RENRG 106 Course Outline as of Fall 2024

CATALOG INFORMATION

Dept and Nbr: RENRG 106 Title: PV BATTERY STORAGE
Full Title: Photovoltaic Battery Storage System Specialty
Last Reviewed: 3/9/2020

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 or P/NP
Repeatability:	00 - Two Repeats if Grade was D, F, NC, or NP
Also Listed As:	
Formerly:	

Catalog Description:
This course will examine electrical energy storage systems for photovoltaic solar panel systems. Field trips may be included.

Prerequisites/Corequisites:

Recommended Preparation:
Eligibility for ENGL 100 OR EMLS 100 (formerly ESL 100) or equivalent

Limits on Enrollment:

Schedule of Classes Information:
Description: This course will examine electrical energy storage systems for photovoltaic solar panel systems. Field trips may be included. (Grade or P/NP)
Prerequisites/Corequisites:
Recommended: Eligibility for ENGL 100 OR EMLS 100 (formerly ESL 100) or equivalent
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

Student Learning Outcomes:
At the conclusion of this course, the student should be able to:
1. Discuss the benefits of adding battery storage to a homeowner's photovoltaic solar system.
2. Evaluate the effectiveness of battery storage for various home scenarios and backup options.
3. Determine electrical backup system requirements based on different battery technologies and anticipated electrical load demand and duration.

Objectives:
At the conclusion of this course, the student should be able to:
1. Size battery system capacity to a home's loads and backup needs.
2. Investigate how storage batteries integrate with solar photovoltaic systems to create microgrids.
3. Examine different battery vendors and evaluate the benefits and detriments of each technology.
4. Evaluate when to use generators with, or in place of, a battery storage system.

Topics and Scope:

I. Grid Tied Battery Energy Storage
   A. Grid tied battery storage system overview
   B. Generators and battery storage comparison: benefits, costs, and limitations
   C. Micro grid overview
   D. Comparison of off-grid storage systems with grid tied storage system
   E. Battery technologies used in residential use
   F. Benefits of pairing battery storage with solar photovoltaic systems
   G. Fuel-switching from gas to electricity and effects on battery storage
   H. Battery storage manufacturers: benefits and limitations
   I. Generators added to battery systems.
   J. Electric vehicle-to-grid storage.
II. Driving Forces for Residential Battery Storage Systems
   A. Solar grid saturation
   B. Reliability of electrical grid: PG&E public safety power shut-offs (PSPS)

C. Increased frequency of major disaster events
D. Changing utility rate schedules for solar-only systems
E. Medical dependency situations
F. Decentralization of electrical distribution grid benefits

III. Sizing Residential Battery Storage Systems
A. Effects of electrical surges: motors and pumps
B. Protected Load Panels (PLP)
C. Load assignments for PLPs
D. Differences between city- and county-located properties differences and backup needs
E. Blending battery storage with generators
F. Extended outages battery sizing
G. Use of variable frequency drives for lowering electrical surge
H. Preparation of new residences for battery storage systems
I. Preparation of existing residences for battery storage systems

IV. Justification of Residential Battery Storage Systems
A. Federal and local incentives
B. Favorable rate schedules
C. Utility usage charges
D. Designing for time of use
E. Losses from power outages

V. Future and Emerging Technology
A. Residential storage as virtual power plants
B. Micro grids, nano grids, and communities
C. Battery technology developments
D. Electric car integration into residential energy storage
E. Other emerging technologies

Assignment:

1. Assigned reading (5-10 pages/week)
2. Problem solving assignments (5-10)
3. Weekly class discussions on advanced topics
4. Three- to five-page reports (5-10)
5. Midterm exam
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.

Reports	Writing 10 - 30%

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

Problem-solving assignments	Problem solving 25 - 35%

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

None	Skill Demonstrations 0 - 0%

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

Midterm and final exam	Exams 20 - 30%

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

Active participation in class discussions	Other Category 15 - 30%

Representative Textbooks and Materials:
Instructor prepared materials