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 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 Retrofit              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.