Cover Sheet: Request 10296

BCN 4XXX - Building Energy Modeling

Info

Process	Course|New|Ugrad/Pro
Status	Pending
Submitter	Schattner,Sallie A sallieas@ufl.edu
Created	7/8/2015 3:35:52 PM
Updated	9/8/2015 3:42:49 PM
Description	As energy is becoming more precious, it is crucial for building sector to proactively design and operate high performance buildings. To achieve higher standards in building design and operation, a solid foundation of energy engineering and sustainability principles is essential.

Actions

Step	Status	Group	User	Comment	Updated
Department	Approved	DCP - Construction Management 011503000	Ries, Robert		8/25/2015
Added BCN 4XXX.Building Energy Modeling.pdf					7/8/2015
College	Approved	DCP - College of Design, Construction and Planning	Wehle, Andrew J		9/8/2015
No document changes					
University Curriculum Committee	Pending	PV - University Curriculum Committee (UCC)			9/8/2015
No document changes					
Statewide Course Numbering System					
No document changes					
Office of the Registrar					
No document changes					
Student Academic Support System					
No document changes					
Catalog					
No document changes					
College Notified					
No document changes					

UF UNIVERSITY of FLORIDA

UCC1: New Course Transmittal Form

Recommended SCNS Course Identification

1. Prefix: BCN 2. Level: 4 3. Number: XXX 4. Lab Code: None

5. Course Title: **Building Energy Modeling**

6. Transcript Title (21 character max.): **Bldg. Energy Modeling**

7. Effective Term: **Fall** 8. Effective Year: **2015** 9. Rotating Topic: **No**

10. Amount of Credit: **3** 11. If variable, # min. and # max. credits per semester.

12. Repeatable Credit: **No** 13. If yes, # total repeatable credit allowed.

14. S/U Only: **No** 15. Contact Type: **Regularly Scheduled [base hr]**

16. Degree Type: **Baccalaureate** 17. If other, specify: **Click here to enter text.**

18. Weekly Contact Hours: **3** 19. Category of Instruction: **Advanced**

20. Delivery Method(s): **On-campus** ☒ **Off-campus** ☐ **Online** ☐

21. Course Description (50 words maximum)

As energy is becoming more precious, it is crucial for building sector to proactively design and operate high performance buildings. To achieve higher standards in building design and operation, a solid foundation of energy engineering and sustainability principles is essential.

22. Prerequisites

Junior or Senior Standing

23. Co-requisites

None

24. Rationale and Placement in Curriculum

This course builds essential knowledge of building energy and sustainability, and provides necessary background to use building energy simulation software tools. The goal of this course is to use building performance modeling as an investigative tool to improve overall energy efficiency of the building. Beside training students with state of the art building energy modeling software, students will gain immense knowledge related to building energy efficiency. This course will be offered as an elective for Junior/Senior students.

25. Course Objectives

To recognize various building energy simulation tools, types and capabilities.
To learn underlying concepts, modeling inputs and analysis methods of building components such as envelope, lighting, occupants, equipment, process loads, HVAC and service hot water systems.
To model building performance using energy simulation software.
To interpret simulation results and troubleshoot errors.
To use measured building energy data to calibrate simulation model.
To evaluate EEMs and perform parametric analysis to identify optimal solutions.

26. Course Textbook(s) and/or Other Assigned Reading

There are no text books for this course. However, the instructor will provide electronic copies of technical articles including course related conference proceedings and journal manuscripts; book chapters; and handouts. These can be accessed in the Resources folder of the e-learning website for the course -- they are organized by modules. The course also uses video recordings of software

simulation.

Assigned readings and video viewings must be completed prior to class. For some sessions, students must post comments regarding these readings prior to class using the website's Discussion board. You will also be notified when you must complete a short quiz on the reading material before class session.

eQUEST v3.64 building energy modeling software will be used in the course. Download instructions available here: http://doe2.com/equest/

27. Weekly Schedule of Topics

Aug 26
Energy Crisis, Codes & Milestones
•Global trends, "Peak Oil 2020," building energy use & challenges
•History & definitions of energy standards, codes and protocols
•Energy policies EPCA & EPAct

Need for Building Energy Evaluation
•Importance of energy evaluation
•Terminology & metrics
•Approach to new & existing buildings

Weather & Climate Characteristics
•Terminology
•Earth: orbit, rotation, sun's radiation
•Climate zone characteristics

Building Energy Analysis (BEA)
•Introduction to Building Energy Analysis
•BEA as a tool for decision-making
•BEA as a process-oriented approach

Sept 2
Building Energy Analysis Tools, Types & Capabilities
•System sizing tools & system performance evaluation tools
•Macroscopic & Microscopic analysis tools
•Calculation methodologies
•BES tools availability & capability
•BES tools approved by US Dept. of Energy
•Emerging Technologies: BIM, gbXML, Predictive Model Controls, Component- based Modeling

Building Energy Standards, Protocols & Rating Systems
•ASHRAE Building Energy Quotient Program
•ASHRAE Fundamentals 2009
•ANSI/ASHRAE/IESNA 90.1-2010; 100-2006
•ANSI/ASHRAE 62.1-2010; 55.1-2004
•ANSI/ASHRAE/USGBC/IES Standard 189.1-2009
•State Energy Codes
•Greenhouse Gas Emission & Carbon Neutrality
•CIBSE Applications Manual 10
•ENERGYSTAR Portfolio Manager
•COMNET Modeling Guidelines
•International Performance Measurement & Verification Protocol
•IRS Tax Deduction
•Net Zero Energy Buildings

•Building Rating Systems (LEED, BREEAM, GGP, GREENSTAR, GREEMARK)

Sept 9
Quiz #1 (will cover Aug 26 and Sept 2 lectures; time allotted: 30 mins)

The following topics will be covered in-depth under each section (related to eQUEST energy modeling software):
•Building Envelope
•Operating Schedules
•Lighting & Daylighting Integration
•Occupants, Equipment & Process
•HVAC Systems & Controls
•Domestic Hot Water Systems

Sept 16
Thermal zoning criteria, schedules, and assumptions

Sept 23
Building Envelope: construction (roof, walls, slab-on-grade, windows, skylights)

Sept 30
Internal Loads: occupants, lighting / daylighting, infiltration, misc. electrical loads.

Oct 7
Mid-term Exam (will cover all prior lectures, and will include software simulation)

Oct 14
HVAC: system and plant specification inputs

Oct 21
Results interpretation and validation, calibration with existing measured data; and Energy Efficiency Measures (EEMs)

Oct 28
Quiz #2 (will cover Oct 14 and Oct 21 lectures; time allotted: 30 minutes)

The following topics will be covered in-depth:
•Troubleshooting errors
•Analyzing and proposing additional EEMs
•Complying with ASHRAE 90.1 Appendix G requirements

Nov 4
Students work on final project in class

Nov 11
Holiday

Nov 18
Students work on final project in class

Nov 25
Holiday

Dec 2
Students work on final project in class

Dec 4
Final Exam (comprehensive exam and will include software simulation)

Dec 9
Final project: project report due date and project presentation by students

28. Grading Scheme

Type of Assessment, Activity or Other Assignment	Percent of Grade
QUIZZES, EXAMS, PROJECT AND GRADING POLICY There will be two quizzes (5 points each); a mid-term exam (20 points); a final exam (30 points); and a final project (40 points). Quizzes and exams will be held in class, while the project will be submitted electronically to the instructor via the course website. The final project is considered late if it arrives a minute past the due date. Final submissions after the stated deadline will be deducted 10% for every day late. Policy for assigning grade points to letter grades will follow UF grading policies, which can be found at: catalog.ufl.edu/ugrad/current/regulations/info/grades. Letter Grade — Numeric Grade A — 93-100 A- — 90-92 B+ — 87-89 B — 83-86 B- — 80-82 C+ — 77-79 C — 73-76 C- — 70-72 D+ — 67-69 D — 63-66 D- — 60-62 E — 0-59	EEMs & Results: 80%; Innovation: 10%; Presentation: 10%).

29. Instructor(s)

Ravi S. Srinivasan, Ph.D., CEM