ENG M 508 Section X6
Energy Auditing and Management

Lecture Outline

Location: NRE2 – 090

Time: Thursdays, 5.00 PM – 8.00 PM

Instructor: Dr. Amit Kumar
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Overall Course Objectives

This graduate course is aimed at teaching students about energy management, energy audit methods and their implementation. This course focuses on an interdisciplinary approach of energy management. The course is designed in such a way that it is expected to help students to contribute better in their employment in the energy sector and especially in the energy intensive industries. This course will expose students with practical examples of energy saving opportunities in energy intensive systems such as steam generation and distribution systems, electrical systems, building, process equipment etc. This course will cover the financial implications of energy savings for a company. Various case studies will be included to give real life examples. The need for preparing professionals in the area of energy management and auditing is enormous and this course is aimed at filling this gap.

General Comments

- This course will involve lectures. Lectures will cover topics and discussion on various areas listed in Table 1.

- Assignments and project are an important component of this course. This is not a subject that can be mastered only by reading a book or a paper, assignments and project are a key part of the learning experience.

- Students may e mail the professor with questions (the replies to which will usually be sent to all class participants).

- Because assignments and other important information are discussed by e-mail, e-mails will be sent to your U of A e-mail address.

- All notes and overheads for the course are subject to copyright; to reproduce these for distribution other than for your own personal use in the course is prohibited unless specific permission is granted.

- The University of Alberta is committed to the highest standards of academic integrity and honesty. Students are expected to be familiar with these standards regarding academic honesty and to uphold the policies of the University in this respect. Students are particularly urged to familiarize themselves with the provisions of the Code of Student Behaviour (online at: www.ualberta.ca/secretariat/appeals.htm) and avoid any behaviour which could potentially result in suspicions of cheating, plagiarism, misrepresentation of facts and/or participation in an offence. Academic dishonesty is a serious offence and can result in suspension or expulsion from the University. Policy about course outlines can be found in §23.4(2) of the University Calendar.

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Text

- There is no textbook for this course. Journal articles, related reports, case studies and handouts will be given in class by the instructor.

- Reference text books:
  - Kreith F and Goswami DG. Energy management and conservation handbook. CRC Press, Taylor and Francis Group, Boca Raton, London, New York, USA, ISBN-13: 978-1-4200-4429-4, 2008.
  - Capehart BL, Turner WC, Kennedy WJ. Guide to energy management - 5th Edition. The Fairmont Press Inc., 700 Indian Trail, Lilburn, GA 30047, USA, ISBN: 0-88173-477-2, 2006.
  - Thumann A and Younger WJ. Handbook of energy management – sixth edition. The Fairmont Press Inc., 700 Indian Trail, Lilburn, GA 30047, USA, ISBN: 0-88173-416-0, 2003.
  - Turner CW and Doty S. Energy management handbook (sixth edition). The Fairmont Press Inc, 700 Indian Trail, Lilburn, GA 30047, USA, ISBN: 0-88173-542-6, 2007.

- Additional reading material will be given during the course.

Comments and Guidelines for Assignments and Projects

There will be **three assignments** and **one group project** in this course. Assignment submission guidelines are given below.

Assignments	***Guidelines***
Assignments 1 & 3	• Based on assigned problems. • Additional guidelines will be given with the assignments, if required. • Please see **Table 1 for due dates**.
Assignment 2	• Report must **not** be more than **5 pages of text.** Follow guidelines given in ***General Report Format*** for preparing the report. • Additional guidelines will be given with the assignment, if required. • Report is **due on March 17, 2011 by 5 PM in class**. Late submission will **not** be accepted.
Group project	• The project will be done by students in groups. • Group should be formed by **January 27, 2011**. *Project Proposal Report* • Proposal report must **not** be more than **3 pages of text**. Follow guidelines given in ***General Report Format*** for preparing the report. • It should provide information regarding: (1) problem to be investigated and objectives (2) System description (3) timelines (4) list of researched/identified resources whether used to date or planned to be used, (5) challenges, if any. • Additional guidelines will be given with the assignment, if required.

Assignments	***Guidelines***
	• Project Proposal is **due on Feb. 3, 2011 by 5 PM in class**. Late submission will **not** be accepted. *Final Report* • Final report must **not** be more than **25 pages of text**. Follow guidelines given in ***General Report Format*** for preparing the report. • Final report marking scheme: 1. Organization and Presentation o Figures, tables, labels, legends, *references*, title page, coherence (12%) 2. Technical Content (a) Summary (complete, independent, concise) (12%) (b) Introduction (8%) - brief statement of motivation/purpose/objectives/scope (c) Findings (20%) - summary of findings with brief explanation (tables, graphs, - calculations/statistics (clear, complete, neat, explained) (d) Discussion (36%) - logical subsections - interpretations of findings and not simply stated - figures/tables referenced and explained - thoroughness in researched references and references' quality (e) Conclusions (12%) - reiteration of objectives - major conclusions/findings qualified • Additional guidelines will be given with the project, if required. • Report is **due on April 11, 2011 by 4 PM to the instructor**. Late submission will **not** be accepted. ***Group Project Presentations – March 31, 2011*** • The presentation will be evaluated based on its content (accuracy, quality of material and references used, thoroughness, ANALYSIS etc.), the delivery, and the ability of the presenter (or group) to engage the audience. • The mark is assigned by the instructor in consultation with the opinion of other students filling the feedback form. • Presenting *in point form* the issues or questions to be discussed (Power point). • Presenting main findings and analysis from researched sources (Power point).

Assignments	***Guidelines***
	○ The presentation should be as interactive as possible. ○ The presentation should be aimed for about 20 min. (i.e. have about 20 slides). 5 minutes should be left for questions/comments. • After the presentation the group should incorporate the discussions/comments in the class along with their findings/analysis in the final report. • A copy of the presentation should be submitted to the instructor for evaluation.

General Report Format Guidelines

- Page limit should be strictly followed otherwise it will result in deduction of marks. Page limit for each assignment is given in table above.
- This exclude title page, table of contents, list of figures, list of tables, figures, tables and references. *Exceeding the page limit will result in marks deduction.*
- Line spacing – 1.5; font – 11; Arial.
- A hard copy of the report should be submitted along with electronic submission through e-mail.
- In evaluating the reports special emphasis will be given on English Language.
- References should be in standard format given below.
    - References should be indicated by number(s) in square brackets in line with the text. You can refer to the authors by name but it should always be followed by number(s).
    - References should be numbered in the order in which they appear in the text.
    - Examples:

[1]. John AB, Wilson BC, Smith CD. The method of referencing. Journal of Energy 2006; 100(1):51-61.

[2]. Bird DE, Kumar EF. The concept of energy planning. 7th ed. Edmonton, Alberta, Canada: Pearson; 2006.

Reference of a chapter in an edited book:

[3]. Pollock G, Smith G, Stern D. How to learn LEAP. In: Donald A, Prince DE, editors. Details of forecasting models, Edmonton, Alberta: Model Publishing Inc; 2006, p. 100-120.

Reference of a website:

[4]. Dravid R, John AB, Lawson BC. The art of modeling. Available from: http://www.modeling.ca (accessed on Jan.1, 2006).

Reference of a paper in a conference proceeding:

[5]. Humphrey DG, Chu J. Optimization of a corn processing simulation model. Proceedings of the Winter Simulation Conference, December 13-16, 1992, Arlington, Virginia, USA. Swain JW, Goldman D, Wilson JR, Crane RC, *eds.*, ISBN:0-7803-0798-4, ACM Press, New York, USA, pp.1349-1355.

Comments and Guidelines for Midterms

This course includes **two in-class midterms.** The midterm exams will be closed book. There is no final exam in this course. See Table 1 (below) for the schedule of the in-class midterms.

Marking Scheme

Items	***Weighting***
Assignment 1	5%
Assignment 2	5%
Assignment 3	5%
Group project • Project proposal report • Final project report • Group presentation	 5% 25% 10%
Midterm 1	20%
Midterm 2	20%
Class participation	5%
Total	**100%**

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Table 1 - ENG M 508 Section X6 – TENTATIVE (!) Lecture Outline

No.	Lecture Topic	Comments/Remarks
1 Jan. 13	• Course overview • Introduction to energy management	
2 Jan. 20	• Heating, Ventilating and Air-Conditioning Systems Audit	• *Guest Lecture*
3 Jan. 27	• Energy management basics • Basics for energy managers • Designing an energy management program • Starting and managing an energy management program • Energy accounting • Energy monitoring and reporting	• Project Group formation deadline
4 Feb. 3	• Energy Audit Process o The facility inspection o Tools for energy audit o Implementation of energy audit recommendations	• Project Proposal due
5 Feb. 10	• Understanding energy bills o Electric rate structures o Natural gas o Fuel oil o Coal	• Assignment 1 – Given out
6 Feb. 17	• Economic analysis of energy management options • Life cycle costing for energy management opportunities	• Assignment 2 – Given out
Feb. 24	*No Class*	• Assignment 1 due • *Reading Week*
7 Mar. 3	**Midterm Exam – 1**	• **In-Class**
8 Mar. 10	• Insulation • Understanding and Managing Boilers • Steam Distribution Systems Audit	• Assignment 3 given out
9 Mar. 17	• Renewable Energy Sources • Water Management	• Assignment 2 – due
10 Mar. 24	• Process Energy Management • Lighting Systems Audit • Course Review	• Assignment 3 due
11 Mar. 31	• Project Presentations	• Project report due on April 11 by 4 PM.
12 Apr. 7	**Midterm Exam – 2**	• **In-Class**