

*Energy systems*

**ENERGY SYSTEMS – ENSYS**

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 Physical Sciences and Engineering Division  
 Physical Sciences Building, Room 263

**Possible career opportunities**

An area of increasing job opportunities is in the various fields of alternate or renewable energy. This includes areas related to solar photovoltaics, solar water heating, wind energy systems, biodiesel and biofuels, biomass, fuel cells and related hydrogen energy devices and other small technologies. Most of the jobs in these areas are involved with the installation, design or maintenance of these systems. Most of these areas require skills in electricity, science, and math.

**Program-level student learning outcomes**

Program learning outcomes are subject to change. The most current list of program learning outcomes for each program is published on the DVC website at [www.dvc.edu/slo](http://www.dvc.edu/slo).

**Associate in science degree**

**Energy systems**

Students completing the program will be able to...

- A. identify, measure, and analyze the major energy uses in typical businesses operations, focusing beyond the building and into processes.
- B. demonstrate the electrical and energy systems skills to successfully interact with builders, architects, engineers, and constructors and advise on building and systems energy use.
- C. design medium complexity solar photovoltaic or other energy system for medium size commercial buildings and processes.

This program provides students with a broad view of energy and energy systems and specific skills for those planning on entering the field designing, installing, servicing/repairing and maintaining renewable/sustainable energy systems. This includes wind energy, biodiesel and biofuels, biomass, fuel cells, hydrogen, and other technologies.

To earn an associate in science degree, students must complete each course used to meet a major requirement with a "C" grade or higher, maintain an overall GPA of 2.5 or higher in the coursework required for the major and complete general education requirements as listed in the catalog.

<i>major requirements:</i>	<i>units</i>
ENSY-120 Introduction to Energy Systems .....	3
ENSY-125 Building Envelope and Systems .....	3
ENSY-130 Photovoltaic Systems Design and Installation .....	2
ENSY-230 Advanced Photovoltaic Systems .....	2

*plus at least 4 units from:*

ELECT-120 Direct Current Circuits .....	4
ELTRN-120 Direct Current Circuits .....	4

*plus at least 12 units from:*

ARCHI-207 Environmental Control Systems .....	3
CONST-110 Occupational Safety.....	2
CONST-183 Title 24: Energy Conservation Codes .....	3
ELECT-121 Alternating Current Circuits .....	4
ELECT-266 Electrical Codes: Articles 90-398.....	3
ELECT-267 Electrical Codes: Articles 400-830.....	3
ENSY-260 Solar Photovoltaic and Thermal Installation Techniques .....	2

**total minimum required units 26**

**Certificate of achievement**

**Energy systems**

Students completing the program will be able to...

- A. identify, measure, and analyze the major energy uses in typical businesses operations, focusing beyond the building and into processes.
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- C. design medium complexity solar photovoltaic or other energy system for medium size commercial buildings and processes.

This program provides students with a broad view of energy and energy systems and specific skills for those planning on entering the field designing, installing, servicing/repairing and maintaining renewable/sustainable energy systems. This includes wind energy, biodiesel and biofuels, biomass, fuel cells, hydrogen, and other technologies.

To earn a certificate of achievement, students must complete each course used to meet a certificate requirement with a "C" grade or higher and maintain an overall GPA of 2.5 or higher in the coursework required for the certificate.

*required courses:* *units*

ENSY-120 Introduction to Energy Systems .....	3
ENSY-125 Building Envelope and Systems .....	3
ENSY-130 Photovoltaic Systems Design and Installation .....	2
ENSY-230 Advanced Photovoltaic Systems .....	2

*plus at least 4 units from:*

ELECT-120 Direct Current Circuits .....	4
ELTRN-120 Direct Current Circuits .....	4

*plus at least 12 units from:*

ARCHI-207 Environmental Control Systems .....	3
CONST-110 Occupational Safety.....	2
CONST-183 Title 24: Energy Conservation Codes .....	3
ELECT-121 Alternating Current Circuits .....	4
ELECT-266 Electrical Codes: Articles 90-398.....	3
ELECT-267 Electrical Codes: Articles 400-830.....	3
ENSY-260 Solar Photovoltaic and Thermal Installation Techniques .....	2

**total minimum required units 26**

*Energy systems*

**Certificate of accomplishment**

**Energy systems**

Students completing the program will be able to...

- A. identify, measure, and analyze the major energy uses in typical businesses operations, focusing beyond the building and into processes.
- B. demonstrate the electrical and energy systems skills to successfully interact with builders, architects, engineers, and constructors and advise on building and systems energy use.
- C. design medium complexity solar photovoltaic or other energy systems for medium size commercial buildings and processes.

This program provides students with a broad view of energy, energy systems, and specific entry-level skills for those planning on entering the field of installing, servicing/repairing and maintaining renewable/sustainable energy systems with a focus on photovoltaic systems. Technologies include wind energy, biodiesel and biofuels, biomass, fuel cells, hydrogen, and other technologies.

To earn a certificate of accomplishment, students must complete each course used to meet a certificate requirement with a "C" grade or higher and maintain an overall GPA of 2.5 or higher in the coursework required for the certificate.

<i>required courses:</i>	<i>units</i>
ENSY-120 Introduction to Energy Systems .....	3
ENSY-125 Building Envelope and Systems .....	3
ENSY-130 Photovoltaic Systems Design and Installation .....	2
ENSY-230 Advanced Photovoltaic Systems .....	2

<i>plus at least 4 units from:</i>	
ELECT-120 Direct Current Circuits .....	4
ELTRN-120 Direct Current Circuits .....	4
<b>total minimum required units</b>	<b>14</b>

**ENSY-120 Introduction to Energy Systems**

3 units SC

- 45 hours lecture/27 hours laboratory per term

This course will cover present day energy systems and an in-depth analysis of the design and installation of alternate energy systems including solar water heating systems, solar electrical systems, wind electrical systems, wind mechanical systems, small hydro-electrical systems and unique conservation methods. Additional topics include geothermal energy, fuel cells, and biomass systems as well as applications of alternate energy in transportation, industrial, commercial, and residential systems. CSU

**ENSY-125 Building Envelope and Systems**

3 units SC

- 45 hours lecture/27 hours laboratory per term
- Recommended: ENSY-120 or equivalent and MATH-090 or MATH-090E or MATH-090SP or equivalent

This course provides an introduction to buildings and building systems, including the envelope and major electro-mechanical equipment used in the building. Students will gain knowledge of and experience with various strategies and tools used to measure and analyze building energy use such as infrared thermography, duct and envelope leak testers, light and sound meters, energy analysis programs. Mitigation strategies to save energy and improve occupancy health are emphasized. CSU

**ENSY-130 Photovoltaic Systems Design and Installation**

2 units SC

- 36 hours lecture/18 hours laboratory per term

Students will learn how to do solar site evaluations, electrical load calculations, solar system size calculations, and installation techniques for grid-tie and off-the-grid photovoltaic systems. Students will learn how to design and install their own solar system and or obtain skills for employment. This course is approved by the North American Board of Certified Energy Practitioners (NABCEP) and the students can take the optional Photovoltaic Systems Entry Level certification exam as part of the course. CSU

**ENSY-150 Topics in Energy Systems**

.3-4 units SC

- Variable hours

A supplemental course in energy systems that provides a study of current concepts and practices in energy systems and related subdivisions. Specific topics will be announced in the schedule of classes. CSU

**ENSY-230 Advanced Photovoltaic Systems**

2 units LR

- 27 hours lecture/27 hours laboratory per term
- Recommended: ENSY-130 and ELECT-122 or equivalents

This course will cover the National Electrical Code (NEC) specifics concerning photovoltaic installations. The topics include code compliant wiring of modules, inverters, charge controllers, batteries, grounding techniques and related topics. Additional topics include the design and installation of large commercial photovoltaic systems. CSU

## Energy systems

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### **ENSY-260 Solar Photovoltaic and Thermal Installation Techniques**

2 units LR

- 27 hours lecture/27 hours laboratory per term
- Recommended: ENSYS-130 and ENSYS-140 or equivalents
- Note: This course will include activities working with high voltages, hot liquids, power tools, and working on elevated surfaces. Class activities include climbing ladders, lifting up to 50 pounds and working in elevated spaces, in crawl spaces and tight areas.

This course will cover the techniques, tools, materials used in the installation of solar photovoltaic and solar thermal systems. This course will also cover the OSHA safety requirements for ladder, roof, fall-protection systems, scissor lifts and fork lifts. CSU

### **ENSY-299 Student Instructional Assistant**

.5-3 units SC

- Variable hours
- Note: Applications must be approved through the Instruction Office. Students must be supervised by a DVC instructor.

Students work as instructional assistants, lab assistants and research assistants in this department. The instructional assistants function as group discussion leaders, meet and assist students with problems and projects, or help instructors by setting up laboratory or demonstration apparatus. Students may not assist in course sections in which they are currently enrolled. CSU