

University of Hawaii Maui College

SSM 403 - Renewable Energy Integration



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

SSM

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

403

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

Renewable Energy Integration

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 (3)

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

Analyzes and describes issues for integrating renewable energy onto a grid structure, the fundamentals of a smart grid, and energy storage technologies. Instructs students how to use software tools applicable to smart grid operation and maintenance. Explores different electrical energy storage technologies and their feasibility for intended applications.



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

SSM 301, SSM 375, MGT 310 and MATH 203 or MATH 205 all with grade "C" or better; or consent.

8. Co-requisites.

9. Recommended Preparation.

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.

Course is receiving minor changes to description pursuant to curriculum committee suggestions.



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 2014

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	Derive equations for efficiency, normalized and normalized efficiency	Calculate the moving average of output values on a renewable energy system such as solar or wind	Navigate and use the OSI software system with basic proficiency	Explain the purpose of a smart grid including design considerations and challenges, advantages and disadvantage.
Develop, format, and organize renewable energy data sets for data base management			<input checked="" type="checkbox"/>	
Modify parameters of power inputs and outputs for simulation and comparison	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
Calculate solar pv power with data of current, voltage, and irradiance	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Analyze, interpret and explain technical reports for data quality, accuracy, and model relevance			<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Model a small smart grid with technical components			<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

Course SLO/PSLO	Explains features and functions of multiple systems are interconnected, and explain how one system can be optimized without degrading other systems or depleting natural resources.	Identify, outline and illustrate the fundamentals of existing and emerging technologies in energy production, distribution and management; water supply; wastewater treatment; and waste management; their applications, processes and requirements.	Appraise, evaluate, summarize, and explain the economic, social, cultural, political, and scientific features that make a system, process, practice, or business sustainable and consolidate that information into a sustainability	Propose and justify creative solutions to sustainability challenges that are scientifically sound.

			profile.	
Develop, format, and organize renewable energy data sets for data base management			<input checked="" type="checkbox"/>	
Modify parameters of power inputs and outputs for simulation and comparison	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
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Analyze, interpret and explain technical reports for data quality, accuracy, and model relevance		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Model a small smart grid with technical components	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

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
Derive equations for efficiency, normalized and normalized efficiency
Calculate the moving average of output values on a renewable energy system such as solar or wind
Navigate and use the OSI software system with basic proficiency
Explain the purpose of a smart grid including design considerations and challenges, advantages and disadvantage.

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
1 Week: course introduction basic concepts on renewable energy intergration
1 Week: Technical and policy challenges for renewable energy integration
1-2 Weeks: Smart Grid overview, global and island case scenerios
4-6 Weeks: OSI software application excercises, modeling, scenarios
2-4 Weeks: Sandia Laboratory ES tool select modeling for renewable and energy storage solutions
1-2 Weeks: Group research and presentations
2-4 Weeks: Maui renewable energy case scenarios

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
Explains features and functions of multiple systems are interconnected, and explain how one system can be optimized without degrading other systems or depleting natural resources.

Identify, outline and illustrate the fundamentals of existing and emerging technologies in energy production, distribution and management; water supply; wastewater treatment; and waste management; their applications, processes and requirements.

Appraise, evaluate, summarize, and explain the economic, social, cultural, political, and scientific features that make a system, process, practice, or business sustainable and consolidate that information into a sustainability profile.

Propose and justify creative solutions to sustainability challenges that are scientifically sound.

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"/> Level 2
<input checked="" type="checkbox"/>	Critical Thinking - Apply critical thinking skills to effectively address the challenges and solve problems. <input checked="" type="checkbox"/> Level 2
<input checked="" type="checkbox"/>	Information Retrieval and Technology - Access, evaluate, and utilize information effectively, ethically, and responsibly. <input checked="" type="checkbox"/> Level 2
<input checked="" type="checkbox"/>	Oral Communication - Practice ethical and responsible oral communications . appropriately to a variety of audiences and purposes. <input checked="" type="checkbox"/> Level 1
<input checked="" type="checkbox"/>	Quantitative Reasoning - Synthesize and articulate information using appropriate mathematical methods to solve problems of quantative reasoning accurately and appropriately. <input checked="" type="checkbox"/> Level 2
<input checked="" type="checkbox"/>	Written Communication - Write effectively to convey ideas that meet the needs of specific audiences and purposes. <input checked="" type="checkbox"/> Level 1

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.
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.
Quantitative Reasoning - Synthesize and articulate information using appropriate mathematical methods to solve problems of quantative reasoning accurately and appropriately.
Written Communication - Write effectively to convey ideas that meet the needs of specific audiences and purposes.

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)
- HITS/Interactive TV (0)
- Hybrid (0)
- Online (0)

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

- OSIsoft. OSI Pi Software. current. OSI soft, .
- United States Department of Energy. Smart Grid Introduction. United States Department of Energy, 2010, article electronic .pdf.
- Michael Hubner, Natalie Pruggler. Smart Grid International, Country Snapshots and Fact sheets. 1st. Austrian Federal Ministry for Transport, Innovation and Technology, 2011, Article electronic .pdf.
- Sandia National Laboratories. ES-Select Tool. 1st. Sandia National Laboratories, 2012, software.

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

18 (limited to software and computers in classroom)

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

YES

computer lab

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

NO

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:	Liberal Arts	LE - Elective
AS:	Human Services - All	NS - Natural Science
AAS:	ANY	NS - Natural Science
BAS:	Other	CR - Core Course/Requirement - BAS
Developmental/ Remedial:		

Core Requirement Bachelor of Science Sustainable Science Management

Diversification Physical

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

Diversification Physical

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.

UHMC 2013-2014 catalog at p. 141.

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.		2
Outcome 1.2 - Identify and analyze the audience and purpose for any intended communication.		2
Outcome 1.3 - Choose language, style, and organization appropriate to particular purposes and audiences.		3

Outcome 1.4 - Gather information and document sources appropriately.		3
Outcome 1.5 - Express a main idea as a thesis, hypothesis, or other appropriate statement.		3
Outcome 1.6 - Develop a main idea clearly and concisely with appropriate content.		3
Outcome 1.7 - Demonstrate a mastery of the conventions of writing, including grammar, spelling, and mechanics.		2
Outcome 1.8 - Demonstrate proficiency in revision and editing.		2
Outcome 1.9 - Develop a personal voice in written communication.		1
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.		2
Outcome 2.6 - Assess the validity of statistical conclusions.		2
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.		3
Outcome 3.2 - Demonstrate knowledge of basic vocabulary, concepts, and operations of information retrieval and technology.		3
Outcome 3.3 - Recognize, identify, and define an information need.		3
Outcome 3.4 - Access and retrieve information through print and electronic media, evaluating the accuracy and authenticity of that information.		3
Outcome 3.5 - Create, manage, organize, and communicate information through electronic media.		3
Outcome 3.6 - Recognize changing technologies and make informed choices about their appropriateness and use.		3
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.		2
Outcome 4.2 - Gather, evaluate, select, and organize information for the		2

communication.		
Outcome 4.3 - Use language, techniques, and strategies appropriate to the audience and occasion.		2
Outcome 4.4 - Speak clearly and confidently, using the voice, volume, tone, and articulation appropriate to the audience and occasion.		3
Outcome 4.5 - Summarize, analyze, and evaluate oral communications and ask coherent questions as needed.		3
Outcome 4.6 - Use competent oral expression to initiate and sustain discussions.		2
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.		2
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.		2
Outcome 6.4: Apply creative principles to discover and express new ideas.		3
Outcome 6.5: Demonstrate the ability to trust and follow one's instincts in the absence of external direction		2
Outcome 6.6: Build upon or adapt the ideas of others to create novel expressions or new solutions.		3

33. Additional Information

Attachments

-  Confirmation Environmental Awareness
-  Diversification Form

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