Avenue  
Fountain Valley, CA 92808  
S. Arthur Martinez  
Assoc. Dean - Area IV  
(714) 898-9871  

* Refer to Section 1 of syllabus for more information.
<table>
<thead>
<tr>
<th>College</th>
<th>Address</th>
<th>Instructor/Coordinator</th>
<th>Phone Number</th>
<th>Courses Offered</th>
</tr>
</thead>
<tbody>
<tr>
<td>Columbia College</td>
<td>P.O. Box 1849, Columbia, CA 95319</td>
<td>Ross Carkeet, Jr.</td>
<td>(209) 532-3141</td>
<td>* Alt. Energy Sources: Solar &amp; Wind</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Compton Community College</td>
<td>1111 E. Alondra Blvd., Compton, CA 90221</td>
<td></td>
<td></td>
<td>No applicable courses offered 1979/80</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Contra Costa College</td>
<td>2600 Mission Bell Drive, San Pablo, CA 94806</td>
<td>Robert Martincich</td>
<td>(415) 235-7800</td>
<td>* Alt. Energy Resources</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>* Energy Dilemma</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>* Nuclear Energy, It's Problems &amp; Potential</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>* Solar Energy</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>* Thermal Insulation</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>* Energy Conservation</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cosumnes River College</td>
<td>8401 Center Parkway, Sacramento, CA 95823</td>
<td>Robert Garl &amp; Harold House</td>
<td>(916) 421-1000</td>
<td>* Intro. to Solar Energy</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>* Solar Heated Water</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>* Intro. to Solar</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>* Collector Const.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>* Res. Energy Cons.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>* Alt. Energy Systems</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>* Solar Energy Appliance</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Crafton Hills College</td>
<td>11711 Sand Canyon Rd., Yucaipa, CA 92399</td>
<td></td>
<td></td>
<td>No applicable courses offered 1979/80</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cuesta College</td>
<td>P.O. Box J, San Luis Obispo, CA 93406</td>
<td>Edwin M. Pearce</td>
<td>(805) 544-2943</td>
<td>* Appl. of Solar Energy</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>* Systems</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cuyamaca College</td>
<td>2950 Jamacha Road, El Cajon, CA 92020</td>
<td>Donald J. Ferris</td>
<td>(714) 464-1980</td>
<td>* Energy Sources &amp; Power</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>* Distribution</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>* Solar Appl. Home &amp; Industrial Tech.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>* Industry</td>
</tr>
</tbody>
</table>

* Refer to Section I of syllabus for more information.
<table>
<thead>
<tr>
<th>College</th>
<th>Courses Offered</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cypress College</td>
<td>No applicable courses offered 1979/80</td>
<td></td>
</tr>
<tr>
<td>De Anza College</td>
<td>Utilization of Solar Energy ENG-369 3</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Design of Solar Energy ENG 379A 2</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Sys.-Heat. &amp; Cooling</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Design of Solar Energy ENG 379B 2</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Sys.-Heat. &amp; Cooling</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Solar Energy for the Consumer IND TECH 60A 1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Solar Energy for the Homeowner IND TECH 60B 4.5</td>
<td></td>
</tr>
<tr>
<td>College of the Desert</td>
<td>Intro. to Solar Energy ARCH 13 (X)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Solar Technology I EnRe 60 3</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Solar Technology II EnRe 61 3</td>
<td></td>
</tr>
<tr>
<td>Diablo Valley College</td>
<td>Flat Plate Solar Collector Heat. Sys. AIR COND 150 (X)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Buildings &amp; the Energy ENG 150 3</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Problem</td>
<td></td>
</tr>
<tr>
<td>East Los Angeles College</td>
<td>No applicable courses offered 1979/80</td>
<td></td>
</tr>
<tr>
<td>El Camino College</td>
<td>Solar Heating/Air Cond.AIR COND 20 (X)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Construction Tech. CON TECH 1/4 (X)</td>
<td></td>
</tr>
<tr>
<td>Evergreen Valley College</td>
<td>No applicable courses offered 1979/80</td>
<td></td>
</tr>
<tr>
<td>Feather River College</td>
<td>Solar Utilization &amp; Energy-Wise Const. NAT RES 75 2</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Alt. Energy Lab Forestry 95A (X)</td>
<td></td>
</tr>
</tbody>
</table>

53
<table>
<thead>
<tr>
<th>College</th>
<th>Courses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Foothill College</td>
<td>Resource Mgmt. in Env. ENV STUD 3 4</td>
</tr>
<tr>
<td></td>
<td>Natural Resources.6. ENV STUD 4 4</td>
</tr>
<tr>
<td></td>
<td>Env. Sci.</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>(Eng. Dept. Chair)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(415) 948-8590</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Fresno City College</td>
<td>Solar Energy SOL SCI 47 2</td>
</tr>
<tr>
<td></td>
<td>Solar Systems AIR COND 55 3</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Richard M. DeKoning, Tech-Ind Division, ext. 8778</td>
</tr>
<tr>
<td></td>
<td>Dennis C. Wash, Tech-Ind Division, ext. 8523</td>
</tr>
<tr>
<td></td>
<td>(209) 442-4600</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Fullerton College</td>
<td>No applicable courses offered 1979/80</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Gavilan College</td>
<td>Principles of Solar CON TECH 66A 3</td>
</tr>
<tr>
<td></td>
<td>CON TECH 66B 3</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Herb Ellenburg, Division Chair</td>
</tr>
<tr>
<td></td>
<td>Occupational Education</td>
</tr>
<tr>
<td></td>
<td>(408) 847-1400</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Glendale College</td>
<td>Energy TECH 101 1</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Golden West College</td>
<td>Applied Solar Energy PHY SCI 115 2</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Hartnell College
156 Homestead Avenue
Salinas, CA 93901

No applicable courses offered 1979/80.

Imperial Valley College
P.O. Box 158
Imperial, CA 92251

Philip E. Champagne
Alternate Energy Coordinator
(714) 352-8320

Imperial Valley College
P.O. Box 158
Imperial, CA 92251

Alt: Energy Tech. CETA (X)
Training
Alcohol Fuels Production (X)

Salinas, CA 5311

Impatiai
Valley: college
4.
P:O. Box 158
Training
Imperial, CA 92251

No applicable courses offered 1979/80

Indian Valley College
1800 Ignacio Blvd.
Novato, CA 94947

Solar Energy (Intro.) PHY SCI 115 (X)
Passive Solar for
BUILDERS
The Self-Sufficient
Home

No applicable courses offered 1979/80

Lake Tahoe Community College
2659 Lake Tahoe Blvd.
South Lake Tahoe, CA 95702

Roger Welt
Assoc. Dean of the College
(916) 541-4660

Lake Tahoe Community College
2659 Lake Tahoe Blvd.
South Lake Tahoe, CA 95702

No applicable courses offered 1979/80

Laney College
300 Fallspot Street
Oakland, CA 94607

Alt. Sources of Energy

Lassen College
P.O. Box 3000
Susanville, CA 96130

Jim Sweet
(916) 257-6181, ext. 230

Lassen College
P.O. Box 3000
Susanville, CA 96130

Alt. Sources of Energy

Los Angeles City College
855 North Vermont Ave.
Los Angeles, CA 90029

No applicable courses offered 1979/80

Long Beach City College
4901 East Carson St.
Long Beach, CA 90808

Les Harris, Dean
Occupational Education
(213) 420-4111

Long Beach City College
4901 East Carson St.
Long Beach, CA 90808

Energy for the Future ENV SCI 1

No applicable courses offered 1979/80
Los Angeles Harbor College
1111 Figueroa Place
Wilmington, CA 90744

Los Angeles Mission College
1101 San Fernando Road
San Fernando, CA 91340

Los Angeles Pierce College
6201 Winnetka Avenue
Woodland Hills, CA 91371

Los Angeles Southwest College
1600 W. Imperial Highway
Los Angeles, CA 90047

Los Angeles Trade Tech.
400 W. Washington Blvd.
Los Angeles, CA 90015

Dr. Neal Adams, Instructor
(213) 746-0800, ext. 273

Los Angeles Valley College
5800 Fulton Avenue
Van Nuys, CA 91401

Phyllis S. Swanes
Ass't. Dean of Instruction
(213) 781-1200

Los Medanos College
2700 E. Leland Road
Pittsburg, CA 94565

Stanley H. Chin
Dean of Nat. Sci. & Related Occupations
(415) 439-2181

College of Marin
Kentfield, CA 94904

Don Martin
(415) 457-8811

*Los Angeles Harbor College
No applicable courses offered 1979/80

Los Angeles Mission College
No applicable courses offered 1979/80

Los Angeles Pierce College
No applicable courses offered 1979/80

Los Angeles Southwest College
No applicable courses offered 1979/80

Los Angeles Trade Tech.
Solar Energy
EN MGMT 188 3
Energy Mgmt. in Bldgs, EN MGMT 189 3

Dr. Neal Adams, Instructor
(213) 746-0800, ext. 273

Los Angeles Valley College
Solar Energy Tech I (X) (X)
Solar Energy Tech II (X) (X)

Phyllis S. Swanes
Ass't. Dean of Instruction
(213) 781-1200

Los Medanos College
An Ethical Inquiry
PHY SCI 3TG 3
Into The Societal Issues of Energy
Solar Energy & You
PHY SCI 97 1
Solar Energy & Conservation
BIO SCI 97 2

Stanley H. Chin
Dean of Nat. Sci. & Related Occupations
(415) 439-2181

College of Marin
Kentfield, CA 94904

Don Martin
(415) 457-8811

Energy Efficient Des. ADULT ED (X)
& Alt. Energy Sources
Solar Energy Util. ADULT ED (X)
Energy & The Way We Live
NEWSPAPER 3
Mendocino College  
P.O. Box 3000  
Ukiah, CA 95482

Raymond D. Liedlick  
Dean of Instruction  
(707) 462-0571

Merced College  
3600 M Street  
Merced, CA 95340

Jim Cox, Instructor  
(209) 723-4321

Merritt College  
12500 Campus Drive  
Oakland, CA 94619

Lloyd G. Baysdorfer  
Ass't. Dean of Instruction  
(415) 531-4911

Mira Costa College  
One Barnard Drive  
Oceanside, CA 92054

Mission College  
3000 Mission College Blvd.  
Santa Clara, CA 95050

Dr. T. A. Thode  
(408) 988-2200

Modesto College  
College Avenue  
Modesto, CA 95350

Bill Wilson, Doug Beaman,  
Ron Alves  
(209) 526-2000

* Monterey Peninsula College  
980 Fromont Avenue  
Monterey, CA 93940

Dr. Philip Nash  
Associate Dean  
Instructional Planning  
(408) 646-4035

Energy   
PHY SCI 94   (X)

Merced College  
Energy Sys. & Cons.  
IT 39  3

Solar Energy - Res.  
IT 40  3

Application

Merritt College  
Surviving the Energy  
BIO SCI 48A  3

Resource Crises  
Household Self-Reliance  
ECOLOGY 48A  1

Alt. Energy Sources  
ECOLOGY 48C  1

Appropriate Tech. Lab  
ECOLOGY 48D  1

Solar Energy for the  
Home

Mira Costa College  
No applicable courses offered 1979/80

Mission College  
Energy   (X)  3

Modesto College  
Energy   PHY SCI 163/63  3

Solar Energy Appli.  
PHY SCI 60/60A  3

Energy & The Way We  
POL SCI 198  1

Live

Monte:rey Penins:ula College  
Solar & Alternate  
CTEC 200  3

Energy Systems  
Solar Sys. & Energy  
CTEC 295/1  6

Conservation  
Alt. Energy Practicum  
CTEC 295/2  3

Basic Skills/Alt.  
CTEC 295/3  4

Energy

* Refer to Section I of syllabus for more information.
Moorpark College
7075 Campus Road
Moorpark, CA 93021

Mt. San Antonio College
1100 N. Grand Avenue
Walnut, CA 91789
Irvin Colt
Admin. Dean, Occ. Programs
(714) 594-5611

No applicable courses offered 1979/80

Mt. San Jacinto College
21-400 Highway 79
San Jacinto, CA 92383
Benton Caldwell, Dean
Vocational Instruction
(714) 654-7371

Mt. San Jacinto College
Solar Energy Appli. ENGR 4 3
Solar Collector Des. ENGR 6 3
Solar System Design ENGR 7 3

Napa College
2277 Napa-Vallejo Highway
Napa, CA 94558

Ohlone College
P.O. Box 3909
Fremont, CA 94538
Dr. Neil McCallum
Dean of Instruction
(415) 657-2100

Orange Coast College
2701 Fairview Road
Costa Mesa, CA 92626
Bill Abernathy
Technology Division Chair
(714) 556-5812

Energy Sources Energy 111* 2
Passive Solar Design Energy 112 3
Solar Installation Operation Energy 115 3
Solar System Design Energy 117 3
Energy Audit Tech. Energy 119 3
Solar Applications Energy 121 3

Oxnard College
P.O. Box 1600
Oxnard, CA 93032
Fernando Cuevas
Division Director for Math/Science
(805) 488-0911

*Refer to Section I of syllabus for more information.
Palo Verde College
811'1. Chanslorway
Blythe, CA 92225

Dr. Margaret H. Arter
Dean of Instruction
(714) 922-6168

Palmomar College
1140 W. Mission
San Marcos, CA 92069

Pasadena City College
1570 Colorado Blvd.
Pasadena, CA 91106
Vernon Spaulding
(213) 578-7301

Porterville College
900 South Main Street
Porterville, CA 93257

College of the Redwoods
Eureka, CA 95501

Dr. David Mills
(707) 443-8411, ext. 424

Reedley College
955 North Reed Ave.
Reedley, CA 93654

Río Hondo College
3600 Workman Mill Road
Whittier, CA 90608

Riverside City College
4800 Magnolia Avenue
Riverside, CA 92506

Jerry Carter, Instructor
(714) 684-3240

Sacramento City College
3815 Freeport Blvd.
Sacramento, CA 95822

Don Goff, Asst. Dean
Technology Division
(916) 449-7568

* Refer to Section I of syllabus for more information.
*Saddleback College  
28000 Marguerite Parkway  
Mission Viejo, CA 92692  
Lee Waian, Coordinator  
Environmental Studies  
(714) 831-4694  

Intro. to Solar Energy SOLAR TECH 100 2  
Solar Construction I SOLAR TECH 101 2  
Solar Construction II SOLAR TECH 102 2  
Domestic Hot Water SOLAR TECH 103 2  
Pool & Space Heating SOLAR TECH 104 2  
Solar Controls & Sensors SOLAR TECH 105 2

Saddleback College  
North Campus  
5500 Irvine Center Drive  
Irvine, CA 92714

No applicable courses offered 1979/80

San Bernardino Valley College Solar Energy - Tech. REFRIC 148 4  
701 S. Mt. Vernon Ave.  
San Bernardino, CA 92403

Jim Wheaton, Instructor  
Harry Smith, Dean of Instruction  
(714) 888-6511

San Diego City College  
1313 Twelfth Ave.  
San Diego, CA 92101

Solar Service, Main., & Technology TRADE/TECH 225 3  
Ad. Solar Service, Main., & Technology TRADE/TECH 226 3

Walter DeFelice, Jr.  
(714) 280-7601

San Diego Mesa College  
7250 Mesa College Drive  
San Diego, CA 92111

Utilization of Solar Energy CON TECH 215 4

Robert B. McCommins  
Dean of Administration  
(714) 279-2300

San Diego Miramar College  
10440 Black Mountain Rd.  
San Diego, CA 92126

No applicable courses offered 1979/80

City College of San Francisco  
50 Phelan Avenue  
San Francisco, CA 94112

No applicable courses offered 1979/80

San Joaquin-Delta College  
5151 Pacific Ave.  
Stockton, CA 95207

No applicable courses offered 1979/80

*Refer to section 1 of syllabus for more information
San Jose City College
2100 Moorpark Ave.
San Jose, CA 95128
John P. Haley, Jr.
(408) 298-2181

San Jose City College offers the following courses:
- Solar Energy Concepts (PHY SCI 19) 3
- "Alt. Energy Sources" (PHY SCI 22) 3
- Energy & Natural Res. (ENV STU 30) 3
- Active Systems (SOLAR 110) 5
- Passive Systems (SOLAR 112) 4

College of San Mateo
1700 W. Hillsdale Blvd.
San Mateo, CA 94402

College of San Mateo offers the following courses:
- No applicable courses offered 1979/80

Santa Ana College
Seventeenth at Bristol
Santa Ana, CA 92706

Bruce Alexander
Env. Tech., Dept. Chair
(714) 835-3000

Santa Ana College offers the following courses:
- Solar Energy Tech I (ENV STU 151) 3
- Solar Energy Tech II (ENV STU 152) 3
- Solar Energy Sources & Principles (ENV STU 153) 3
- Wiring Circuits & Control for Solar Application (ENV STU 154) 3
- Energy Resources, Present & Future (ENV STU 155) 3
- Power Generation & Transportation (ENV STU 157) 3
- Geothermal Energy Res. (ENV STU 160) 3
- Biomass & Energy Prod. (ENV STU 162) 1
- Energy: Problems & Decisions (ENV STU 163) 2

Santa Barbara City College
721 Cliff Drive
Santa Barbara, CA 93109

Santa Barbara City College offers the following courses:
- No applicable courses offered 1979/80

Santa Monica College
1900 Pico Blvd.
Santa Monica, CA 90405

Santa Monica College offers the following courses:
- No applicable courses offered 1979/80

Santa Rosa Junior College
1501 Mendocino Ave.
Santa Rosa, CA 95401

Charles Relden
Assoc. Dean, Occ. Ed.
(707) 524-6252

Santa Rosa Junior College offers the following courses:
- Getting Into Hot Water (COM SER 28) 3
- Through Solar Heating

College of the Sequoias
915 S. Mooney Blvd.
Visalia, CA 93277

College of the Sequoias offers the following courses:
- Solar Applications (PHY SCI 14) 3

Richard Petrell, Instructor
David Bockman, Dean of Voc. Ed.
(209) 733-2050

* Refer to Section I of syllabus for more information.
Shasta College  
1065 N. Old Oregon Trail  
Redding, CA  96001

*Sierra College  
5000 Rocklin Road  
Rocklin, CA  95677

Martin E. Jack, Jr.  
Dean of Instructional Services  
(916) 624-3333

College of the Siskiyous  
800 College Avenue  
Weed, CA  96094

Bill Kinkade, Instructor  
(916) 938-4463

Skyline College  
3300 College Drive  
San Bruno, CA  94066

Solano Community College  
Suisun Valley Road  
Suisun City, CA  94585

Dr. C. Thomas Hosley  
Asst. Supt., Vice Président  
(707) 864-7000

Southwestern College  
900 Otay Lakes Road  
Chula Vista, CA  92010

Taft College  
29 Emmons Park Drive  
Taft, CA  93268

Ventura College  
4667 Telegraph Road  
Ventura, CA  93003

C. Dahl  
(805) 642-3211

*Refer to Section I of syllabus for more information.
Victor Valley College
18422 Bear Valley Road
Victorville, CA 92392
Charles A. Peterson
Assoc. Dean of Inst./Occ. Ed.
(714) 245-4271

*Vista College
2020 Milvia St. #200
Berkeley, CA 94704
Michael B. Hills, Program Planner - Alt. Technology/Env. Management
(415) 841-8431

** West Hills College
300 Cherry Lane
Coalinga, CA. 93210

West Los Angeles College
4800 Freshman Drive
Culver City, CA 90230

West Valley College
14000 Fruitvale Ave.
Saratoga, CA 95070
Theodore Geredes
Dean of Instruction
(408) 867-2209

*Yuba College
2088 N. Beale Road
Marysville, CA 95901

*Refer to Section I of syllabus for more information.
SECTION 3  COMMUNITY EDUCATION - SERVICES
WORKSHOPS, SEMINARS, OR
FORUMS ON ENERGY  Non-Credit
Community Education/Services  
Workshops, Seminars, or Forums on Energy  
(Non-Credit)

Energy Lecture/Forum Series  
Tech X 91

Energy Seminar I - Solar Water Heating for Consumers

Energy Seminar II - Solar Pool Heating

(Seminars on active space heating, passive space heating, energy auditing and weatherization planned for 1980-81)

Energy Fair (covered all areas of energy)

Solar Energy Symposium

Workshop - "Cut Your Gas and Electric Bill Up to 50%"

Energy Auditor Training Program (co-sponsored by the Chancellor's Office and the California Energy Commission)

Have offered courses in past

College Name

Antelope Valley College  
3041 West Avenue K  
Lancaster, CA 93534

Jennings G. Brown  
Vice President of Academic Affairs  
(805) 943-3241

Butte College  
Route 1, Box I83A  
Oroville, CA 95965

William Earle  
Director of Community Services  
(916) 895-2511

Cabrillo College  
6500 Soquel Drive  
Aptos, CA 95003

Liz Irwin  
Community Education Coordinator  
(408) 425-6000

Canada College  
4200 Farm Hill Blvd.  
Redwood City, CA 94061

Ruth Nagler  
Director of Extended Educational Programs  
(415) 364-1212

Cerritos College  
1111 East Alondra Blvd.  
Norwalk, CA 90650

C. Dean Paige  
Associate Dean  
Science, Engineering and Math Division  
(213) 860-2451

Cerritos Co. College  
Huntington Beach, CA 92648

Robert L. Takacs  
Campus Coordinator  
Solar Energy Technology Program  
(714) 487-5001
Citrus College
18824 E. Foothill Blvd.
Azusa, CA 91702

George Bratt
(213) 335-9521, Ext 379

Columbia College
P.O. Box 1849
Columbia, CA 95310

Jan Jorn
Community Services
(209) 532-3141

De Anza College
21250 Stevens Creek Rd.
Cupertino, CA 95014

Dr. Rowland K. Chase
Director, Community Services
(408) 996-4567

Gavilan College
5055 Santa Teresa Blvd.
Gilroy, CA 95020

Kenneth Cooper
Director of Community Services
(408) 847-1400

Imperial Valley College
P.O. Box 155
Imperial, CA 92251

Philip E. Champagne
Alternate Energy Coordinator
(714) 352-8320, Ext. 228

Indian Valley College
1800 Ignacio Blvd.
Novato, CA 94947

Lucien O'Keefe
Energy Forum Coordinator
(415) 833-2211

Lake Tahoe Community College
263 Lake Tahoe Blvd.
South Lake Tahoe, CA 95712

Carrie Campbell Price
Consumer Education
(916) 541-4660

"The Community College Faculty Energy Seminar"

"Domestic Hot Water Workshop"
(or offered in past)

"Workshop on Alcohol Production"

"Solar Pool Heating--"Converting Your Pool to Solar"

"Do-It-Yourself Solar Energy Workshop"

"Alcohol Fuel Production Seminar"

""Energy and the Way We Live" (Courses by Newspaper--national program)

"Energy Auditor Training Program (co-sponsored by the Chancellor's Office and the California Energy Commission)"

""Passive Solar Design for Builders and Homeowners"

"Retrofitting Your House for Passive Solar Design"

"Energy Week" (May 1980 in conjunction with "Energy and the Way We Live")
Lassen College
P.O. Box 3000
Susanville, CA 96130

Linda Kennedy
Public Information Specialist
(916) 257-6181

Los Angeles City College
855 North Vermont Ave.
Los Angeles, CA 90029

Glenn D. James
Math/Solar Instructor
(213) 633-9141, Ext. 253

Los Angeles Harbor College
1111 Figueroa Place
Wilmington, CA 90744

Bill Stout
Community Services
(213) 518-1090

Los Angeles Mission College
1101 San Fernando Road
San Fernando, CA 91340

Community Services
(213) 365-8271

Los Angeles Pierce College
6201 Winnetka Avenue
Woodland Hills, CA 91371

Community Services
(213) 347-0551

College of Marin
Kentfield, CA 94904

Office of Instruction
(415) 457-4381

Merced College
3660 N Street
Merced, CA 95340

Community Services
(209) 736-1321

Merritt College
12500 Campus Drive
Oakland, CA 94619

Suzanne Dye
Business Officer
(415) 631-4911, Ext. 211

Department of Energy Solar Information Session

Energy Fair

"Solar Collectors--Build Your Own"

Los Angeles Energy Fair
"Solar Collectors - Build Your Own"

Solar Domestic Hot Water Workshop for Installers and Builders

Los Angeles Mission College
Solar Collectors Workshop
1101 San Fernando Road
San Fernando, CA 91340

Community Services
(213) 365-8271

Los Angeles Pierce College
"Solar Energy - An Alternative Energy Source"
6201 Winnetka Avenue
Woodland Hills, CA 91371

Community Services
(213) 347-0551

College of Marin
Kentfield, CA 94904

Office of Instruction
(415) 457-4381

Merced College
3660 N Street
Merced, CA 95340

Community Services
(209) 736-1321

Merritt College
12500 Campus Drive
Oakland, CA 94619

Suzanne Dye
Business Officer
(415) 631-4911, Ext. 211

"Solar Energy Utilization - Energy Efficient Design"

Workshop (one day) on "Energy and the Way We Live"

"Energy and the Way We Live" (Courses by Newspaper - national program)

Have done energy forums entitled:

"$5.00 a Gallon or 5 Gallons Per Week"
"Coal and Clean Air in California"
Mission College
3000 Mission College Blvd.
Santa Clara, CA 95050
Community Services
(408) 988-2200

Energy Auditor Training Program
(co-sponsored by the Chancellor's Office
and the California Energy Commission)

Modesto College
College Avenue
Modesto, CA 95350
Bill Wilson
Coordinator, Sunrise
Energy Center
(209) 526-2009, Ext. 311

Sunrise Energy Center offers various community energy workshops

Monterey Peninsula College
380 Fremont Avenue
Monterey, CA 93940
Dr. Philip Walsh
Dean of Instructional Planning
(408) 646-4035

M.P.C. Energy Center offers energy hotline services and various community energy workshops (solar space, pool and domestic water heating, weatherization, greenhouse construction)

Mt. San Antonio College
1100 S. Grand Avenue
Walnut, CA 91789
Community Services
(714) 594-5611

"Energy Resources" (covering topics of solar conversion, wind energy, voltaic, geothermal, etc.)

Orange Coast College
2701 Fairview Road
Costa Mesa, CA 92626
Community Services
(714) 556-5601

Energy Auditor Training Program (co-sponsored by the Chancellor's Office and the California Energy Commission)

Pasadena City College
1570 Colorado Blvd.
Pasadena, CA 91106
Vernon Spaulding
Supervisor, Occup. Ed.
(213) 578-7011

"Solar Energy for the Consumer" (ENGR 4308)
"Fundamentals of Energy Management" (ENGR 4312)

College of the Redwoods
Eureka, CA 95501
Office of Instruction
(707) 443-8411

"Energy--Your Choice Today"

San Bernardino Valley Coll.
701 S. Mt. Vernon Ave
San Bernardino, CA 92403
Harry Smith
Dean of Instruction
(714) 888-6511

San Bernardino Valley Coll. Energy Auditor Training Program (co-sponsored by the Chancellor's Office and the California Energy Commission)
San Diego Mesa College
7250 Mesa College Drive
San Diego, CA 92111

Bob Gray, Director,
Community Services
(714) 279-2300

San Jose City College
2100 Moorpark Avenue
San Jose, CA 95128

Community Services
(408) 298-2181

Shasta College
1065 N. Old Oregon Trail
Redding, CA 96001

Lloyd Livingston
(916) 241-3523

Sierra College
5000 Rocklin Road
Rocklin, CA 95677

Martin E. Jack, Jr.
Dean of Instructional Serv.
(916) 624-3333

College of the Siskiyous
800 College Avenue
Weed, CA 96094

Dr. Gary Peterson
Vice President, Instruction
(916) 938-4463

Southwestern College
900 Otay Lakes Road
Chula Vista, CA 92010

Community Services
(714) 421-6700, Ext. 259

Taft College
29 Emmons Park Drive
Taft, CA 93268

Donald Zumbro,
Dean of Community Services
(805) 765-4191

San Diego Mesa College
7250 Mesa College Drive
San Diego, CA 92111

Bob Gray, Director,
Community Services
(714) 279-2300

San Jose City College
2100 Moorpark Avenue
San Jose, CA 95128

Community Services
(408) 298-2181

Shasta College
1065 N. Old Oregon Trail
Redding, CA 96001

Lloyd Livingston
(916) 241-3523

Sierra College
5000 Rocklin Road
Rocklin, CA 95677

Martin E. Jack, Jr.
Dean of Instructional Serv.
(916) 624-3333

College of the Siskiyous
800 College Avenue
Weed, CA 96094

Dr. Gary Peterson
Vice President, Instruction
(916) 938-4463

Southwestern College
900 Otay Lakes Road
Chula Vista, CA 92010

Community Services
(714) 421-6700, Ext. 259

Taft College
29 Emmons Park Drive
Taft, CA 93268

Donald Zumbro,
Dean of Community Services
(805) 765-4191

Energy Auditor Training Program (co-sponsored by the Chancellor's Office and the California Energy Commission)

Greenhouse workshop

"Basic Solar Power" (a six session community education short course)

Alcohol Fuel Workshop

Series of four forums entitled:

"Energy and the Humanities"

Have offered community workshops on solar utilizing instructors from local solar company

"Energy Week" was followed by a series of three Saturday forums

Forum I: "Extracting oil from Diatomaceous Earth"

Forum II: "Effects of the Petroleum Industry on the Westside of Kern County"

Forum III: "Ethics of Energy: Dependence on Foreign Sources, Needs and Problems"

"The Energy Dilemma" (community service short course)
Ventura College
4667 Telegraph Road
Ventura, CA 93003

Charles C. Dahl
Instructor, Engineering
(805) 642-3211

Victor Valley College
18422 Bear Valley Road
Victorville, CA 92392

Dr. Alex Rudoff
Community Services
(714) 425-4271

West Hills College
300 Cherry Lane
Coalinga, CA 93210

Putheone Rouse
(209) 935-0801

West Los Angeles College
4800 Freshman Drive
Culver City, CA 90230

Marty Ross
(213) 836-7110

Yuba College
2088 N. Beale Road
Marysville, CA 95901

Wilson Dillard
Public Information Officer
(916) 742-7361

---

Energy Auditor Training Program (co-sponsored by the Chancellor's Office and the California Energy Commission)

"Sun-Corp" workshops in which students fabricate solar panels for personal use

Two or three workshops per semester on energy

Various workshops have been done covering topics of greenhouses and hydroponics, alcohol production, energy alternatives

Energy Auditor Training Program (co-sponsored by the Chancellor's Office and the California Energy Commission)

"Energy Conservation for the Homeowner and Industry" (Community Services course)

Workshops on solar design and renovating old homes for solar (workshops covered topics of domestic hot water, passive solar, weatherization)

Two-part seminar on energy conservation will be offered in cooperation with P.G. & E. and local businesses during 1980-81
Colleges reporting no current activity in non-credit Energy Seminars/Forums/Workshops:

College of Alameda
Allan Hancock College
American River College
Bakersfield College
Barstow College
College of the Canyons
Chabot College, Hayward Campus
Chaffey College
Coastline Community College
Compton Community College
Contra Costa College
Cosumnes River College
Cerritos Hills College
Cuesta College
Cuyama College
Cypress College
College of the Desert
Diablo Valley College
East Los Angeles College
El Camino College
Evergreen Valley College
Foothill College
Fresno City College
Fullerton College
Glendale College
Golden West College
Grossmont College
Hartnell College
Laney College
Long Beach City College
Los Angeles Southwest College
Los Angeles Trade Tech.
Los Angeles Valley College
Los Medanos College
Mendocino College
Mira Costa College
Moorpark College
Mt. San Jacinto College
Napa College
Ohlone College
Oxnard College
Palo Verde College
Palomar College
Porterville College
Reedley College
Riverside City College
Sacramento City College
Saddleback College
San Diego City College
San Diego Miramar College
City College of San Francisco
San Joaquin Delta College
College of San Mateo
Santa Ana College
Santa Barbara City College
Santa Monica College
Santa Rosa Junior College
College of the Sequoias
Skyline College
Solano Community College
Vista College
West Valley College
SECTION 4    OTHER PROGRAMS OF NOTE
This solar energy program is aimed at two sections of the community. Through Industrial Technology 60A and 60B, the consumer, home owner, and general education student will become energy aware. Inservice training for engineers and technicians is provided through the night class offerings of Engineering 369, 379A, and 379B.

**ENG 369**
**Utilization of Solar Energy**

Principles of utilizing solar energy; application advantages and problems; its technology an economic potential for the near future. Three hours lecture.

**ENG 379A**
**Design of Solar Energy Systems for Heating and Cooling**

Introduction to the use of solar energy for heating and air conditioning homes and buildings. Topics include an introduction to heat transfer, the availability of solar energy, the design of flat plate solar collectors, and energy loads on buildings. Two hours lecture.

**ENG 379B**
**Design of Solar Energy Systems for Heating and Cooling**

Continuation of Engineering 379A. Topics include advanced solar collector designs, design of the storage system, the designs of a complete system for heating and a complete system for cooling, and the economics of design. Two hours lecture.

**I TECH 60A**
**Solar Energy for the Consumer**

Introduction to solar energy. Topics will include economic feasibility, home use to include pool heaters, hot water heaters, active and passive systems for space heating, and energy conservation. Subject will be covered on a descriptive, non-mathematical basis. 12 hours lecture.

**I TECH 60B**
**Solar Energy for the Homeowner**

Background, economics, feasibility of solar energy as an alternative source of home energy for consumers. Pool heaters, hot water heaters, active and passive systems for space heating of homes. Energy conservation, heat pumps and other alternative sources will be considered. Retrofitting these devices to the home will be emphasized. Topics will be covered on a descriptive, non-mathematical basis. Fifty four hours lecture/demonstration.
ENdERGY COURSES

Mount San Antonio College provides energy information to its general education students through its Physical Science 20, 22, 24, and 26 classes. In addition, vocational solar information is provided through Air Conditioning 70, 71, and 71L.

PHSC 20 Energy-Options and Issues 3 units
A study of energy: What it is, where it comes from, how we use it, general systems for energy conversion, and energy conservation. A major part of the course will be devoted to studying characteristics, advantages, and disadvantages of alternative energy sources. Three hours lecture.

PHSC 22 Solar Energy 1 unit
Study of the collection, storage, and use of solar energy, considering both domestic and commercial possibilities. Includes a field trip to a solar generating facility. One hour lecture.

PHSC 24 Geothermal Energy 1 unit
Study of geothermal energy: its source, availability, types of geothermal systems and their advantages and disadvantages. Includes a field trip to a geothermal field. One hour lecture.

PHSC 26 Nuclear Energy 1 unit
A study of nuclear energy (including fission and fusion), nuclear waste management, and the impact on society of a nuclear economy. Includes a field trip to a nuclear power plant. One hour lecture.

AIRC 70 Solar and Alternate Energy Sources 3 units
A study of energy sources including solar conversion to light and heat with an exploration of wind power, fuel cells, geothermal, and other potential alternate energy fields. Includes legislation pertaining to energy conservation. Three hours lecture.

AIRC 71 Solar Energy Systems Installation 3 units
Current solar energy systems with concentration on the conversion, installation, and maintenance of these systems, including insulation procedures, controls, and codes. Three hours lecture.
AIRC 71L Solar Energy Systems Installation  1 unit
Laboratory

Laboratory experiments and experience in techniques of installing and maintaining solar conversion systems. Three hours laboratory.
ENERGY COURSES

Mount San Jacinto College has been building solar energy technology classes into its vocational programs by offering Engineering 4, 6, and 7.

ENGR 4

Solar Energy Applications 3 units

A semi-technical course on the applications of solar energy, specifically in building houses to naturally accept solar energy as a free heating system, and in the design of solar collectors, such as flat plate collectors, pool heaters, parabolic reflectors, and trough-type collectors. The path of the sun, the heating requirements of homes, and the efficiency of various types of solar energy systems will be evaluated. Three hours lecture.

ENGR 6

Solar Collector Design 3 units

A technical course on the design of solar collectors including flat plate, air-type, hydronic, and focusing solar models.

ENGR 7

Solar System Design 3 units

A technical course that treats the subject of system design subjectively and mathematically. Includes study of collector, storage units, controls and distribution equipment and design of complete systems for residential and commercial use. Three hours lecture.
The Sunrise Energy Center has been funded from December 31, 1978 to August 31, 1980, by a California Energy Commission contract. The Sunrise Energy Center, under this contract, is to develop, implement, and demonstrate a community energy information resource center to provide conservation/solar energy information to the general public in the greater Modesto area.

The Sunrise Energy Center is affiliated with Yosemite Community College District and located on the West Campus of Modesto Junior College. While the Center is part of Modesto Junior College and takes a leadership role in on-campus energy matters, its primary functions are not dependent upon any other on-campus programs.
SOLAR ENERGY INSTALLATION & MAINTENANCE - CERTIFICATE AND ASSOCIATE DEGREE PROGRAM

The program is designed to provide the student with the knowledge and skills for job entry into the solar energy field, in the area of installation and maintenance, and to provide upgrading and refresher courses for people already employed in the field.

PASSIVE SOLAR ENERGY DRAFTING AND DESIGN - ASSOCIATE DEGREE PROGRAM

The program is designed to provide the student with the knowledge and skills for job entry into the solar energy field, in the area of passive drafting and design, and to provide upgrading and refresher courses for people already employed in the field.

CURRICULUM

Requirements for Associate Degree (Solar Energy Installation & Maintenance)

<table>
<thead>
<tr>
<th>Course No.</th>
<th>Title</th>
<th>Cr. Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>SOM 220</td>
<td>Basic Solar Systems</td>
<td>3</td>
</tr>
<tr>
<td>SOM 221</td>
<td>Solar Engineering Technology I</td>
<td>4</td>
</tr>
<tr>
<td>SOM 222</td>
<td>Solar Engineering Technology II</td>
<td>4</td>
</tr>
<tr>
<td>SOM 225</td>
<td>Solar System Design &amp; Layout</td>
<td>3</td>
</tr>
<tr>
<td>SOM 226</td>
<td>Solar Panel Arrays</td>
<td>3</td>
</tr>
<tr>
<td>SOM 227</td>
<td>Testing &amp; Evaluation of Solar Systems</td>
<td>3</td>
</tr>
<tr>
<td>SOM 228</td>
<td>Solar System Maintenance</td>
<td>3</td>
</tr>
<tr>
<td>SOM 229</td>
<td>Solar Panel Installations</td>
<td>3</td>
</tr>
<tr>
<td>SOM 235</td>
<td>Basic Solar Controls</td>
<td>3</td>
</tr>
<tr>
<td>SOM 236</td>
<td>Advanced Solar Systems &amp; Controls</td>
<td>3</td>
</tr>
<tr>
<td>SOM 237</td>
<td>Passive Solar Systems</td>
<td>3</td>
</tr>
<tr>
<td>SOM 238</td>
<td>Alternative Backup Systems for Solar Energy</td>
<td>3</td>
</tr>
<tr>
<td>SOM 239</td>
<td>Introduction to Photovoltaic &amp; Wind Energy</td>
<td>3</td>
</tr>
<tr>
<td>PLU 100</td>
<td>Orientation of Tools, Basic Plumbing, and Drawings</td>
<td>3</td>
</tr>
<tr>
<td>PLU 107</td>
<td>Water Piping Methods</td>
<td>3</td>
</tr>
<tr>
<td>PLU 206</td>
<td>Hot Water Heating-Installation &amp; Maintenance</td>
<td>3</td>
</tr>
<tr>
<td>BRI 120</td>
<td>Bricklaying For Construction Trades</td>
<td>3</td>
</tr>
<tr>
<td>BRI 125</td>
<td>Blueprint Reading For Construction Trades</td>
<td>3</td>
</tr>
<tr>
<td>CAR 120</td>
<td>Carpentry For Construction Trades</td>
<td>3</td>
</tr>
<tr>
<td>SHM 100</td>
<td>Basic Sheet Metal For Solar Energy</td>
<td>3</td>
</tr>
</tbody>
</table>

Total Cr. Hours: 63
COMMUNITY COLLEGE OF DENVER, cont'd.

Required Related Courses

<table>
<thead>
<tr>
<th>Course</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Math Elective</td>
<td>3</td>
</tr>
<tr>
<td>English Elective</td>
<td>3</td>
</tr>
<tr>
<td>Social Science Elective</td>
<td>3</td>
</tr>
<tr>
<td>Electives</td>
<td></td>
</tr>
<tr>
<td><strong>TOTAL REQUIRED HOURS</strong></td>
<td>78</td>
</tr>
</tbody>
</table>

Additional Major Courses

<table>
<thead>
<tr>
<th>Course</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>SOM 297 Cooperative Work</td>
<td>2-9</td>
</tr>
<tr>
<td>SOM 299 Independent Study</td>
<td>3</td>
</tr>
</tbody>
</table>

CORE ENERGY CLASSES (Solar Energy Installation & Maintenance)

<table>
<thead>
<tr>
<th>Course</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>SOM 220 Basic Solar Systems</td>
<td>3 Cr. Hours</td>
</tr>
<tr>
<td>SOM 221 Solar Engineering Technology I</td>
<td>4 Cr. Hours</td>
</tr>
<tr>
<td>SOM 222 Solar Engineering Technology II</td>
<td>4 Cr. Hours</td>
</tr>
<tr>
<td>SOM 223 Solar System Design &amp; Layout</td>
<td>3 Cr. Hours</td>
</tr>
</tbody>
</table>

SOM 220 Basic Solar Systems

Different types of solar systems, collectors storage, and distribution. Solar heating, solar domestic hot water and solar air conditioning. Difference between air and liquid systems. 15 hours theory. 45 hours laboratory. 60 Ct. Hours

SOM 221 Solar Engineering Technology I

The purpose of this course is to develop the capability of practitioners in the home building industry to size, install and operate solar heating and cooling systems for residential buildings. Also included is an overview of our energy problems today, a review of engineering math pertaining directly to this course, and basic physics. 45 hours theory/lecture - 23 hours laboratory 68 Ct. Hours

SOM 222 Solar Engineering Technology II

This course is limited in scope to the design of solar heating and cooling systems for residential buildings, with primary emphasis on heating systems, although solar cooling systems are discussed. Design and economic analysis of systems are the topics, and a review of engineering math related to this course. 45 hours theory/lecture - 23 hours laboratory 68 Ct. Hours

SOM 223 Solar System Design & Layout

Keeping architecture and solar systems in harmony; adapting to existing structures, and when it is practical; types of collectors; flat plate air, or liquid; some directional tracking and tower reflection used in high temperature concentrating collectors. 15 hours theory - 45 hours laboratory. 60 Ct. Hours
COMMUNITY COLLEGE OF DENVER, cont'd.

SOM 226 Solar Panel Arrays 3 Cr. Hours

Principles of operation and functional components, as in lumber and type required. Construction features of most air or liquid panels, and construction of a basic panel. 15 hours theory - 45 hours laboratory.

60 Ct. Hours

SOM 227 Testing & Evaluation Of Solar Systems 3 Cr. Hours

Cost, efficiency, and durability of panels, cost of backup systems and types of control and sensors used. 15 hours theory - 45 hours laboratory.

60 Ct. Hours

SOM 228 Solar System Maintenance 3 Cr. Hours

Repair of panels, checking for heat loss, where and how to correct condition of liquid evaluation equipment; maintenance of pumps, blowers, coils, and controls. 15 hours theory - 45 hours laboratory.

60 Ct. Hours

SOM 229 Solar Panel Installations 3 Cr. Hours

Installing all types of panels on all types of roofs. 15 hours theory - 45 hours laboratory.

60 Ct. Hours

SOM 235 Basic Solar Controls 3 Cr. Hours

Theory of low and line voltage controls. Emphasis on schematic and layout techniques. Safety and basic electric components discussed. Trouble shooting solar control system and operational problem solving. 15 hours theory - 45 hours laboratory.

60 Ct. Hours

SOM 236 Advanced Solar Systems & Controls 3 Cr. Hours

This course will cover solar systems and controls of flat, plate and concentrating collectors and solar systems, heat pumps, solar cooling and dehumidifying with emphasis on trouble shooting, and problems resolution using lab systems and simulators. 30 hours theory/lecture 30 hours laboratory.

60 Ct. Hours

SOM 237 Passive Solar Systems 3 Cr. Hours

A study of the theory and use of passive solar energy. The design of the structure in harmony with passive systems experiment different storage methods, and cost analysis of passive systems versus other heating methods. 30 hours theory - 30 hours laboratory.

60 Ct. Hours
COMMUNITY COLLEGE OF DENVER, cont'd.

SOM 238 Alternative Backup Systems for Solar Systems 3 Cr. Hours
Review of conventional and nonconventional sources of energy with applications. 30 hours theory - 30 hours laboratory. 60 Ct. Hours

SOM 239 Introduction to Photovoltaic & Wind Energy 3 Cr. Hours
This course will explore the state-of-the-art hardware and its application for residential use. It will include discussion of the electrical circuits and components, power regulation and storage of electrical energy. 30 hours theory - 30 hours laboratory. 60 Ct. Hours

SOM 100 Sheet Metal for Solar Energy 3 Cr. Hours
Introduction to the Sheet Metal field, safety, basic equipment, and tools. Fabrication, techniques, and blueprint interpretation. 15 hours theory - 45 hours laboratory. 60 Ct. Hours

SOM 297 Cooperative Work Experience 2-9 Cr. Hours
A program of study developed with coordinated college course work, and industry work experience. 15 hours theory - 45-360 hours laboratory. 60-376 Ct. Hours

SOM 299 Independent Study 3 Cr. Hours
Individual study on a special project which is related to the Diesel Program and outside the program offering. 90 hours laboratory. 90 Ct. Hours

Requirements for Associate Degree (Passive Solar Energy Drafting & Design)
SOM 220 Basic Solar Systems 3
SOM 237 Passive Solar Systems 3
SOM 240 Advance Passive Solar Systems 3
SOM 245 Greenhouses 4
SOM 247 Site Built Solar Systems 3
SOM 248 Solar Greenhouse Construction 3
SOM 249 Earth Shelter Dwellings 4
SOM 250 Computer & Calculator Techniques for Solar Energy 2
BRI 125 Bricklaying for Solar Energy 3
BRI 126 Solar Walls & Fireplaces 3
BRI 105 Introduction to Drafting 6
BRI 115 Perspective Drawing 3
DAC 116 Introduction to Architectural Drafting-Frame Construction 6
DRC 200 Introduction to Commercial Architecture-Masonry Construction 6
COMMUNITY COLLEGE OF DENVER cont'd

DRI 206  Industrial Piping and Utility Consideration  3
DRI 210  Solar Drafting Technical Project  6

Required Related Courses

Math Elective  3
English Elective  3
Social Science Elective  3
Electives  6

76

CORE ENERGY CLASSES (Passive Solar Energy Drafting & Design)

SOM 260  Computer & Calculator Techniques for Solar Energy  2 Cr. Hours

This course will familiarize the practitioner to the use of the TI-59 calculator for technical problem solving, algebraic entry procedure, chain calculations, keyboard functions, use of memory, programming techniques, and use of printer and magnetic card storage. 30 hours theory  30 Ct. Hours

BRI 125  Bricklaying for Solar Energy  3 Cr. Hours

Orientation to the field of bricklaying. General principles, initial techniques, and skill development and how bricklaying relates to the various aspects of solar energy. 15 hours theory - 45 hours laboratory. 60 Ct. Hours

BRI 126  Solar Walls & Fireplaces  3 Cr. Hours

Trombe wall and solid masonry construction; fireplace construction to include basic and special types with emphasis on heat radiators and heat exchangers. 15 hours theory - 45 hours laboratory. 60 Ct. Hours

SOM 240  Advance Passive Solar Systems  3 Cr. Hours

Advance study of passive design in buildings. Advance calculation techniques. Material and cost efficiency analysis. 45 hours theory - 15 hours laboratory. 60 Ct. Hours

SOM 245  Greenhouses  4 Cr. Hours

Various designs of greenhouses, parameters affecting heating and cooling loads of greenhouses. Contribution of solar energy in winter heating of greenhouses and measures of maximizing this contribution, modifications in greenhouse design. 45 hours theory - 23 hours laboratory. 68 Ct. Hours
COMMUNITY COLLEGE OF DENVER, cont'd.

SOM 247   Site Built Solar Systems   3 Cr. Hours

Construction of site built collectors on roofs and walls integrated harmoniously with the building structure. To include liquid and air collectors, waterwalls and south wall glazing techniques applicable on both regular and modular construction. Codes, materials and cost efficiency analysis. 15 hours theory - 45 hours laboratory. 60 Ct. Hours

SOM 248   Solar Greenhouse Construction   3 Cr. Hours

Construction techniques and materials necessary for building a greenhouse: footing, stem walls and floors; structure and framing techniques; exterior paneling and glazing; insulating and ventilating techniques; codes. 15 hours theory - 45 hours laboratory. 60 Ct. Hours

SOM 249   Earth Shelter Dwellings   4 Cr. Hours

A state-of-the-art study to cover site planning; structural design; cold and warm climate designs; waterproofing and insulation; public policy issues and marketing techniques. 45 hours theory - 23 hours laboratory. 68 Ct. Hours

DRS 210   Solar Drafting Technical Project   6 Cr. Hours

A technical project in solar drafting skills by arrangement and permission of the instructor prior to registration. The project will consist of a written and approved proposal, scheduled progress reports and a finalized set of drawings. 120 hours laboratory. 120 Ct. Hours
ASSOCIATE DEGREE PROGRAM - SOLAR ENERGY TECHNICIAN

Navarro College, as Project Center, with four cooperating institutions (Brevard College in Cocoa Beach, Florida, Cerro Coso Community College in California; Malaspina College in British Columbia, and North Lake College in Dallas, Texas) has received funding from the National Science Foundation to design, develop, implement, test, evaluate and disseminate an associate degree curriculum to train solar energy technicians. This program, with Malaspina College funded by the Provincial Government of British Columbia, constitutes both a national and international effort to train viable and marketable solar energy technicians.

The SOLAR TECH Curriculum is modular in format. The program consists of both technical courses and courses which provide training and hands-on experience in the skills and tasks the Solar Energy Technician will be expected to perform. This parallel track modular development means that the materials can be used on many different levels and types of programs, from single introductory courses, modular topics or special short courses, through selected course sequences or for providing the basis for developing a Solar Energy Installation Certificate Program. All of these additional options and uses are above and beyond the basic demand for trained Solar Energy Science and Engineering Technicians.

CURRICULUM

Requirements for Associate Degree:

Math I 3
Energy Science I 4
Introduction to Solar Energy (Conservation & Passive Design) 4
Materials and Material Handling 3
Engineering Drawing 3
Education & Career Planning 1
Math II 4
Energy Science II 4
Collectors & Energy Storage 4
Heat, Ventilation, & A.C. 4
English 4
Applied Elec. Circuits & Instr. 4
Sizing Design & Retrofit 4
Tech. Survey of Energy Sources 3
Introduction to Computers & Programming 3
Introduction to Business 3
Operational Diagnosis 3
Codes, Legal; Econ., Consumerism 2
General Psychology, Human Relations in Industry 3
Non-residential Applications & Future Technology 3
Technical Report Writing 2
Solar Practicum 3-5

CORE ENERGY CLASSES

**Introduction to Solar Energy** 4 credits

A self-contained introduction to the general principles of solar energy and the concepts of specific types of solar energy systems. This course is designed for general information and background purposes.

**Energy Science I and II** 4 credits

A two-semester course covering the basic scientific, engineering and physical principles governing the collection, conversion, storage, and utilization of solar energy. The content level matches that of a general physics and chemistry course and can be utilized as an energy/applied physics replacement at either the non-calculus or calculus level.

**Technical Survey of Energy Sources** 3 credits

This course provides a flexible double semester format that allows instruction in either quantification of the introductory course or a complete passive solar energy heating and cooling course. Depending on interest and need, either option or a mixture of the two can be taught.

**Non-Residential Applications and Future Technology** 3 credits

This course covers areas of solar energy outside the core area of the program and can be specialized to provide a secondary expertise for the technician. Current areas of emphasis are photovoltaic, biomass fuel production, and solar thermal control receivers. The content of this course depends on current demand and projected future growth.

**Collectors and Energy Storage** 4 credits

This course considers the methods which are used to collect solar energy for use in simple heating and cooling applications. Various collector types are studied and the physics of their operation examined. The storage of energy in the form of heat, chemical reaction, and electrical production is presented and studied in detail. Extensive and detailed studies of the characteristics of passive systems and passive energy storage are also included in this course.
The purpose of this program is to prepare trainees for entry-level employment in the Solar Technology Field. They may be employed as technicians in research laboratories; solar energy systems installations; assistants to designers and architects; or other occupations related to the energy industry. Students will be prepared to perform installation and service functions to support architects and engineers designing and developing solar energy systems; maintenance of installed units; sizing, designing, and installing specific solar units with the proper storage. The student will be proficient in heating and air conditioning, sheet metal work, and all installation of all domestic and industrial units.

**CURRICULUM**

<table>
<thead>
<tr>
<th>Requirements for Associate Degree</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>82-001 Basic Refrigeration Fundamentals</td>
<td>6</td>
</tr>
<tr>
<td>82-002 Basic Electrical Fundamentals</td>
<td>6</td>
</tr>
<tr>
<td>50-016 General Mathematics I</td>
<td>3</td>
</tr>
<tr>
<td>11-005 Communication Skills I</td>
<td>3</td>
</tr>
<tr>
<td>82-003 Soldering &amp; Brazing</td>
<td>2</td>
</tr>
<tr>
<td>82-102 Electrical Controls &amp; Circuitry</td>
<td>6</td>
</tr>
<tr>
<td>82-101 Refrigeration Components</td>
<td>4</td>
</tr>
<tr>
<td>50-017 General Mathematics II</td>
<td>3</td>
</tr>
<tr>
<td>82-004 Fundamentals of Air Flow</td>
<td>5</td>
</tr>
<tr>
<td>82-103 Domestic Heating &amp; Air Conditioning</td>
<td>6</td>
</tr>
<tr>
<td>82-014 Blue Print Reading</td>
<td>3</td>
</tr>
<tr>
<td>82-005 Commercial Refrigeration Principles</td>
<td>6</td>
</tr>
<tr>
<td>82-006 Sheetmetal Fundamentals</td>
<td>3</td>
</tr>
<tr>
<td>50-118 Applied Mathematics II</td>
<td>4</td>
</tr>
<tr>
<td>82-007 Introduction to Solar Heating &amp; Cooling</td>
<td>3</td>
</tr>
<tr>
<td>82-008 Commercial Refrigeration Systems</td>
<td>6</td>
</tr>
<tr>
<td>63-003 Physics I (heat and insulation)</td>
<td>4</td>
</tr>
<tr>
<td>75-011 Human Relations</td>
<td>3</td>
</tr>
<tr>
<td>50-119 Technical Mathematics</td>
<td>4</td>
</tr>
<tr>
<td>83-002 Engineering Drafting I</td>
<td>4</td>
</tr>
<tr>
<td>04-016 Computer Programming</td>
<td>3</td>
</tr>
<tr>
<td>63-103 Physics II (Statics &amp; Fluids)</td>
<td>4</td>
</tr>
<tr>
<td>82-104 Industrial Electronics</td>
<td>3</td>
</tr>
<tr>
<td>50-120 Technical Mathematics II</td>
<td>4</td>
</tr>
<tr>
<td>82-009 Solar System Analysis</td>
<td>6</td>
</tr>
<tr>
<td>63-203 Physics III (Optics)</td>
<td>3</td>
</tr>
<tr>
<td>82-010 Microprocessor Control Fundamentals</td>
<td>6</td>
</tr>
<tr>
<td>70-020 Energy Economics</td>
<td>6</td>
</tr>
<tr>
<td>82-011 Graphics</td>
<td>6</td>
</tr>
<tr>
<td>82-012 Design Project - Phase A</td>
<td>5</td>
</tr>
</tbody>
</table>
Requirements for Air Conditioning & Refrigeration Option:

After the first two quarters of the above program, a person may elect to go through a year option program in air conditioning and refrigeration repair. This option will lead to a diploma upon completion. After the first two quarters of the above program, the student will take the following two quarters:

- 82-103 Domestic Heating & Air Conditioning
- 82-020 Laundry & Kitchen Components I
- 82-005 Commercial Refrigeration Principles
- 00-024 Business Organization & Management
- 75-011 Human Relations
- 82-008 Commercial Refrigeration Systems
- 82-120 Laundry & Kitchen Components II
- 82-021 Refrigeration System Diagnosing

CORE ENERGY CLASSES

82-007 Introduction to Solar Heating & Cooling 3 Cr. Hours

Introduction to the fundamental concepts of solar space heating and cooling, domestic water heating, and solar-generated electricity. Centralized and decentralized solar utilization is discussed, and solar thermal aspects of space conditioning are reviewed.

82-009 Solar System Analysis 6 Cr. Hours

The theory and practical aspects of complete solar system installations will be studied in regard to the operation and efficiency. Different types of solar heat collection and storage will be studied and the students will gain first hand experience with these in the lab.

Design Project

A two quarter course in two phases

- 82-112 Phase A 5 Cr. Hours
- 82-113 Phase B 6 Cr. Hours

The two phases must be taken in two successive quarters. Each student will select and define the objectives for an alternate energy system. Students will draw upon all of their previous course knowledge to complete these design projects.
63-003  Physics I (Heat & Insulation)  4 Cr. Hours

Covers the basic principles of heat, and heat transfer. Studies will include both materials for good heat transfer and materials for the prevention of heat transfer.

63-203  Physics III (Optics)  3 Cr. Hours

Basic principles of solar heat collection. He/she will be introduced to solar availability, solar radiation measurement; refraction-reflection-transmissivity; collector covers, absorber plates; selective surface coatings. Students will learn to set up and monitor solar radiation readings and to record, diffuse, and direct solar radiation.

70-020  Energy, Economics  6 Cr. Hours

A study of the economic value of various forms of energy with the main emphasis being on solar energy. Methods of estimating initial installation and operations cost will be covered with analysis of savings compared to conventional forms included.
Community Resource Project  
3317 S Street  
Sacramento, CA 95816

TYPE OF PROGRAM: Solar Technician Training
NUMBER OF STUDENTS: 10
DATES OF OPERATION: Program initiated 1978
SOURCE OF FUNDS: CETA

PROGRAM DESCRIPTION: Nine month training program includes three months of OJT. The six months of "in-house" training is focused on passive space heating and active hot water systems, with approximately 50% devoted to classroom and 50% to hands-on training. Two classes have graduated since program began.
Job Corp of San Diego
1325 Iris Ave.
Imperial Beach, CA 92032

To
Guerin
1325 Iris Ave.
Randy Mann
Imperial Beach, CA 92032
Rick Brooke
(714) 423-6872

TYPE OF PROGRAM: Solar Energy Installer Training

NUMBER OF STUDENTS: 25 - 30

DATES OF OPERATION: Program initiated January 1980

SOURCE OF FUNDS: Job Corp

PROGRAM DESCRIPTION: Training program is self-paced. Phase I involves academic instruction and has a remedial reading and math component; Phase II is work experience in solar system installation. It is a vocational training program in installation of solar hardware, primarily hot water heating systems.
TYPE OF PROGRAM: Solar Technician Training
NUMBER OF STUDENTS: 16
DATES OF OPERATION: March 1979 - December 1979
SOURCE OF FUNDS: CETTA; Department of Energy; Department of Labor

PROGRAM DESCRIPTION
Nine month training program with three months of classroom training and six months of hands-on experience. Most subjects were taught in-house by staff and/or local tradespersons, but students spent two days/week taking courses at College of the Redwoods during the first three months of training. Training focused on design, construction, and installation of: (1) active and passive hot water systems; (2) attached greenhouses. Installations were made on low-income housing. Net Energy currently operates a weatherization project that includes some solar instruction.
Dave Timson  
Solar Instructor  
(209) 584-7518

Proteus Adult Training  
319 N. Harris  
Hanford, CA 93230

TYPE OF PROGRAM: Solar Installer Training
NUMBER OF STUDENTS: 15
DATES OF OPERATION: Program initiated February 1978
SOURCE OF FUNDS: CETA

PROGRAM DESCRIPTION: Five month training program focuses upon domestic hot water system construction and installation. Classes are run on an overlapping schedule with four persons rotated in each month as four others graduate. Six training classes have graduated since program began in 1978.
TYPE OF PROGRAM: Solar Mechanic Training

NUMBER OF STUDENTS: 10

DATES OF OPERATION: October 1979 - October 1979

SOURCE OF FUNDS: CETA; Department of Energy; Community Services Administration; National Center for Appropriate Technology

PROGRAM DESCRIPTION. One year training program taught basic skills for solar installers (i.e., plumbing, electrical, carpentry, etc.). Hands-on accounted for approximately 60% of training and was done at a house that was renovated by trainees. Classroom instruction was approximately 40%, much of which was given by Canada College. Local contractors were brought in from time to time to assist with particular topics.
Sierra Committee Solar Project
7993 Rock Springs Road
Penryn, CA 95663

Carl Young, Director
(916) 663-3192

Kirk Lindgren, Solar Instructor
(916) 823-0963

TYPE OF PROGRAM: Solar Installer Training
NUMBER OF STUDENTS: 11
DATES OF OPERATION: Program initiated 5/79
SOURCE OF FUNDS: CETA

PROGRAM DESCRIPTION: 15 week course for solar mechanics includes ten weeks of classroom instruction and five weeks of hands-on experience. Training focused on active hot water systems and passive space heating. 25 persons have completed two previous training cycles.
TYPE OR PROGRAM: Solar Installer Training
NUMBER OF STUDENTS: Average of 14 per class
DATES OF OPERATION: Program initiated September 1978
SOURCE OF FUNDS: CETA

PROGRAM DESCRIPTION: Skyray programs are located in Hayward, Belmont, and Sacramento. Training curriculum, focused upon hot water heating systems, includes instruction on safety and basic job motivation as well as construction techniques, blueprint reading, solar theory, and plumbing.
TYPE OF PROGRAM: Solar Installer Training

NUMBER OF STUDENTS: 24 - 35

DATES OF OPERATION: Program initiated 1977

SOURCE OF FUNDS: CETA, other state and federal grants

PROGRAM DESCRIPTION: The solar installer course lasts approximately six months and is lecture/hands-on training with courses in blueprint reading, math, photovoltaic conversions, etc.
TYPE OF PROGRAM: Solar Mechanic Training

NUMBER OF STUDENTS: 8

DATES OF OPERATION: October 1978 - September 1980

SOURCE OF FUNDS: YCJJP; CETA Title VI; Southwest Region Border Commission

PROGRAM DESCRIPTION: Originally designed as a five month training program for 15 participants, the program was changed to a 10 month cycle. Eight persons will have completed this 10 month training cycle when the program ends September 30, 1980.

Training is 40 hours/week, 15 hours/week classroom and 25 hours/week practicum. The practicum included installing domestic hot water systems in low-income housing.
Colby Community College
1255 South Range
Colby, Kansas 67701
(913) 462-3984

Colby Community College has developed a Learning Guide for Alcohol Fuel Production. The Guide has been used in the college's sequence of one-week workshops over the past year, but it is now used as a resource for the newly instituted Alcohol Fuels Technology AA degree program.

Energy Incorporated
P.O. Box 736
Idaho Falls, Idaho 83401

Energy Incorporated has recently produced a curriculum guide entitled: Alcohol Fuels: Use, Principles, and Economics. Steven J. Winston, the principal writer, has also sketched out a full-fledged Associate Degree program that might be organized with the text as a base.

National Alcohol Fuels Producers Association
P.O. Box 2756
Lincoln, Nebraska 68502
(402) 423-7830

or

NAFPA/WASHINGTON,
1760-Reston Avenue, Suite 102
Reston, Virginia 22090
(703) 471-1611

NAFPA publishes a monthly newsletter, "Earth & Energy", and a monthly technical bulletin. NAFPA has helped Colby Community College and other colleges in designing curriculum and locating instructors and speakers for workshops and training programs. The association maintains an active file of people in the alcohol fuels business—manufacturers, suppliers, consultants.

National Center for Appropriate Technology
P.O. Box 3838
Butte, Montana 59701
(406) 494-4572

Ken Runnion of the Alcohol Fuels Division of NCAT is doing Research and Development (R & D) on Alcohol Fuels Production, which is tied in with plans for demonstration projects.
Aside from the R & D of the Agriculture and Biofuels Task group, NCAT has a Building Technology Task Group which focuses its work on energy conservation and weatherization; building rehabilitation; design and construction techniques of low-cost housing for energy efficiency. The Renewable Energy Task Group is the third branch of NCAT's R & D Division, and its work focuses on the development and evaluation of various low-cost renewable energy appliances with particular emphasis on retrofit applications to existing homes and apartments.

NCAT's Information Division maintains a library and resource center and responds to informational requests. In addition, NCAT publishes a wide range of information materials on appropriate technology for which an order form and price list can be obtained by writing the Information Division at the above address.

Office of Alcohol Fuels
Department of Energy
Forrestal Building 2A611
Washington, D.C. 20585

Bill Holmberg is the Acting Director, Office of Alcohol Fuels, at DOE and his office should be able to provide referral to other information sources.

Solar Energy Research Institute
Alcohol Fuels Hotline
1536 Cole Boulevard
Golden, Colorado 80401
(800) 525-5555

SERI offers Hotline Services and information packets in response to inquiries about Alcohol Fuels production.

SERI also maintains the Solar Energy Information Data Bank (SEIDB) for the Federal Government with files on: Solar Energy Manufacturers; Solar Energy Education; Solar Insolation; Solar Installations; Solar Law and Legislation; Computer Models and Simulations; International Projects; International contacts; Solar Energy Professionals; Solar Energy Products; Solar Bibliography.

Information about the use of the SEIDB, about SERI Publications, or specific inquiries about solar technologies can be directed to the National Solar Inquiry and Referral Service that is maintained by SERI (800) 525-5000.
Consumer and Homemaking Education
Inservice Project
333 Main Street
Redwood City, CA 94063

Phyllis A. Marcus, Director
(415) 364-5600, Ext. 2560

PROGRAM DESCRIPTION:

Resource material for Home Economics teachers interested in incorporating energy and environmental issues into their curriculum, are available from the CHE Inservice Office. Topic areas include: Energy Choices and Environmental Problems; Energy Conservation in the Home; Chemicals and the Food Cycle; and Pollution Problems: air, chemical, noise, pesticide, toxic substances and water. The CHE Inservice Project sponsored two regional workshops on "Resource Management Through Energy Conservation" last spring and hopes to offer additional workshops in 1980-81.

CHE Inservice Education is a VEA Subpart V Statewide Inservice Project in cooperation with the San Mateo County Office of Education.
Congress passed the National Energy Extension Service Act in 1977 to help states establish energy information programs that would do for energy what the Cooperative Extension Service has done for agriculture: provide individuals with advice, training, and technical assistance. In this case, the focus is on conserving energy and reducing costs while converting to renewable sources of energy. The program is aimed at small businesses, farms, individuals, and local governments.

OAT is the lead agency for the California Energy Extension Service, with CEES managing the grants program in addition to providing other services.

---

**Energy Conservation Funding Awarded**

This map shows how federal Energy Extension Service funds, for local energy conservation demonstration projects will be distributed in California in 1980. Thirty organizations and groups won contracts totaling $657,121 in an intense competition for funding. Over one thousand groups and individuals requested proposal applications and over two hundred proposals were submitted, seeking funding for projects that could be transferred to other communities in the state. Information about the contracts programs is available from the California Energy Extension Service, 1211 16th Street, Sacramento, CA 95814, telephone (916) 323-4388.

- **Sacramento**
  - California Energy Extension Service
  - Director, CEES
  - (916) 323-4388

- **San Francisco**
  - The Solar Center
  - SACRAMENTO
  - Berkeley Planning Associates
  - SEATTLE
  - Sunrose Design Group

- **Oakland**
  - City of Oakland
  - Berkeley Planning Associates

- **Los Angeles**
  - Environmental Center
  - Self-Help Enterprises
  - City of Imperial Beach
  - Berkeley Planning Associates

- **San Diego**
  - Allan A. Sjoholm & Associates
  - Senior Citizen Demonstration Center

---

**Program Description:**

Congress passed the National Energy Extension Service Act in 1977 to help states establish energy information programs that would do for energy what the Cooperative Extension Service has done for agriculture: provide individuals with advice, training, and technical assistance. In this case, the focus is on conserving energy and reducing costs while converting to renewable sources of energy. The program is aimed at small businesses, farms, individuals, and local governments.

OAT is the lead agency for the California Energy Extension Service, with CEES managing the grants program in addition to providing other services.
Community Contractors

Brairpatch Cooperative Market
1830 Cooper Street, Palo Alto, CA 94301 Contact Karl Johnson (415) 326-4286 &R678
The Practical Applications for Teaching Conservation in the Household (PATCH) Program has devised a program to reach renters who shop at the Brairpatch Food Co-op and receive the bi-weekly newsletter. Workshops will teach members who live in rental housing how to perform their own energy audits, emphasizing little or no cost measures. A unique aspect of this project is a kit of conservation devices renters can take with them when they move to low-flow shower heads, lighdimmers, water heater insulation blankets and more. Displays and handouts will highlight water conservation, weather-stripping, insulation, and solar projects.

City of Oakland, Social Services Department
659-14th Street, Oakland CA 94612 Contact Roma Hunter (415) 777-3941
The Retrofit Conservation program will operate a self-help weatherization and retrofitting program that will be directed at low-income renters in the West Oakland Community Action Agency Planning District. By providing technical assistance through workshops, project RentRonU seeks to encourage low-income tenants of West Oakland to perform minor home repairs and weatherization on their rental units.

Pacific Economic Resources League, Inc.
1221 Broadway Suite 310, Oakland CA 94612 Contact James B Brewer (415) 454-8850/840 000
Project Sesame will focus energy outreach activities at small businesses in Alameda and Contra Costa Counties included in their project are plans to conduct 120 energy audits for small businesses in this region. Project Sesame will also conduct nine seminars in energy management and provide financial consultation for energy loan programs for small businesses.

Self-Help Enterprises
220 South Bridge Street, Visalia CA 93277 Contact Paul Bosser (209) 733-9306
The Tevisston Solar Project will provide energy conservation counseling and consumption surveys for 100 houses. The project will use the skill and labor of local residents to construct and install 25 passive solar water heating systems.

Monterey Peninsula College District
980 Fremont Street, Monterey, CA 93940 Contact Dr Philip Nash (408) 649-150 Ext 338 $40,000
The Project for Industry, Education and Consumer Conservation of Energy (PIECC) targets three groups: building industry, teachers and consumers. The approach combines hotline services with a series of workshops on energy sources, utilization and conservation. The building industry workshops highlight solar design and construction techniques using recognized experts. Teachers K-14 of the County of Monterey will participate in a workshop and provide in-service training at their respective schools. Emphasis will be on social science and home economics courses and the provision of a 2-week learning package. A hotline will provide specific curriculum and teaching aid information.

Energy Action of Santa Cruz County
Post Office Box 1380, Santa Cruz CA 95061 Contact John Cohn (408) 454-3300 $15,209
This Energy Efficient Business Project will provide outreach, education and technical assistance for small businesses in Santa Cruz County. A manual on energy audits and conservation will be developed to provide not only practical information, but a referral for services of the program and adutschein workshops for small businesses. The Santa Cruz Community Credit Union will provide life cycle energy cost analysis and technical evaluation of equipment purchases through their technical and financial services program. They will combine with this program an energy loan service geared to the commercial sector. The program will culminate with "Conservation Week" featuring successful energy conserving businesses and renters, an auction of energy conservation devices and other activities.

Environmental Center of San Luis Obispo County (ECOSLO)
983 Palm Street, San Luis Obispo, CA 93401 Contact Steven Seo (805) 544-1777 $10,750
The Energy Conservation Through Resource Recovery Project will utilize slide show presentations to service groups, schools and clubs to highlight the energy savings aspects of recycling. A special seminar series for the teachers of the county will be held to instruct teachers from primary to college levels on recycling options.
COMMUNITY CONTRACTORS:

Net Energy
834 Ninth Street, Arcata, CA 95521 Contact Suzanne Gueguen (707) 822-5925 $30,960

The Residential/Small Business Energy Conservation Program will provide residents of Humboldt County with a variety of energy conservation information services through a combination of workshops and neighborhood energy presentations. Fifteen pre-targeted neighborhoods, including three mobile home parks, will be provided with energy conservation presentations tailored to their needs. The program will also focus on consumer education and management for small businesses.

Everything New Under The Sun
KIXE-TV Channel 9 (PBS) 825 Industrial Redding, CA 96099 Contact Laura Yule or Sandy Mc, Caleb (916) 241-7900 $38,649

Public Television Station KIXE in cooperation with California State University, Chico, Butte College, and the Butte County Community Action Agency proposes to increase the use of solar energy in northeastern California. A series of six half-hour programs on solar energy will be produced for public television broadcast to rural residents of northeastern California during the fall of 1980. Classes emphasizing "hands on" experience in the construction of solar water heating systems and solar greenhouses will be offered in local community colleges in conjunction with the television broadcasts.

Sunrise Design Group
Box 26-7202 Boloney Avenue, Sebastopol, CA 95472 Contact Paul Larkin (707) 823-2047 $25,455

The North Coast Builders Exchange Energy Audit Program will serve the construction industry in six counties: Sonoma, Mendocino, Lake, Marin, Humboldt, and Del Norte by providing energy audits, on-site visits and counseling services. Results of audits will be highlighted for the members of this organization, the largest builders exchange in California through their weekly paper.

Berkeley Planning Associates (BPA):
California Housing Action and Information Network (CHAIN)
1912 Bonita Avenue, Berkeley, CA 94704 Contact FP E, Douglas Fields (415) 349-3492/CHAIN Stee Hopferet (916) 448-2544 $37,805

The Energy Efficiency for Multi-family Tenants Program will conduct energy conservation awareness and training workshops and follow-up energy saving action activities that offer technical assistance and materials for energy saving maintenance improvement. This project will use low/no cost conservation equipment. Two low/moderate income rental complexes in each of the cities of Oakland, Sacramento and Los Angeles have been targeted for presentations. Low-income and moderate income rental complexes will be selected in each of these cities for demonstration.

Asian Neighborhood Design, Inc.
576 Vallejo Street, San Francisco, CA 94133 Contact Gilbert Chan (415) 982-2756 $22,244

The Chinatown Energy Conservation Project, Phase 3, will provide bilingual energy conservation education, information and technical assistance to Chinese speaking residents, renters and small businesses in San Francisco, Oakland and other East Bay neighborhoods. Energy conservation literature will be translated into Chinese, workshops and audits will be conducted, a hotline will answer questions and weatherization materials will be provided for do-it-yourself conservation efforts.

The Solar Center
62 Townsend Street, San Francisco, CA 94107 Contact Peter Barnes (415) 957-3660 $32,171

The Multi-Unit Energy Efficiency Project will provide technical and economic energy conservation information to apartment owners and managers in the North Bay area. Information will be delivered in a workshop format, followed by individual audits.

Left Diana Felt, vice president of the Solar Center surveys solar water heating system installed in 50-unit apartment building in Oakland.
COMMUNITY CONTRACTORS:

Community Environmental Council
924 Anacapa Street Suite B, Santa Barbara, CA 93101 Contact Paul Rehls (805) 965-8302 $28,450

The Santa Barbara Energy Extension Service will develop energy conservation demonstration projects involving commercial offices, the rental housing market, Santa Barbara's motel industry, and the general residential market. Workshop sessions will focus on weatherization, efficient load management, and new energy conservation activities.

Vitalize Van Nuys, Inc.
14545 Victory Boulevard Van Nuys CA 91411 Contact Marcia Afendini (213) 989-4377 $160,000

The Business Community Energy Conservation Program will serve as a demonstration project for revitalization and rehabilitation programs in the central business district of Van Nuys. The program will alert a large part of the San Fernando Valley business community to suitable energy conservation measures through a program of public awareness including "shopping lists" of applicable measures, audit workshops on implementation and a follow-up monitoring of energy consumption.

Santa Monica Energy Project
131W 14th Street Apt C Santa Monica CA 90404 Contact Catherine A Tyrell (213) 393-7353 $27,762

The Santa Monica Energy Project will provide energy workshops, energy audits and technical assistance aimed specifically at tenants and landlords. The project will promote cooperation between tenants and landlords.

Los Angeles Community Design Center
541 S Spring Street #800 Los Angeles CA 90013 Contact Gary Squier (213) 626-1453 $36,731

The Energy Efficient Housing Rehabilitation Training Pilot Harvard Park Community Revitalization Program will develop specific design financing and counseling packages to make energy conservation and solar water heating options a reality for the clients in Harvard Park as they rehabilitate their homes. The Los Angeles Community Design Center will develop a manual introducing housing rehabilitation specialists to energy efficient design and building specifications. The analysis will focus on retrofit opportunities in low and moderate-income housing. Workshops will instruct specialists in the use of the manual. Homeowner brochures will be provided for clients, with less technical information concerning energy and money saving possibilities.

TELACU
615 S Atlantic Boulevard East Los Angeles, CA 90022 Contact David Lazzarone (213) 263-8309 $40,000

The TELACU Bilingual Energy Conservation Project is designed to improve the quality of life of the Mexican-American Community in Los Angeles. Personalized programs will reach this neglected population through hands-on solar workshops, solar greenhouse construction and bilingual consumer conservation information centers, media presentations and residential audits.

Allan Sjoholm & Associates
6893 Summit Ridge Way San Diego CA 92120 Contact Allan Sjoholm (714) 287-8585 $35,873

The Energy Conservation Program for Seniors will directly affect a specific category of low-income energy user desperately in need of assistance. This energy information and training outreach program will use seniors themselves as change agents to influence their peers to adopt energy conservation measures. It will develop new and improved ways of communicating energy information through hands-on training sessions, walk-through life-size exhibits, and step-by-step large print illustrated guides to residential energy conservation techniques.

City of Imperial Beach
825 Imperial Beach Boulevard Imperial Beach, CA 92032 Contact Howard Hicks (714) 423-8306 Ext 22, 537, 382

The Landlord/Tenant Partnership program from the City of Imperial Beach addresses the concerns and interests of tenants and landlords through the promotion of energy conservation devices suitable for renters and energy information materials, specifically tailored for landlords. A series of workshops bringing together the two interest groups will be held to demonstrate devices and techniques that can be used in rental dwellings.
SECTION 5 — INFORMATION SOURCES.
The following list contains information sources that might prove helpful in answering energy-related questions. Those that are preceded by an asterisk (*) are offices consulted under this grant.

**CALIFORNIA AGENCIES, ASSOCIATIONS, AND SOCIETIES**

- *Alternative Consumer Energy Society*
  c/o Public Education Services
  Jet Propulsion Laboratory
  4800 Oak Grove Drive
  Pasadena, CA 91103
  (213) 254-2402

- Alternative Energy Co-Operative
  (Berkeley)
  2600 Dwight Way, Room 204
  Berkeley, CA 94702 (415) 849-3816
  (Santa Cruz)
  1200 River Street
  Santa Cruz, CA 95060
  (408) 426-1299

- *California Energy Commission*
  1111 Howe Avenue
  Sacramento, CA 95825
  Public Information (800) 852-7516
  Solar Office (General & (916) 920-6019
  Building &Appliance (916) 920-6091
  Conservation (916) 920-6006
  Standards (916) 920-6106
  Transportation

- *California Energy Extension Service*
  1211 16th Street
  Sacramento, CA 95814
  (916) 223-4388

- California Public Utilities Commission
  350 McAlister
  San Francisco, CA 94102
  (415) 557-2527

- Cal SBIAC
  2555 Clovis Avenue
  Clovis, CA 93612
  (209) 299-9741

- Center for Solar Energy Application
  San Jose State University
  San Jose, CA 95192
  (408) 277-2939

- *Consumer Homemaking Education*
  Inservice Project
  333 Main Street.
  Redwood City, CA 94063
  (415) 365-5600, Ext. 2567

- *Contractors State Licensing Board*
  1020 N Street, Room 579
  Sacramento, CA 95814
  (916) 445-7500

- Department of Consumer Affairs
  1020 N Street
  Sacramento, CA 95814
  (800) 952-5567

- Energy Conservation Center
  (P.G. & E., SMUD, SCE)
  77 Beale Street
  San Francisco, CA 94106
  (800) 792-8000
  (call collect)

- Energy Research Group
  Ecology Action Institute
  1000 N. Ninth Street
  Modesto, CA 95350
  (209) 838-7073

- Franchise Tax Board
  Energy Resource Conservation & Development Commission
  1111 Howe Avenue, Room 424
  Sacramento, CA 95825
  (800) 952-5670
CALIFORNIA AGENCIES, cont'd.

Habitat Center
P.O. Box 2363
Berkeley, CA 94702
(415) 526-0869

Northern California Solar Energy Assoc.
P.O. Box 1056
Mountain View, CA 94042

Office of Appropriate Technology (OAT)
1530 Tenth Street
Sacramento, CA 95814
(916) 445-1803

Solar Business Office
1120 N Street, 2nd Floor
Sacramento, CA 95814
(916) 445-0970

SolarCal Office
1111 Howe Avenue, Suite 315
Sacramento, CA 95825
(916) 920-7621
(800) 952-5670 Solar Information

Solar Energy Advocates
P.O. Box 876
Sacramento, CA 95814
(916) 446-2012

Solar Energy Society of America
2780 Sepulveda Blvd.
Torrance, CA 90605

Solar Utilization Now for Services and Employment (SUNRAE)
P.O. Box 915
Goleta, CA 93017
Sacramento (916) 448-1198

Southern California Solar-Energy Assoc.
City Administration Building 11-B
202 C Street
San Diego, CA 92101
(714) 236-0432

U.C. Energy Extension
University of California, Davis
Davis, CA 95616
(916) 752-0858

NATIONAL AGENCIES, ASSOCIATIONS, AND SOCIETIES

American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE)
Research and Technical Services
345 East 47th Street
New York, NY 10017
(212) 644-7931

Center for Energy & Environmental Management
P.O. Box 536
Fairfax, Virginia 22030
(703) 250-5900

Center for Renewable Resources
1001 Connecticut Avenue, NW
Washington, D.C. 20006
(202) 466-6350

Consumer Energy Council of America
1900 M Street NW, Suite 620
Washington, D.C. 20006
(202) 659-0404

*U.S. Department of Energy
1333 Broadway
Oakland, CA 94612

Energy Resources Center
333 Market Street
San Francisco, CA 94105
(415) 766-7035 General Information

Conservation & Solar Energy
Forrestal Building
Washington, D.C. 20585
(202) 252-5000

Energy Communication Center
National Council for Resource Development (AACJC)
One Dupont Circle, NW, Suite 410
Washington, D.C. 20036
(202) 293-7050

Energy Education Program
Academy for Educational Development
680 Fifth Avenue
New York, NY 10019
(212) 397-0040
NATIONAL AGENCIES, cont'd.

*Government Printing Office
Federal Building
450 Golden Gate
San Francisco, CA 94102
(415) 556-6657

*International Solar Energy Society (ISES)
American Technological University
P.O. Box 1416
Killeen, TX 76541
(817) 526-1300

*League for Innovation
1100 Glendon Avenue, Suite 925
Los Angeles, CA 90024
(213) 479-3941

*National Alcohol Fuels Producers Assoc.
P.O. Box 2756
Lincoln, Nebraska 68502
(402) 474-1977

or-

NAFFA/Washington
1760 Reston Avenue, Suite 102
Reston, Virginia 22090
(703) 471-1611

*National Center for Appropriate Technology
P.O. Box 3838
Butte, Montana 59701
(406) 494-4572

National Center for Resource Recovery
1211 Connecticut Avenue
Washington, D.C. 20036
(202) 223-6154

*National Energy Information Center
(NEIC)
Forrestal Building, Room 1F048
1000 Independence Avenue SW
Washington, D.C. 20585
(202) 223-6500

National Gasohol Commission
521 S. 14th Street, Suite 5
Lincoln, Nebraska 68502
(402) 475-8044

National Solar Heating and Cooling Information Center
P.O. Box 1607
Rockville, MD 20850
(800) 523-2929

National Technical Information Service
U.S. Department of Commerce
5285 Port Royal Road
Springfield, VA 22161
(703) 487-4600 General Information
(703) 487-4780 Title Information
(703) 487-4650 General Sales

New Mexico Solar Energy Association
P.O. Box 2004
Santa Fe, NM 87501
(505) 983-1006/983-2887

RAIN
2270 N.W. Irving
Portland, OR 97210
(503) 227-5110

Solar Energy Industries Assoc.
1001 Connecticut Avenue, NW
Washington, D.C. 20036
(202) 293-2981

Solar Energy Institute of North America
1110 6th Street NW
Washington, D.C. 20001
(202) 667-6611

*Solar Energy Research Institute
1536 Cole Blvd.
Golden, CO 80401
(303) 231-1000 Public Information
(800) 525-5000 Solar Information
(800) 525-5555 Alcohol Fuels Information

*Technical Information Center
U.S. Department of Energy
P.O. Box 62
Oak Ridge, TN 37830
(615) 576-1188

Western Sun
Pioneer Park Building
715 SW Morrison
Portland, OR 97204
(503) 221-2437