ELEC 157 Course Outline as of Fall 2011

CATALOG INFORMATION

Dept and Nbr: ELEC 157 Title: ADVANCED PV SYSTEMS
Full Title: Advanced Photovoltaic Systems
Last Reviewed: 2/11/2019

Units		Course Hours per Week		Nbr of Weeks	Course Hours Total	
Maximum	2.00	Lecture Scheduled	2.00	17.5	Lecture Scheduled	35.00
Minimum	2.00	Lab Scheduled	0	6	Lab Scheduled	0
		Contact DHR	0		Contact DHR	0
		Contact Total	2.00		Contact Total	35.00
		Non-contact DHR	0		Non-contact DHR	0

Total Out of Class Hours: 70.00 Total Student Learning Hours: 105.00

Title 5 Category:	AA Degree Applicable
Grading:	Grade Only
Repeatability:	00 - Two Repeats if Grade was D, F, NC, or NP
Also Listed As:	
Formerly:	

Catalog Description:
Advanced topics in applied photovoltaic technology. Includes applying the National Electrical Code (NEC) and California Electrical Code (CEC) to photovoltaic installations, OSHA safety requirements, commercial applications, off-grid and direct coupled systems, and emerging thin-film technologies.

Prerequisites/Corequisites:
Course Completion of ELEC 156

Recommended Preparation:

Limits on Enrollment:

Schedule of Classes Information:
Description: Advanced topics in applied photovoltaic technology. Includes applying the National Electrical Code (NEC) and California Electrical Code (CEC) to photovoltaic installations, OSHA safety requirements, commercial applications, off-grid and direct coupled systems, and emerging thin-film technologies. (Grade Only)
Prerequisites/Corequisites: Course Completion of ELEC 156

Recommended:
Limits on Enrollment:
Transfer Credit:
Repeatability: Two Repeats if Grade was D, F, NC, or NP

ARTICULATION, MAJOR, and CERTIFICATION INFORMATION:

AS Degree:	**Area**	Effective:	Inactive:
CSU GE:	**Transfer Area**	Effective:	Inactive:
IGETC:	**Transfer Area**	Effective:	Inactive:

CSU Transfer:	Effective:	Inactive:
UC Transfer:	Effective:	Inactive:

CID:

Certificate/Major Applicable:
Certificate Applicable Course

COURSE CONTENT

Outcomes and Objectives:
Upon completion of the course, students will be able to:
1. Interpret Article 690 of the NEC and its application to photovoltaic installations.
2. Calculate system voltage drops and select correct wire types/sizes per the NEC.
3. Create a photovoltaic single line diagram to meet building permit requirements.
4. Understand sub-parts of Occupational Safety and Health Administration (OSHA) 29 Code of Federal Regulations (CFR) Part 1926 Safety and Health Regulations relevant to photovoltaic installations.
5. Select appropriate personal protection equipment for photovoltaic installations.
6. Apply photovoltaics to commercial power situations.
7. Select appropriate equipment for battery based off-grid photovoltaic systems.
8. Size a solar direct water pumping system.
9. Describe alternative (non-crystalline) photovoltaic technologies.

Topics and Scope:

1. NEC Article 690
 a. Terminology
 b. Conductor ampacity
 c. Fusing
 d. System & equipment grounding
2. Voltage drop calculations
3. Equipment characteristics and selection
 a. Modules
 b. Inverters
 c. Charge controllers
 d. Batteries
 e. Balance of system

4. PV system permitting requirements
5. Photovoltaic line diagrams
6. OSHA regulations and safety
 a. Electrical safety
 b. Fall protections
 c. Stairways and ladders
 d. Personal protective equipment
7. 3-phase power and commercial applications
8. Off-grid system sizing
 a. Load analysis
 b. Battery sizing
 c. Array sizing
 d. Maximum power point tracking (MPPT) & pulse width modulation (PWM) charge controllers
 e. Wiring requirements
9. Direct-coupled water pumping systems
 a. System sizing
 b. Pump selection
 c. Array sizing
10. Current topics in photovoltaic technology
 a. Amorphous & thin film photovoltaics
 b. Concentrated photovoltaics

Assignment:

1. Read approximately one textbook chapter per week
2. Weekly problem sets
3. 5-10 Quizzes
4. Midterm
5. PV system design project
6. Final exam

Methods of Evaluation/Basis of Grade:

Writing: Assessment tools that demonstrate writing skills and/or require students to select, organize and explain ideas in writing.

None, This is a degree applicable course but assessment tools based on writing are not included because problem solving assessments and skill demonstrations are more appropriate for this course.	Writing 0 - 0%

Problem Solving: Assessment tools, other than exams, that demonstrate competence in computational or non-computational problem solving skills.

Problem sets	Problem solving 10 - 40%

Skill Demonstrations: All skill-based and physical demonstrations used for assessment purposes including skill performance exams.

PV system design project(s)	Skill Demonstrations 20 - 50%

Exams: All forms of formal testing, other than skill performance exams.

Quizzes, midterm, final: fill-in, short answer, multiple choice, true-false	Exams 30 - 50%

Other: Includes any assessment tools that do not logically fit into the above categories.

None	Other Category 0 - 0%

Representative Textbooks and Materials:
2011 National Electrical Code, National Fire Protection Association, Quincy, Massachusetts: 2011

Study Guide for Photovoltaic System Installers Version 4.2 April, 2009, North American Board of Certified Energy Practitioners, Clifton Park, New York: 2009

Messenger, Roger and Jerry Ventre. Photovoltaic Systems Engineering 3rd Edition, CRC Press, Boca Raton, Florida: 2010

Instructor prepared materials