

ECE 3040: Sustainable Energy and Power Systems I

Course Description

Introduction to electrical energy systems: history, current trends, renewable and non-renewable sources, rotating machines and their operation, and smart grid initiatives.

Prior Course Number: 341

Transcript Abbreviation: SusEnrgy & PwrSys1

Grading Plan: Letter Grade

Course Deliveries: Classroom

Course Levels: Undergrad

Student Ranks: Junior, Senior

Course Offerings: Autumn, Spring

Flex Scheduled Course: Never

Course Frequency: Every Year

Course Length: 14 Week

Credits: 3.0

Repeatable: No

Time Distribution: 3.0 hr Lec

Expected out-of-class hours per week: 6.0

Graded Component: Lecture

Credit by Examination: No

Admission Condition: No

Off Campus: Never

Campus Locations: Columbus

Prerequisites and Co-requisites: Prereq: 2100, 2100.02, 2105, 2020, 2021, 205, 292, or 294 (Spring 2011), and enrollment in ECE or EngPhysics major.

Exclusions: Not open to students with credit for 341.

Cross-Listings:

Course Rationale: Existing course.

The course is required for this unit's degrees, majors, and/or minors: Yes

The course is a GEC: No

The course is an elective (for this or other units) or is a service course for other units: Yes

Subject/CIP Code: 14.1001

Subsidy Level: Baccalaureate Course

Programs

Abbreviation	Description
CpE	Computer Engineering
EE	Electrical Engineering

Course Goals

Master analyzing single-phase and three-phase ac systems
Be competent with electromechanical energy conversion
Be exposed to the current trends and smart grid initiatives

Course Topics

Topic	Lec	Rec	Lab	Cli	IS	Sem	FE	Wor
Historical perspective of electrical energy systems	2.0							
Discussion of traditional and non-traditional energy sources including renewable and green	6.0							
Energy, power, volt-amp 1-phase & 3-phase relationships including "why 3-phase vs 1-phase"	4.0							
Transformers and variable speed drives with associated power electronics, i.e., constant voltage/frequency transformer and a variable voltage/frequency "transformer"	6.0							
Synchronous and induction machines physical and operational basics, including utilizing variable voltage/frequency "transformer"	3.0							
DC machine applications with variable speed drives	3.0							
The electric power industry	3.0							
Introduction to distributed generation systems and comparison with central station systems	4.0							
Introduction to the "smart grid"	4.0							

Grades

Aspect	Percent
Exams - 2 during semester + final	60%
homework	15%
quizzes	15%
written paper(s) & possible in-class presentation	10%

Representative Textbooks and Other Course Materials

Title	Author
<i>Electric Energy: An Introduction</i>	Mohamed A. El-Sharkawi

ABET-EAC Criterion 3 Outcomes

Course Contribution		College Outcome
***	a	An ability to apply knowledge of mathematics, science, and engineering.
*	b	An ability to design and conduct experiments, as well as to analyze and interpret data.
*	c	An ability to design a system, component, or process to meet desired needs.
	d	An ability to function on multi-disciplinary teams.
***	e	An ability to identify, formulate, and solve engineering problems.
*	f	An understanding of professional and ethical responsibility.
	g	An ability to communicate effectively.
**	h	The broad education necessary to understand the impact of engineering solutions in a global and societal context.
**	i	A recognition of the need for, and an ability to engage in life-long learning.
**	j	A knowledge of contemporary issues.

Course Contribution		College Outcome
**	k	An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

CpE ABET-EAC Criterion 9 Program Criteria Outcomes

Course Contribution		Program Outcome
**	1	an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
*	2	an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors
	3	an ability to communicate effectively with a range of audiences
*	4	an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts
	5	an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives
*	6	an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions
**	7	an ability to acquire and apply new knowledge as needed, using appropriate learning strategies

EE ABET-EAC Criterion 9 Program Criteria Outcomes

Course Contribution		Program Outcome
**	1	an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
*	2	an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors
	3	an ability to communicate effectively with a range of audiences
	4	an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts
	5	an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives
*	6	an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions
**	7	an ability to acquire and apply new knowledge as needed, using appropriate learning strategies

Additional Notes or Comments

updated prereqs, exclusions course description, and abbreviation to match university version

added or 292 or 294 (Spring 2011) to prereqs 4/11/12

Change Textbook 10/14/13 BLA

Added "; or prereq or concurrent 2010 or 2110, and permission of department." to prereqs 10/20/13

Make consistent with University version 12/13/14

Update course goals to reflect level of mastery; add course topic on distributed generation systems. 4/16/14 BLA

Add 2020, 2021 to prereqs due to sophomore change 10/6/15 BLA

Edited text info, 5/10/17, CED

Updated new outcomes BLA 5/31/2019

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