RC430

Integration of Distributed Energy Systems

3 Credits

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Reviewer: James Woodhouse; Dr. Mal Dissanayake
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Approval: 04/11/2015

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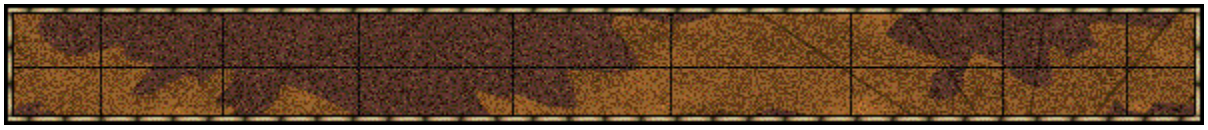
RC430 Version: 1



Integration of Distributed Energy Systems

Calendar Description

This course examines the monitoring and control logistics and integration challenges of the distributed renewable energy technologies of solar, wind and geo-exchange into new construction or creating compatibility with existing energy systems. This course through the use of holistic design thinking, integrates the knowledge learned about the individual renewable technologies and essential performance factors that may be required to be monitored and controlled.

Rationale

This course is a required course for the Renewable Energy and Conservation program. It is structured to combine existing knowledge with new approaches and methods that are specifically focused on the cutting edge of distributed energy systems integration. The goal is to equip participants with the knowledge to design holistic systems for residential and light commercial buildings that deliver unsurpassed efficiency and reliability. This all really comes down to how we 'think' about integration when designing new or retrofitting existing building structures. RC 430 goes beyond integration of distributed energy systems. It includes energy efficiency and the effective use of these systems, which is added value to Renewable Energy and Conservation.

Prerequisites

RC320, RC321, and RC325

Co-Requisites

RC322

Course Learning Outcomes

Upon successful completion of this course, students will be able to

1. discuss the key factors of and the correlation between distributed energy systems for the purpose of integrating a holistic design of energy systems.
   - list key factors involved with a wind turbine installation.
   - review the various factors involved with a geothermal exchange installation.

- summarize the various factors involved with a solar thermal installation.
- select the key factors involved with a solar photovoltaic installation.

2. discuss current local market experiences and practices with hybrid energy systems.
   - investigate the historical and current initiatives within hybrid energy systems.

3. research integrated distributed energy automated systems.

4. summarize the efficiencies of design tools.
   - discover holistic systems outside the box, utilizing the working tools, mass marketed systems and products from within the status quo.
   - research how a well-controlled energy system that is automated leads to acceptance, to an understanding of the conveniences of and demystifies the use of distributed energy systems in the main stream energy markets
   - give examples of control strategies that increase the efficiency of a holistic distributed energy system.

5. describe energy reduction systems currently on the market.
   - define 'reduce before you produce'.
   - outline the traditional and non-traditional methods of reducing energy loads.
   - recognize the impact of energy efficiencies.

6. design a potential client questionnaire for the installation of an integrated distributed energy system.
   - acquire relevant documentation and information related to the integration of distributed energy systems from the local stakeholders.

Resource Materials

***Required Text(s)*:**

There is no text. The author has drawn parallels from other industries to provide the learners (participants in RC 430), the opportunity to think differently on how you design systems. This is a very conceptual course rather than a technical course in integration. All materials that you need will be sent, and with this emerging market that is always changing. Learners will also have to find some of the material themselves as part of their assignments. The published information is changing fast and furious with the race to integrate on a manufacturers' level, and therefore a stimulating challenge to keep up with updates on existing publications. Nonetheless, existing information remains functional for conceptualizing possibilities of integration. Module IV specifically addresses this matter.

***Other Resources*:**

- Access to a computer and the Internet
- Library
- D2L orientation and technical assistance

***Optional Resources*:**

- Other resources referred to throughout the course materials.

Conduct of Course

This course consists of the equivalent of 45 hours of lecture delivered on-line using an online learning manager program. The course is delivered over a set 8 week period. Course content modules and links to assigned readings will be available on-line. A course facilitator will be available to guide the learner through the course, answer any questions, and grade assignments. Learners are expected to participate and will be given marks on the on-line discussion forums and synchronous conference discussions with other classmates and the course facilitator. Assignments will be submitted electronically through the learning manager program. Assignments will be marked by the instructor and returned to the student with a grade and comments in the learning manager program. Students can monitor their progress though the course using utilities available in the learning manager program. In order to complete the course on time, deadlines for assignments will be enforced.

Evaluation Procedures

Module	Dates	Activity	Time	Marks
Module 1 - Prerequisite Review		Wind Turbine Review	1	
		Geothermal Exchange Review	1	
		Solar Thermal Review	1	
		Solar Photovoltaic Review	1	
		Assignment Written Report on Wind	1	2%
		Assignment Written Report of Geothermal	1	2%
		Assignment Written Report on ST	1	2%
		Assignment Written Report on SPV	1	2%
	2015/09/08 7:00 - 9:00 p.m.	Online Discussion	2	
	2015 Sept 14	Written report on Discussion Submission		5%
Module 2 - Hybrid Systems		Diffusion of Innovation	1	
		History of 'Hybrid Automotive'	1	
		History of Hybrid Energy	1	
		Assignment - Written	2	10%

	2015/09/15 7:00 - 9:00 p.m.	Online Discussion	2	
	2015 Sept 21	Written Report on Discussion Submission		8%
Module 3 - Integrated Systems C & C		Review Xu theses and other reading materials	6	
		Assignment	2	20%
	2015/09/29 7:00 - 9:00 p.m.	Online Discussion	2	
	2015 Sept 28	Written Report on Discussion Submission		8%
Module 4 - Holistic Approach		Radiant Barrier Review	2	
		Waste Water Heat Recovery Review	2	
		Assignment	2	10%
	2015/09/29 7:00 - 9:00 p.m.	Online Discussion	2	
	2015 Oct 05	Written Report on Discussion Submission		8%
Module 5 - 3rd Party Considerations		Design Thinking and Stake Holder Interests	6	
		Assignment	2	14%
	2015/10/06 7:00 - 9:00 p.m.	Online Discussion	2	
	2015 Oct 19	Written Report on Discussion Submission		9%
			45	**100%**

Grade Equivalents and Course Pass Requirements

A minimum grade of D (50%) (1.00) is required to pass this course.

Letter	F	D	D+	C-	C	C+	B-	B	B+	A-	A	A+
Percent Range	0-49	50-52	53-56	57-59	60-64	65-69	70-74	75-79	80-84	85-89	90-94	95-100
Points	0.00	1.00	1.30	1.70	2.00	2.30	2.70	3.00	3.30	3.70	4.00	4.00

Students must maintain a cumulative grade of C (GPA - Grade Point Average of 2.00) in order to qualify to graduate.

Attendance

Active participation is required in all courses within the Renewable Energy and Conservation one-year certificate program. Each facilitator designates these requirements through the use of tools within the management system and personal contact with learners.

These expectations can be given marks as part of the assessment process. Each course outlines these expectations within the course structure.

For example, learners can be asked to demonstrate their participation/attendance through discussion forums, sharing research results, contributing relevant information, submitting assignments, communicating with colleagues and the facilitator, and participating in synchronous meetings or asynchronous activities.

Attendance is considered vital to the learning process. Absenteeism is recorded. For example, if a discussion forum is organized; the learner is expected to attend as per the guidelines set by the facilitator.

Students can request for an excused absence. An excused absence is one that is verified with your facilitator.

NOTE: Any exceptions to the above attendance policy (e.g. family or work-related issues) **must** be approved in writing by the Department Chair **prior** to the beginning of the course.

It is the student's responsibility to know their own absentee record.

Course Units/Topics

Module One: Prerequisites Review

Module Two: Hybrid Energy Systems

Module Three: Integrated Systems Concepts and Controls

Module Four: A More Holistic Approach

Module Five: 3rd Party Considerations

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