

Buildings and Energy: Design and Operation vs. sustainability



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A graduate/undergraduate multidisciplinary course,
developed with support from FESC

Motivation



- ❖ The need to address energy efficiency from all angles, i.e. design, construction, and operation
- ❖ Bridging the gap between different disciplines involved (architecture, energy modeling, HVAC design, control, IT)
- ❖ Create a learning environment to students working professionals for dissemination
- ❖ Create an opportunity for interdisciplinary research via knowledge cultivated through integration of input from parties involved

Specific course goals:

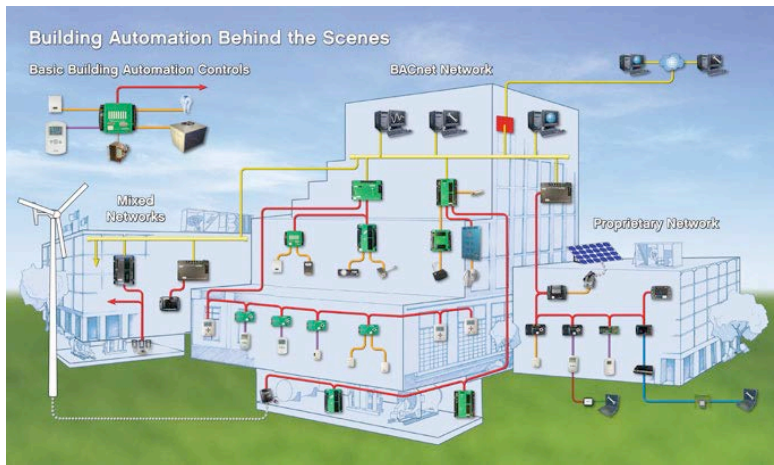
- ❖ Cover fundamentals while emphasizing both *design* and *operational* issues in achieving energy efficiency
- ❖ Existing courses in the building sector: architecture, construction, energy analysis, HVAC design, etc., but they lack an integrated approach, and lack focus on Florida-specific climate

Course Themes



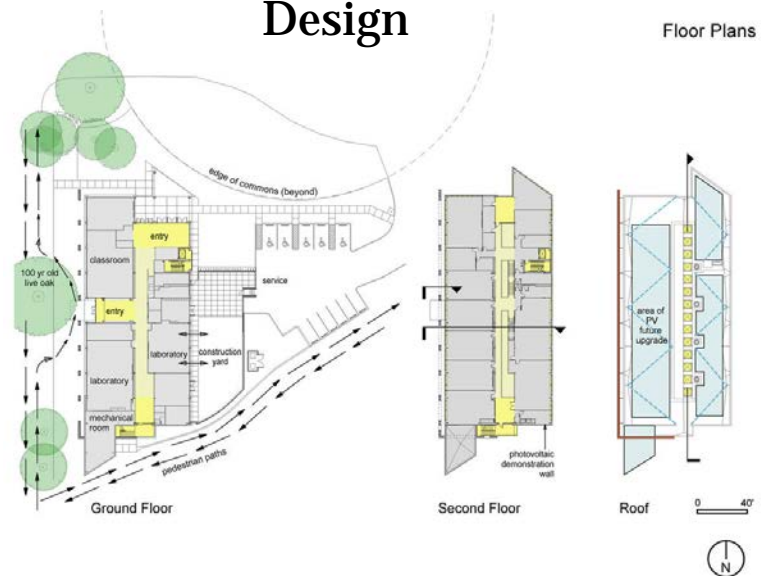
Socio-economic factors driving design/construction/operation, relevant technologies and their outlook, Assessment, Impact of Smart Grid Technologies and renewable energy systems

Operation



Building Control and IT
(courtesy kmcccontrols)

Design



Rinker Hall, UF

Course Overview



- ❖ First offered in Fall 2014 through UF EDGE (Electronic Delivery of Gator Engineering), both graduate and undergraduate sections.

Design:

- ❖ Energy Codes, Standards & Protocols
- ❖ HVAC fundamentals, Load Calculations & Equipment Sizing,
- ❖ Renewable energy systems: solar, geothermal etc.
- ❖ Energy Modeling

Operation:

- ❖ Existing climate control systems
- ❖ Advances sensors and controls
- ❖ Smart Buildings for a Smart Grid

Assessment:

- ❖ Rating systems,
- ❖ Measurement and Verification,
- ❖ Investment analysis

Summary



1. Good reception by students: instructor overall scores from 4.0-4.7 (out of 5)
“Very industry-relevant, interesting and fun course”, “Sometimes there were too many important tables, charts, guidelines to reference or remember...”
2. Springboard for research collaboration
 - a) **Publications**
 1. Duzgun Agdas, Ravi S. Srinivasan, Kevin Frost, and Forrest J. Masters, “Energy Use Assessment of Educational Buildings: Toward a Campus-Wide Sustainable Energy Policy.” *Sustainable Cities and Society* 17 (September 2015): 15–21. doi:10.1016/j.scs.2015.03.001.
 2. Duzgun Agdas and Ravi S. Srinivasan. "Building energy simulation and parallel computing: opportunities and challenges". *Proceedings of the Winter Simulation Conference 2014 (WSC 2014)*, Savannah, GA, USA
 - b) **International research collaboration:** *Assessing scalability of a wireless sensor based advanced HVAC controls platform*, collaborative research between University of Florida and Queensland University of Technology