# ECT162 : Introduction to Solar Principles

## General Information

| | |
|---|---|
| **Author:** | • Christopher Herwerth |
| **Course Code (CB01) :** | ECT162 |
| **Course Title (CB02) :** | Introduction to Solar Principles |
| **Department:** | ECT |
| **Proposal Start:** | Spring 2026 |
| **TOP Code (CB03) :** | (0934.00) Electronics and Electric Technology |
| **CIP Code:** | (47.0101) Electrical/Electronics Equipment Installation and Repair Technology/Technician, General. |
| **SAM Code (CB09) :** | Clearly Occupational |
| **Distance Education Approved:** | No |
| **Will this course be taught asynchronously?:** | No |
| **Course Control Number (CB00) :** | CCC000535999 |
| **Curriculum Committee Approval Date:** | 02/26/2025 |
| **Board of Trustees Approval Date:** | 04/22/2025 |
| **Last Cyclical Review Date:** | 02/26/2025 |
| **Course Description and Course Note:** | ECT 162 introduces students to key aspects of solar power, the basics of solar energy, and the concepts behind installing and troubleshooting solar panels. The course prepares students to pass the Photovoltaic Installer examination and to become certified by Electronics Technician Association (ETA) International, so that they can enter the job market as solar technicians in sales, installation, or repair. |
| **Justification:** | Mandatory Revision |
| **Academic Career:** | • Credit |
| **Mode of Delivery:** | • In-Person<br>• Remote<br>• Online |
| **Author:** | No value |
| **Course Family:** | No value |

## Academic Senate Discipline

| | |
|---|---|
| **Primary Discipline:** | • Electronic Technology (Radio, television, computer repair, avionics) |
| **Alternate Discipline:** | No value |
| **Alternate Discipline:** | No value |

## Course Development

**Basic Skill Status (CB08)**

Course is not a basic skills course.

☐ Allow Students to Gain Credit by Exam/Challenge

**Course Special Class Status (CB13)**

Course is not a special class.

**Pre-Collegiate Level (CB21)**

Not applicable.

**Grading Basis**

- Grade with Pass / No-Pass Option

**Course Support Course Status (CB26)**

Course is not a support course

## General Education and C-ID

**General Education Status (CB25)**

Not Applicable

**Transferability**

Transferable to CSU only

**Transferability Status**

Approved

## Units and Hours

### Summary

| | |
|---|---|
| **Minimum Credit Units (CB07)** | 3 |
| **Maximum Credit Units (CB06)** | 3 |
| **Total Course In-Class (Contact) Hours** | 54 |
| **Total Course Out-of-Class Hours** | 108 |
| **Total Student Learning Hours** | 162 |

### Credit / Non-Credit Options

**Course Type (CB04)**

Credit - Degree Applicable

**Noncredit Course Category (CB22)**

Credit Course.

**Noncredit Special Characteristics**

No Value

**Course Classification Code (CB11)**

Credit Course.

☐ Variable Credit Course

**Funding Agency Category (CB23)**

Not Applicable.

☐ Cooperative Work Experience Education Status (CB10)

### Weekly Student Hours

| | In Class | Out of Class |
|---|---|---|
| Lecture Hours | 3 | 6 |
| Laboratory Hours | 0 | 0 |
| Studio Hours | 0 | 0 |

### Course Student Hours

| | |
|---|---|
| **Course Duration (Weeks)** | 18 |
| **Hours per unit divisor** | 0 |
| **Course In-Class (Contact) Hours** | |
| Lecture | 54 |

| | |
|---|---|
| Laboratory | 0 |
| Studio | 0 |
| **Total** | 54 |

**Course Out-of-Class Hours**

| | |
|---|---|
| Lecture | 108 |
| Laboratory | 0 |
| Studio | 0 |
| **Total** | 108 |

## Time Commitment Notes for Students

No value

## Units and Hours - Weekly Specialty Hours

| Activity Name | Type | In Class | Out of Class |
|---|---|---|---|
| No Value | No Value | No Value | No Value |

## Prerequisites, Corequisites, Recommended Corequisites, and Recommended Preparation

### Advisory

ECT110 - Electricity and Electronics Principles

**Objectives**

- Determine the value of resistors from their color code, measure DC (Direct Current) and AC (Alternating Current) voltage.
- Identify conductors and insulators, and test common types of switches.
- Measure current in a circuit, verify ohms law, investigate errors in measurement.
- Develop methods of troubleshooting circuits using voltage, current, capacitor, and resistance measurements.
- Describe the effect of AC and DC electrical motors and inductance.

## Entry Standards

| Entry Standards | Description |
|---|---|
| No value | No value |

## Course Limitations

| Cross Listed or Equivalent Course | Description |
| --- | --- |
| No value | No value |

## Specifications

### Methods of Instruction

| Methods of Instruction | Lecture |
| --- | --- |
| Methods of Instruction | Multimedia |
| Methods of Instruction | Demonstrations |
| Methods of Instruction | Guest Speakers |

### Out of Class Assignments

- Quizzes
- Examination at the end of each instructional module
- Final project
- Final exam

| Methods of Evaluation | Rationale |
| --- | --- |
| Exam/Quiz/Test | Final examination |
| Exam/Quiz/Test | Quizzes |
| Exam/Quiz/Test | Midterm examination |

### Textbook Rationale

No Value

### Textbooks

| Author | Title | Publisher | Date | ISBN |
| --- | --- | --- | --- | --- |
| Holt, Mike | Solar Photovoltaic and Energy Storage Systems | Mike Holt Enterprises of Leesburg Inc. | 2023 | 978-1-950431-75-5 |

**Other Instructional Materials (i.e. OER, handouts)**

No Value

## Learning Outcomes

**Course Objectives**

Describe the current solar energy industry and the history of solar energy systems used for heating, lighting, and converting the sun's energy into AC electrical power with solar photovoltaic panels.

Explain how solar energy fits into the supply of green energy.

Describe the basic scientific principles of how photovoltaic materials convert sunlight to AC electrical power.

Discuss electrical concepts such as voltage, current resistance, and power as they relate to photovoltaic panels.

Discuss advantages and disadvantages of the different types of batteries available for use with solar energy systems.

Demonstrate the steps for installing residential and commercial solar photovoltaic panels.

Discuss the electrical knowledge needed to install, troubleshoot, and repair electrical parts of the solar energy systems.

Explain how the new "Smart Grid" makes electrical transmission more efficient.

**SLOs**

**Describe the current solar energy industry and the history of solar energy systems.** Expected Outcome Performance: 70.0

| | |
|---|---|
| *ILOs*<br>Core ILOs | Demonstrate depth of knowledge in a course, discipline, or vocation by applying practical knowledge, skills, abilities, theories, or methodologies to solve unique problems. |
| *ECT*<br>Electronics & Computer Technology - Electronics Technology Technician | Demonstrate knowledge in photo-voltaic concepts |
| | Demonstrate knowledge in photo-voltaic concepts |

**Describe the basic scientific principles of how photovoltaic materials convert sunlight to AC electrical power.** Expected Outcome Performance: 70.0

| | |
|---|---|
| *ILOs*<br>Core ILOs | Demonstrate depth of knowledge in a course, discipline, or vocation by applying practical knowledge, skills, abilities, theories, or methodologies to solve unique problems. |

| | |
|---|---|
| *ECT*<br>Electronics & Computer Technology - Electronics Technology Technician | Demonstrate knowledge in photo-voltaic concepts |
| | Demonstrate knowledge in photo-voltaic concepts |

**Discuss electrical concepts such as voltage, current resistance, power, and battery technology as they relate to photovoltaic panels.**

Expected Outcome Performance: 70.0

| | |
|---|---|
| *ILOs*<br>Core ILOs | Demonstrate depth of knowledge in a course, discipline, or vocation by applying practical knowledge, skills, abilities, theories, or methodologies to solve unique problems. |
| *ECT*<br>Electronics & Computer Technology - Electronics Technology Technician | Demonstrate knowledge in photo-voltaic concepts |
| | Demonstrate knowledge in photo-voltaic concepts |

**Discuss the technology and installation for the installation residential and commercial solar photovoltaic panels.** Expected Outcome Performance: 70.0

| | |
|---|---|
| *ILOs*<br>Core ILOs | Demonstrate depth of knowledge in a course, discipline, or vocation by applying practical knowledge, skills, abilities, theories, or methodologies to solve unique problems. |
| *ECT*<br>Electronics & Computer Technology - Electronics Technology Technician | Demonstrate knowledge in photo-voltaic concepts |
| | Demonstrate knowledge in photo-voltaic concepts |
| | Knowledge of California State Contractors and Electronics Technician Association examinations. |
| | Knowledge of California State Contractors and Electronics Technician Association examinations. |

## Additional SLO Information

**Does this proposal include revisions that might improve student attainment of course learning outcomes?**

No

**Is this proposal submitted in response to learning outcomes assessment data?**

No

**If yes was selected in either of the above questions for learning outcomes, explain and attach evidence of discussions about learning outcomes.**

No Value

**SLO Evidence**

No Value

## Course Content

### Lecture Content

**Introduction to Solar Energy (6 hours)**
- Modern solar energy systems and producing electricity from solar energy
- Types of photovoltaic cells
- Solar energy dispersion
- Weather effects on solar energy
- Solar energy storage
- Financial implications and return on investment calculations

**Electrical and Energy Demands for the United States and the World (4 hours)**
- The need for an uninterrupted and continuous power supply
- Ways to work around varying amounts of electricity generated by solar energy
- Transmission limitations for electricity
- The electrical demand for the United States

**Types of Solar Energy Systems (5 hours)**
- Modern solar energy systems
- Solar lighting and solar heating used to provide hot water
- Using a solar water heating system to heat a swimming pool
- Passive hot water heating systems
- Solar heating using air and PV modules

**Solar Installations (6 hours)**
- Project development and solar energy site assessment
- Visual and landscape assessment
- Small residential solar energy systems
- Homemade solar energy system systems
- Solar energy farms and electrical energy produced by parabolic trough solar collectors

**Basic Photovoltaic (PV) Principles and Types of Solar PV Cells (Converting Solar Energy to Electricity) (6 hours)**
- Conductors, Insulators, and Semiconductors in the periodic table of elements
- Simplified structure of a conductor and creating a PN junction
- Simplified structure of an insulator
- Simplified structure of a semiconductor and combining silicon atoms
- Combining phosphorous or arsenic with silicon to make N-Type material
- Combining boron and silicon to make P-Type material

**Construction and manufacturing of solar PV panels (4 hours)**
- Panel test standards
- Making a rigid frame solar panel
- Making solar panels from polycrystalline cells

**Photovoltaic (PV) Controllers and Inverters (5 hours)**
- Types of applications that need charge controllers
- Basic operation of a solar charger controller
- Basic control diagrams for photovoltaic systems
- Anti-islanding circuits and other protection circuits
- Inverters DC-to-AC voltage conversion

**Storing Electrical Energy and Batteries (5 hours)**
- Solar high-powered batteries
- Effects of temperature on batteries
- Batteries in series and parallel for solar banks
- Periodic maintenance for storage batteries

**The Grid and Integration of Solar-Generated Electricity into the Grid (6 hours)**
- Understanding the grid and overview of power quality issues
- Transformers, transmission, and distribution infrastructures
- National Electric Code (NEC) and other requirements for PV
- Voltage, true power, and power quality
- UF and OF circuits

**Installing, Troubleshooting, and Maintaining Solar Energy Systems (7 hours)**

- Installing solar panels at a residential location
- Installation of ground panels on a large solar farm
- Installing a solar panel on a pole
- Theory of servo systems
- Troubleshooting solar PV panels

**Total Hours: 54**

## Additional Information

**Repeatability**

Not Repeatable

**Justification (if repeatable was chosen above)**

No Value

**Is it possible this course will have a material fee?**

No Value

**I have contacted my library liaison (https://campusguides.glendale.edu/faculty/liaisons):**

No Value

**What term(s) will this course be offered?**

No Value

**Will any additional resources be needed for this course? (Click all that apply)**

No Value

**If additional resources are needed, add a brief description and cost in the box provided.**

No Value

## Resources

**Did you contact your departmental library liaison?**

Yes

**If yes, who is your departmental library liason?**

Adina Lerner (Technology & Aviation, Visual & Performing Arts)

**Did you contact the DEIA liaison?**

Yes

**Were there any DEIA changes made to this outline?**

No

**If yes, in what areas were these changes made:**

No Value

**Will any additional resources be needed for this course? (Click all that apply)**

- No

**If additional resources are needed, add a brief description and cost in the box provided.**

No Value