



Engineering & Technology Department
Fall River, Massachusetts

Course Number, CRN & Title: EGR183 – 44H Energy Efficiency and Conservation Measures

Instructor: J. P. da Silva, NCARB, LEED AP, Ph.D. Candidate
Phone #: (508) 678-2811 ext.: 3688
Email: Use Course email @
<http://bristolcc.angellearning.com/default.asp>
Emergency Email: joseph.dasilva@bristolcc.edu


Required Texts: **Guide to Energy Management, 2012**
Douglas Harris, Spon Press
ISBN#: 978-0415566490

Optional - Reference Texts: Guide to Energy Management, Sixth Edition
(Seventh Edition available) 2008; Barney L Capehart,
Wayne Turner, William J Kennedy, Fairmont Press
ISBN 0-88173-605-8

Energy and the New Reality: Energy Efficiency and the Demand for
Energy Services, 2010; L.D. Danny Harvey, Earthscan
ISBN: #978-1-8497-072-5

Sustainable Energy Without the Hot Air, David JC MacKay, 2008, UIT
Free on-line book at the following web site:
<http://www.withouthotair.com/about.html>
ISBN#: 978-0-9544529-3-3 (paperback)

Greening Your Home, Sustainable Options for Every System in Your House,
2008; Clayton Bennett, McGraw-Hill Companies
ISBN 978-0-07-149909-5

Class Times & Locations: Lecture: Wednesdays 4:00-6:40pm,
Room B222
Date Range: 3/26 -5/14
Lab : <http://bristolcc.angellearning.com/default.asp>

I. Course Description & Rationale:

Description:

This course is designed to give students the skills to identify and understand energy efficiency and conservation methods used to reduce energy consumption in the built environment. Students will analyze residential and commercial facilities for opportunities to employ these energy saving measures. Students will become familiar with the use of energy monitoring and measuring equipment used for energy auditing. Students will also learn to calculate energy savings and determine environmental impacts of these energy saving methods.

Rationale:

Energy is becoming increasingly more important in the economic development of our societies. The combination of limited fossil and nuclear fuel supply together with concerns on pollution and global climate change has put the conservation of energy to the forefront of future human endeavor. It has long been recognized that human activities are the cause of many global problems, such as air and water pollution, climate change, fuel shortage, etc., that we face today, and if unchecked, can bring disastrous outcomes to our spaceship earth and all its life form inhabitants. In addition, the limited fossil fuel resources and its impact on economy and national security point to an urgent need to develop energy efficiency and conservation measures.

Sustainability, i.e., the ability to achieve economic prosperity while protecting the natural systems of the planet, and providing a higher quality of life for its people, is a crucial issue for all nations now and for the foreseeable future. As the recent energy shortage and energy price increase indicate, energy efficiency and conservation measures will be at the forefront of the effort to develop a sustainable economy.

Engineers of the future will have to grapple with this energy problem for a long time to come, whether they want to or not, and it is important that the universities prepare them for this task, and this course is offered for this exact purpose.

II. Course Requirements:

The Student is required to review weekly assignments and lecture notes, and complete assigned reading, laboratory presentations and homework problems. Two hours of out of class study per class/laboratory hour should allow students to be adequately prepared for class and complete these requirements. Homework and Laboratory Presentations will follow a prescribed format and should be neat and organized. The following grading breakdown will be used:

Assignments:

Sustainable Design Report:	20%
Exterior Envelope Report	15%
Technology/Topic Presentations:	5%
Attendance/Participation:	15%
On-line Resource:	15%
Final Exam Energy Audit Report	25%
Self-Assessment	5%
Extra Credit	TBD

III. Course Objectives / Outcomes:

1. Provide students with the understanding of basic areas of energy efficiency and conservation methods.
2. Instruct students in the proper usage of the equipment necessary to gather energy efficiency data.
3. Instruct students in the analysis of energy bills.
4. To provide students with information on the energy conservation measures pertaining to HVAC systems, building equipment, building envelope, sustainable building design and electrical systems.
5. To emphasize the math and science principles used to design, develop, test, and supervise production/construction energy efficiency and conservation methods.
6. Introduce students to the various types of energy suppliers and methods of fuel acquisition.
7. Develop the ability of students to prioritize energy conservation methods
8. To introduce students to basic engineering principles and physical laws that they will use in their education and/or profession.
9. To emphasize the importance of team work, oral, graphic and written communication in green technology fields.
10. Upon successful completion of this course, the student shall be able to:
 - Explain energy efficiency/conservation methods available for energy use reduction in residential and commercial settings.
 - Demonstrate energy savings and environmental impacts for most energy efficiency methods in order to identify and assess energy conservation opportunities.
 - Demonstrate the appropriate usage of energy monitoring and measuring equipment commonly used by energy specialists and energy auditors.

IV. Teaching Methodology:

The following approaches will be used in teaching this course: lecture, discussion, interactive computing, and open question and answer. Visual aids will be used whenever possible to reinforce key concepts. Student learning will be assessed with in-class exams, projects, presentations, reports and class participation. In class discussion will be encouraged, students are expected to read materials before class and be prepared for class discussions. Students will be responsible for written assignments, individual and group projects, oral presentations, assignments, and exams. Participation in class and in the performance of the laboratory experiments is required and will be reflected in the final grade.

V. Attendance Policy:

In accordance with the attendance policy of the college, attendance is mandatory and will be taken at each class. Students should arrive for class on time (All late arrivals will require an explanation!) and in a prepared manner (this includes the text). While in class, students should be courteous to the instructor and their fellow students (No Cell Phones/Pagers). If an absence is unavoidable it should be discussed with the professor prior to the class and an alternate assignment will be determined. Any excessive or unexplained absences in excess of six hours may result in withdrawal or failure of this course.

All assignments are due on the day collected regardless of attendance. Assignments will be penalized 10% per school day late. Assignments will not be accepted more than one week late.

VI. Academic Misconduct:

You (the student) are expected to practice academic honesty in every aspect of this course, and all other courses. Make sure you are familiar with the policies of the State of Massachusetts and this College; See the Student Code of Conduct (in the Student Handbook), BCC's Academic Integrity Policy (<http://www.bristolcc.edu/Academics/integrity/index.cfm>) and Student Academic Rights & Responsibilities (in the Academic Catalog). Students who engage in academic misconduct are subject to school disciplinary procedures.

VII. Disability Accommodations:

Bristol Community College complies with federal legislation for individuals with disabilities (Section 504 of the Rehabilitation Act of 1973 and the Americans With Disabilities Act of 1990) and offers reasonable accommodations to qualified students with disabilities. It is your responsibility to notify me and the Office of Disability Services of your need for classroom accommodations. Accommodations are arranged through the Office of Disability Services/ODS, which will issue a confidential Disability Services Accommodation Form. This should be accomplished, when possible, during the first two weeks of class. If you have questions about the process, please contact ODS by calling (508) 678-2811 x2955 or stopping by B104. You may also contact ODS online at http://www.bristol.mass.edu/Students/ods/request_forms/ods_contact_us.cfm

VIII. Course Outline:

The schedule is subject to change with fair notice and the notice will be made available.

1. Basic areas for energy efficiency and conservation measures
 - i. Low cost/no cost energy conservation methods (ECM)
 - ii. Weatherization ECMs
 - iii. Replacement vs. Retrofits of equipment
2. Data Acquisition, Monitoring, Auditing, and system balancing equipment for energy analysis, including data loggers, universal data recorder, flue gas analyzer, thermometer, utility meters, combustion analyzers, infrared thermography, airflow velocity meters, relative humidity measures, electrical meters, refrigeration measures, light meters, and sling psychrometer.
3. Energy Bill Analysis, including power factor correction, peak demand limiting, rate structure and comparison to alternative rate opportunities, including green power.
4. HVAC Energy Conservation Measures (ECMs)
5. Other Building Equipment ECMs (Kitchen, laundry, office equipment)
6. Building Envelope ECMs
7. Review renewable energy assessments and analysis (green power), green building, sustainable design.
8. Electrical ECMs – Lighting systems review, pumps, fans, motors review, including efficiencies, belt drives, variable speed/frequency drives, load factors, fan laws and pump curves.
9. Energy Suppliers and fuel Acquisition
10. Prioritization of ECMs based on Cost Effectiveness and environmental impacts.
11. Case studies: Analyses and prioritization of ECMs for a given facility.

Why a Hybrid Online class format?

One advantage of the hybrid online format is the ability to include a lot of graphic images -- over a thousand in all -- plus video clips. Hopefully they will make the subject more interesting and the material easier to understand. And you won't have to pass them on to someone sitting next to you or strain to see them on a screen at the front of a room -- they'll be right in front of you, to spend time studying, to keep, print, or whatever you choose.

Students learn best in quite different ways. One of the advantages of the online format of the course is that it allows students to approach the course in ways that suit their personal styles and preferences. In classrooms, instructors are inclined to teach either as they themselves were taught, or as they think "the average student" prefers. Online, all of the instructor-presented class material is laid out at once, and students can do with it whatever they prefer in order to learn in as personal and unique a fashion as possible.

This course by design specifically accommodates different learning styles by involving a variety of components, including text, a wealth of photos and drawings, video clips, self-check quizzes, reference lists, online discussion, and a construction project. Since you are probably used to learning more or less as prescribed or required by a classroom teacher and are not used to designing your own learning strategy, it might take a little time to do that and to settle into a comfortable routine. I think you'll find that as you figure out on your own (and with the help of the online questionnaires mentioned) how to learn the material, everything will fall into place.

Confidentiality Policy

Students are asked to try to form conceptual links between the course material and their own personal experiences in class discussions because this is an excellent way to learn new material. Therefore, confidentiality must be guaranteed to all students in order to provide a safe learning environment. No student should ever repeat class discussions or allow people outside the class to access our password protected course Website or read printed versions of any student's posts. Be sure to discuss only information you wouldn't mind being made public in case anyone violates this confidentiality rule.

Plagiarism Policy

Students must cite all sources of information in posts, essays, or papers and provide references to them. Using ideas or words written or spoken by another person without providing a citation and reference for the source is plagiarism and will not be tolerated in this course.

Civility Policy

I am committed to developing and actively protecting a class environment in which respect must be shown to everyone in order to facilitate and encourage the expression, testing, understanding, and creation of a variety of ideas and opinions. Rude, sarcastic, obscene, or disrespectful posts have a negative impact on everyone's learning and will not be tolerated. Please refer to the college's **etiquette policy** for more information on acceptable behavior and interaction in the online course environment.

Technical Help

If you have any technical problems or questions about eLearningBCC please visit the BCC Wiki: <http://dl.bristol.mass.edu/wiki>. If you require additional assistance or have other questions please contact the distance learning help desk by calling (508) 678-2811 x3333 or send an email to distancelearning@bristol.mass.edu.

As a hybrid on line class, this will be a non-traditional classroom experience and students should be prepared to spend a minimum of 5 hours a week on reading and on course assignments. While you may feel that a great deal of content is delivered on a weekly basis remember that in a traditional weekly course you would be coming to class for 3 hours and then spending an additional 3 hours (at least) outside of class on assignments and reading. In this hybrid online course format it is expected that you will be spending those out of class time on your own working on the concepts that you would usually get in a live lecture. Please be sure to budget your time accordingly!

Discussion Boards

I highly encourage students to read and respond to postings from their classmates. Part of the nature of this class is for students to help each other troubleshoot problems and develop critical-thinking skills and working through questions on the forum is an excellent method to develop proficiency in these areas.

Discussion board postings are an integral part of the course. As the attendance policy states, you must post your own responses weekly to the discussion board and must read and respond to at least one other student's posting. Responses must be more than "I agree." They should be substantive and should reference reading assignments, web references, lecture notes or outside resources.

IX Course Outline:

The schedule is subject to change with fair notice and the notice will be made available.

Class	Date	Topics	On-line Lesson	Readings/Assignments
1	3/26	<ul style="list-style-type: none"> • Introductions • Energy & Codes • Sustainable Design Philosophy 	Class 1: Planning, Design, and Construction	Read Harris, Chapter 1 Background Read Harris, Chapter 2 Aspects of building energy use Read Harris, Chapter 6 Organization and implementation
2	4/2	Renewable Energy, Solar Energy	Class 2: Renewable Energy	Read Renewable Energy (Ch13) Handout/PDF On line lesson Renewable Energy Sources
3	4/9	<ul style="list-style-type: none"> • Sustainable Design Philosophy Green Buildings Integrative Design Passive Buildings Net Zero Approach Living Building Challenge 	Class 3: MA State Energy Codes	<u>Green Buildings & Integrative Design</u> Sustainable Design Protocols: LEED & CHPS Net Zero Building Research & Outline Living Building Challenge Research & Outline
4	4/16	<ul style="list-style-type: none"> • Building Envelope & Insulation **No in person Meeting	Class 4: Solarium and Greenhouse Technology	Read Chapter 11 Handout/PDF Energy Leakage Inspection Residential Air Sealing Energy Audit Assignment- in lieu of in person class meeting
5	4/23	<ul style="list-style-type: none"> • Lighting **No in person Meeting Wednesday Schedule	Class 5: Efficiency Lighting and Daylighting	Lighting Lesson 1 Lighting Lesson 2 Lighting Lesson 3
6	4/30	<ul style="list-style-type: none"> • Energy Audit Equipment • Energy Monitoring Laboratory-Site/Building Walk-thru	Class 6: Air Conditioning and Refrigerants	Read Monitoring Equipment Handout (ch 2)
7	5/7	<ul style="list-style-type: none"> • HVAC /Audit • Life Cycle Costing & Energy Bills 	Class 7: Audit	Lesson 1 HVAC Fundamentals Lesson, 2 HVAC Management & Tools On-Line Lesson,3 HVAC System Control Read Harris, Chapter 3 Energy Audits
8	5/14	<ul style="list-style-type: none"> • Final Project/Exam 		

This Syllabus is provided for informational purposes regarding the anticipated course content and schedule of this course. It is based upon the most recent information available on the date of its issuance and is as accurate and complete as possible. The instructor reserves the right to make any changes deem necessary and/or appropriate. The instructor will make the best efforts to communicate any changes in the syllabus in a timely manner. Students are responsible for being aware of these changes.