

Department, Number, Title of course, Semester, Meeting Time

IENG 433 Energy Efficiency and Sustainability, 3 credit course
CRN 87838, Section 001, ESB G84, 6:00 PM to 8:45 PM

Type of course: Technical Elective

Course Description: Principles of energy efficiency for large industrial and large commercial building systems. Determination of energy usage, use of energy analysis and diagnostic equipment, and the development of energy efficiency measures including the economics related to implementation. Review of energy generation, renewable energy, smart grid, energy management, ASHRAE standards, and LEED. Sustainability aspects of energy efficiency.

Prerequisites: Senior or graduate standing in Statler CEMR

Co-requisites by topics: None

Text Book Guide to Energy Management, Capehart, B.L., Turner, W.C., Kennedy W.J., 8th Edition, Association of Energy Engineers, The Fairmont Press Inc, 2016.

Instructor Bhaskaran Gopalakrishnan, PhD, PE, CEM, CPEnMS, LEED Green Associate
Professor and Director of the Industrial Assessment Center
Dept. IMSE, Statler CEMR, Room 351 ESB
Email: bgopalak@mail.wvu.edu, Phone: 304 293 9434

Topics

- Introduction to energy management and sustainability
- The energy assessment (audit) process
- Energy billing
- Economic analysis
- Lighting
- Heating, ventilation, air conditioning
- Boilers and Steam systems and Insulation
- Process heat systems
- Electrical distribution systems
- Motors
- Compressed air systems
- Control systems and computers
- Building energy efficiency
- Maintenance aspects
- Distributed generation and smart grid
- Renewable energy systems
- ASHRAE standards and LEED

Expected Learning Outcomes

1. The students will demonstrate an understanding of the principles of energy efficiency and energy management as applied to large industrial and large commercial building systems.
2. The students will determine energy usage and develop energy efficiency measures and calculations for energy savings, cost savings, implementation cost, carbon footprint and payback on investment.
3. The students will demonstrate an understanding of important topics such as renewable energy, smart grid, and LEED.

Contribution of course to meeting the professional component

Engineering topics: 100%.

Grading

90-100 (A), 80-89 (B), 70-79 (C), 60-69 (D), less than 60 (F)

Exam, 30%, October 15th, 2019

Projects/Assignments/Homework – 20% (Late submissions will not be accepted. Work should be submitted at the beginning of the class period)

Quizzes (can be given during any class period at any time) – 15%

Final exam, December 10th, 2019 – 35%

Student behavior:

Students are expected to be attentive in class and not be disruptive when the instructor is teaching. This means no talking, laughing, or other similar disruptive behavior during the class period when the lecture is ongoing. Disruptive students will be warned and then if the behavior continues this will result in the student being removed from the class and referred to the Office of the Department Chair and/or Associate Dean for Academic Affairs.

Statement on Attendance:

Student attendance is mandatory unless excused by the instructor. The basis for an excused absence will follow University and IMSE policy. Students who are absent from class for any reason are responsible for all missed work. Students who miss taking a quiz or an exam will not be allowed to make it up, and will receive a score of zero, **except** in the case of a **legitimate** emergency that is well documented and presented to the instructor for approval, within one working day from the day of the missed quiz or exam. The instructor will review the student's excuse and decide if the student will be allowed to take the quiz or exam along with the final exam or will receive a zero on the quiz or exam. If a student does not take a quiz due an instructor approved legitimate reason then the missed quiz or quizzes will be added to the student's final exam noting that the added quizz(es) will not be the same as the original quiz(es) in format and/or level of difficulty. Students who miss taking the first exam due to an instructor approved legitimate emergency related reason will have the exam added to the final exam. Students who miss the final exam due to an instructor approved legitimate emergency related reason will receive an incomplete grade.

Inclusivity Statement:

The West Virginia University community is committed to creating and fostering a positive learning and working environment based on open communication, mutual respect, and inclusion. If you are a person with a disability and anticipate needing any type of accommodation in order to participate in your classes, please advise your instructors and make appropriate arrangements with [the Office of Accessibility Services](https://accessibilityservices.wvu.edu/). (<https://accessibilityservices.wvu.edu/>)

More information is available at the [Division of Diversity, Equity, and Inclusion](https://diversity.wvu.edu/) (<https://diversity.wvu.edu/>) as well. It is the responsibility of the student requiring the accommodation approved by the Office of Accessibility Services to contact me to initiate the plan for accommodations.

Other academic policies that will be adhered to will be in accordance with information on <https://tcommons.wvu.edu/syllabus-policies-and-statements#15>

Prepared By: Bhaskaran Gopalakrishnan, IMSE, Statler CEMR, Date: 08/27/19