Course Syllabus Fall 2017

Energy Analysis for Energy Efficiency

SUMA PS5135

Professor Luke Falk

Instructor Information:

Luke Falk

Teaching Assistant:

Jordan Burke

Comments:

Each week students are assigned a set of readings to be completed prior to each lecture. These readings are intended to illuminate the material covered during lectures, and to serve as reference material for assignments. Some of the readings will be highly technical.

Course Objectives:

Responsible resource management represents the cornerstone of any sustainability initiative. Because the generation, distribution, and use of energy has a profound, continuous, and global impact on natural resources energy issues tend to be the fulcrum upon which sustainability programs hinge. Energy use has a direct impact on organizations' cash flow, a reality which endows energy efficiency improvements and renewable energy installations with the potential to deliver quantifiable financial savings. The ability to identify and articulate financial and environmental benefit associated with clean energy projects is a required skill for sustainability managers.

This physical dimensions / analytics-track course will provide real-world information on energy management issues from a practitioner's perspective with a focus on quantitative analysis. Through lectures, problem sets, and readings students will learn how manage energy audits, analyze building energy performance, and evaluate the energy use and financial impacts of potential design enhancements and operations improvements to building systems.

Although the class will focus on understanding energy issues from a building owner’s perspective discussions will also include the perspective of utility companies, energy generators, and policy makers.

Best practice in energy management and energy efficient design will always involve some level of complex engineering to survey existing conditions and predict energy savings from various improvement options. Sustainability managers need to understand how to manage, quality-control, and present these analyses to stakeholders. This course seeks to empower students to do that by providing a foundational understanding of building systems, building science, and methods for quantitatively analyzing the potential benefit of various energy improvements.

This class requires an understanding of Microsoft Excel and an enthusiasm for quantitative analysis. Although there are no prerequisites for the class, an ability to do basic arithmetic is required.

If you are not interested in dealing with technical information, this class is not for you.

Class content

Week 01 09/06: The Argument for Efficiency
Week 02 09/13: Introduction to Energy Audits and Thermodynamic Modeling
Week 03 09/20: Metrics and Benchmarking
Week 04 09/27: Building Envelope and Thermal Performance
Week 05 10/04: Air Sealing Diagnostics (guest lecturer)
Week 06 10/11: Ventilation
Week 07 10/18: Heating
Week 08 10/25: Commercial Air Conditioning
Week 09 11/01: Electricity Rate Analysis
Week 10 11/08: Lighting
Week 11 11/15: Financial Analysis for Energy Projects
Week 12 11/22: NO CLASS - THANKSGIVING
Week 13 11/29: Domestic Hot Water and Cogeneration
Week 14 12/06: Passive House
Week 15 12/13: New York City and State Energy Policy – 80x50 and more
Week 16 12/20: Final Exam Due

Assignments:

Problem Sets

1. Dimensional Analysis	posted 09/06,	due 09/13
2. Heating Index	posted 09/20,	due 09/27
3. Heat Loss Calculation	posted 09/27,	due 10/02
4. VFD Savings	posted 10/25,	due 11/01
5. Lighting Retofit	posted 11/08,	due 11/15
6. Economic Analysis	posted 11/29,	due 12/06

Problems sets will be assessed both on:

1. The ability of each student to follow the analysis method at issue as presented in the lectures (partial credit will be assessed for partial success) and;
2. The ability of each student to derive the answer to the problem based on the information provided.

Credit for Methodology: 50%, Credit for Answer: 50%

Please post all questions on Problem Sets to the Courseworks Discussion Board under the appropriate topic area. Questions should be submitted by 10pm on the Monday evening before the assignment is due. Please do the assignments in Excel, as if you make errors we can see your work and give you partial credit wherever possible.

Midterm
Format TBD. This assignment will be handed out 10/11 at 8:00pm and will due 10/18 at 6:00pm.

Final Exam

Format TBD. The exam will be posted on 12/06 at 8:00pm and will be due on 12/18 6:00pm. Please note that any questions should be posted to Courseworks by 12/15 at 5:00pm.

Method of Evaluation (Grading)

Weighting of Assignments:

1. Midterm: 15%
2. Problem Sets: 55%
3. Final Exam: 25%
4. Class Participation: 5%

Any problem set assignment submitted late will be given an F (50 points). Problem sets late by more than one week will receive a zero. Midterm and final exams submitted late will receive a letter grade deduction (10 points off) for each day they are late. Final exams not submitted by 12/20 will be given a zero.