

University of Hawaii Maui College

ETRO 350 - Power Systems

1. Course Alpha. Please click on the ? to the right for help.

ETRO

2. Course Number. Please click on the ? to the right for help.

350

3. Course Title/Catalog Title. Please click on the ? to the right for help.

Power Systems

4. Number of Credits. Please click on the ? to the right for help.

3

5. Contact Hours/Type. Please click on the ? to the right for help.

- Hour lecture/lab (4)

6. Course Description. Please click on the ? to the right for help.

Studies the basic principles of electromechanical energy conversion: single and three-phase circuits, transformers, three-phase induction and synchronous machine, DC machine, AC including magnetic circuits, and poly-phase circuits. Demonstrates energy management systems and efficiency concepts from engineering technology. Studies power generation and transmission system. Utilizes computer programming and modeling. Includes laboratory exercises and inquiries.

7. Pre-Requisites. Please click on the ? to the right for help.

ETRO 212 with grade C or better, or consent.

8. Co-requisites.

None

9. Recommended Preparation.

No

10. Is this a cross-listed course? Please click on the ? to the right for help.

NO

11. Reason for Proposal. Why is this course being proposed or modified? This question requires specific information as part of the explanation. Please click on the ? to the right for help.

The pre-requisites are modified to reflect the changes to the ENGT program map: ETRO 350 is now offered the first semester of the program.

12. Effective Semester and Year. For new or modified courses, the effective year is one year from the semester proposed. For example, if proposed in Spring 2012, the effective semester is Spring 2013. Please click on the ? to the right for help.

Fall 2015

13. Grading Method. What grading methods may be used for this course? Please click on the ? to the right for help.

- Standard (Letter,Cr/NCr,Audit) (0)

14. Is this course repeatable for credit? How often can this course be counted toward a degree or certificate? Please click on the ? to the right for help.

NO

15. Course Student Learning Outcomes (SLOs). DO NOT ENTER TEXT IN THE TEXT BOX BELOW. Click on the yellow button "COURSE LEARNING OUTCOMES" and enter in that screen. Please click on the ? to the right for help.

Course SLO/Competency	A	B	C	D	E	F	G
demonstrate knowledge of power systems concepts relevant to electrical and electromechanical energy	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>					
develop modeling techniques for the analysis and design of electromechanical system		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		
evaluate energy efficiency solutions in managing utility systems needs				<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
demonstrate methods used in the experimental determination of the characteristics and in the measurements of an electromechanical and electrical power system					<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

LEGEND

- A. solve problems related to the sinusoidal steady state of electrical circuits
- B. apply the laws of magnetic circuits and their application for the solution of problems related to flux distribution and inductance calculations
- C. use the principles of a power transformer equivalent circuit for test data (open and short circuit tests)
- D. solve the transformer circuit to obtain the transformer performance
- E. obtain experimentally the machine parameters for both the synchronous and the induction machine
- F. use the data to obtain the machine equivalent circuit
- G. utilize the capabilities of MATLAB with SIMULINK and its applications to power to simulate energy systems

Course SLO/PSLO	A	B	C	D
demonstrate knowledge of power systems concepts relevant to electrical and electromechanical energy	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		
develop modeling techniques for the analysis and design of electromechanical system		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	

evaluate energy efficiency solutions in managing utility systems needs	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
demonstrate methods used in the experimental determination of the characteristics and in the measurements of an electromechanical and electrical power system		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

LEGEND

- A. analyze, design, and implement electro-optic systems, control systems, instrumentation systems, communication systems, computer systems, or power systems
- B. demonstrate critical engineering technology skills and experiences such as: making existing technology operate, creating/selecting new technology, troubleshooting, calibrating, characterizing, and optimizing
- C. utilize integral and differential calculus, or other appropriate mathematics above the level of algebra and trigonometry to solve technical problems
- D. demonstrate engineer's way of thinking, analyzing technology as systems

16. Course Competencies. DO NOT ENTER TEXT IN THE TEXT BOX BELOW. Click on the yellow button "COURSE COMPETENCIES/ISSUES/SKILLS" and enter text in that screen. Course competencies are smaller, simpler tasks that connect to and facilitate the SLOs.

Competency
solve problems related to the sinusoidal steady state of electrical circuits
apply the laws of magnetic circuits and their application for the solution of problems related to flux distribution and inductance calculations
use the principles of a power transformer equivalent circuit for test data (open and short circuit tests)
solve the transformer circuit to obtain the transformer performance
obtain experimentally the machine parameters for both the synchronous and the induction machine
use the data to obtain the machine equivalent circuit
utilize the capabilities of MATLAB with SIMULINK and its applications to power to simulate energy systems

17. Recommended Course Content and Timeline. The course content facilitates the course competencies. Course content may be organized by weeks, units, topics or the like.

Content
Review of sinusoidal steady state, phasors, and AC power. 2-3 weeks
Magnetic materials and magnetic circuits. 2-3 weeks
Single and three-phase transformers and autotransformers. 2-3 weeks
Fundamentals of electromechanical energy conversion. 2-3 weeks
Induction machines. 2-3 weeks
Synchronous machines. 2-3 weeks

DC machines. 2-3 weeks

Tour of alternative energy and energy conservation facilities on Maui. 1 week

- 18. Program Learning Outcomes. DO NOT ENTER TEXT IN THE TEXT BOX BELOW. Click on the yellow button "PLOs" and enter text in that screen. Program Student Learning Outcomes (PLOs) supported by this course. If you are not a "program" use the Liberal Arts PLOs, view them by clicking on ? icon to the right.**

Program SLO

analyze, design, and implement electro-optic systems, control systems, instrumentation systems, communication systems, computer systems, or power systems

demonstrate critical engineering technology skills and experiences such as: making existing technology operate, creating/selecting new technology, troubleshooting, calibrating, characterizing, and optimizing

utilize integral and differential calculus, or other appropriate mathematics above the level of algebra and trigonometry to solve technical problems
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demonstrate engineer's way of thinking, analyzing technology as systems

- 19. College-wide Academic Student Learning Outcomes (CASLOs). FIRST, fill out the CASLO grid located in the UHMC tab above. Click on the HELP icon for tips on determining support for the CASLOs and indicate your choices below by clicking on the box in front of each supported CASLO. NOTE: Our campus does not use the Preparatory Level, Level 1 and Level 2 designations in the chart below.**

<input checked="" type="checkbox"/>	Creativity - Able to express originality through a variety of forms. <input checked="" type="checkbox"/> Preparatory Level
<input checked="" type="checkbox"/>	Critical Thinking - Apply critical thinking skills to effectively address the challenges and solve problems. <input checked="" type="checkbox"/> Preparatory Level
	Information Retrieval and Technology - Access, evaluate, and utilize information effectively, ethically, and responsibly.
	Oral Communication - Practice ethical and responsible oral communications appropriately to a variety of audiences and purposes.
<input checked="" type="checkbox"/>	Quantitative Reasoning - Synthesize and articulate information using appropriate mathematical methods to solve problems of quantitative reasoning accurately and appropriately. <input checked="" type="checkbox"/> Preparatory Level
	Written Communication - Write effectively to convey ideas that meet the needs of specific audiences and purposes.

GenED SLO
Creativity - Able to express originality through a variety of forms.
Critical Thinking - Apply critical thinking skills to effectively address the challenges and solve problems.
Quantitative Reasoning - Synthesize and articulate information using appropriate mathematical methods to solve problems of quantitative reasoning accurately and appropriately.

20. Linking. CLICK ON CHAIN LINK ICON IN UPPER RIGHT HAND CORNER TO BEGIN LINKING. Please click on the ? to the right for help.

21. Method(s) of delivery appropriate for this course. Please click on the ? to the right for help.

- Classroom/Lab (0)

22. Text and Materials, Reference Materials, and Auxiliary Materials. Please click on the ? to the right for help.

Stephen J. Chapman, Electric Machinery Fundamentals, 5/E, Mc Graw Hill, 2012, ISBN978-0-07-352954-7

Reference materials:

V. Del Toro, Basic Electric Machines, Prentice Hall, 1990, ISBN-10: 0130601462

Auxilliary materials:

Software such as MATLAB with SIMULINK

23. Maximum enrollment. Please click on the ? to the right for help.

24

24. Particular room type requirement. Is this course restricted to particular room type? Please click on the ? to the right for help.

YES

Laboratory with computers

25. Special scheduling considerations. Are there special scheduling considerations for this course? Please click on the ? to the right for help.

YES

This course must fit the BAS ENGT course scheduling

26. Are special or additional resources needed for this course? Please click on the ? to the right for help.

No

27. Does this course require special fees to be paid for by students? Please click on the ? to

the right for help.

NO

28. Does this course change the number of required credit hours in a degree or certificate? Please click on the ? to the right for help.

No

29. Course designation(s) for the Liberal Arts A.A. degree and/or for the college's other associate degrees. Please click on the ? to the right for help.

Degree	Program	Category
Associate in Arts:		LE - Elective LE - Elective
AS:		PE - Program Elective
AAS:		
BAS:	ET	CR - Core Course/Requirement - BAS
Developmental/ Remedial:		

30. Course designation(s) for other colleges in the UH system.

This course transfers as an elective

31. Indicate the year and page # of UHMC catalog referred to. For new or modified courses, please indicate the catalog pages that need to be modified and provide a sheet outlining those changes.

Page 113 in general catalog 2014-2015.

32. College-wide Academic Student Learner Outcomes (CASLOs). Please click on the HELP icon for more information.

Standard 1 - Written Communication Write effectively to convey ideas that meet the needs of specific audiences and purposes.		
Outcome 1.1 - Use writing to discover and articulate ideas.		1
Outcome 1.2 - Identify and analyze the audience and purpose for any intended communication.		1
Outcome 1.3 - Choose language, style, and organization appropriate to particular purposes and audiences.		1
Outcome 1.4 - Gather information and document sources appropriately.		2
Outcome 1.5 - Express a main idea as a thesis, hypothesis, or other appropriate		2

statement.		
Outcome 1.6 - Develop a main idea clearly and concisely with appropriate content.		2
Outcome 1.7 - Demonstrate a mastery of the conventions of writing, including grammar, spelling, and mechanics.		0
Outcome 1.8 - Demonstrate proficiency in revision and editing.		1
Outcome 1.9 - Develop a personal voice in written communication.		0
Standard 2 - Quantitative Reasoning Synthesize and articulate information using appropriate mathematical methods to solve problems of quantitative reasoning accurately and appropriately.		
Outcome 2.1 - Apply numeric, graphic, and symbolic skills and other forms of quantitative reasoning accurately and appropriately.		3
Outcome 2.2 - Demonstrate mastery of mathematical concepts, skills, and applications, using technology when appropriate.		3
Outcome 2.3 - Communicate clearly and concisely the methods and results of quantitative problem solving.		3
Outcome 2.4 - Formulate and test hypotheses using numerical experimentation.		3
Outcome 2.5 - Define quantitative issues and problems, gather relevant information, analyze that information, and present results.		3
Outcome 2.6 - Assess the validity of statistical conclusions.		3
Standard 3 - Information Retrieval and Technology. Access, evaluate, and utilize information effectively, ethically, and responsibly.		
Outcome 3.1 - Use print and electronic information technology ethically and responsibly.		1
Outcome 3.2 - Demonstrate knowledge of basic vocabulary, concepts, and operations of information retrieval and technology.		1
Outcome 3.3 - Recognize, identify, and define an information need.		2
Outcome 3.4 - Access and retrieve information through print and electronic media, evaluating the accuracy and authenticity of that information.		1
Outcome 3.5 - Create, manage, organize, and communicate information through electronic media.		1
Outcome 3.6 - Recognize changing technologies and make informed choices about their appropriateness and use.		2
Standard 4 - Oral Communication Practice ethical and responsible oral communications appropriately to a variety of audiences and purposes.		
Outcome 4.1 - Identify and analyze the audience and purpose of any intended communication.		0
Outcome 4.2 - Gather, evaluate, select, and organize information for the communication.		1
Outcome 4.3 - Use language, techniques, and strategies appropriate to the audience		1

and occasion.		
Outcome 4.4 - Speak clearly and confidently, using the voice, volume, tone, and articulation appropriate to the audience and occasion.		1
Outcome 4.5 - Summarize, analyze, and evaluate oral communications and ask coherent questions as needed.		1
Outcome 4.6 - Use competent oral expression to initiate and sustain discussions.		1
Standard 5 - Critical Thinking Apply critical thinking skills to effectively address the challenges and solve problems.		
Outcome 5.1 - Identify and state problems, issues, arguments, and questions contained in a body of information.		3
Outcome 5.2 - Identify and analyze assumptions and underlying points of view relating to an issue or problem.		3
Outcome 5.3 - Formulate research questions that require descriptive and explanatory analyses.		2
Outcome 5.4 - Recognize and understand multiple modes of inquiry, including investigative methods based on observation and analysis.		2
Outcome 5.5 - Evaluate a problem, distinguishing between relevant and irrelevant facts, opinions, assumptions, issues, values, and biases through the use of appropriate evidence.		3
Outcome 5.6 - Apply problem-solving techniques and skills, including the rules of logic and logical sequence.		3
Outcome 5.7 - Synthesize information from various sources, drawing appropriate conclusions.		3
Outcome 5.8 - Communicate clearly and concisely the methods and results of logical reasoning.		2
Outcome 5.9 - Reflect upon and evaluate their thought processes, value system, and world views in comparison to those of others.		2
Standard 6 - Creativity Able to express originality through a variety of forms.		
Outcome 6.1: Generate responses to problems and challenges through intuition and non-linear thinking.		2
Outcome 6.2: Explore diverse approaches to solving a problem or addressing a challenge.		3
Outcome 6.3: Sustain engagement in activities without a preconceived purpose.		1
Outcome 6.4: Apply creative principles to discover and express new ideas.		1
Outcome 6.5: Demonstrate the ability to trust and follow one's instincts in the absence of external direction		1
Outcome 6.6: Build upon or adapt the ideas of others to create novel expressions or new solutions.		2

33. Additional Information