

**ENG M 643 Section X1
Energy Simulation and Modeling**

Lecture Outline

Location: NRE2 – 090

Time: Mondays, 6.00 PM – 9.00 PM

**Instructor: Dr. Amit Kumar
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Office Hours: Wednesdays, 1 PM – 3 PM**

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Objectives

- Expose students to energy simulation and modeling tools which will help them to contribute better in their employment in energy industry.
- Expose students to softwares useful for energy forecasting and planning.
- Expose students to decision support systems useful for energy industry.
- Expose students to databases used for estimation of emissions in the energy industry.

Overall aim of this course is to equip engineers with knowledge of several software tools useful for energy industry and its use in forecasting and assembling energy scenarios.

General Comments

- This course will involve lectures as well as computer laboratory sessions. Lectures will cover topics and discussion on selected softwares related to simulation of energy systems, energy forecasting and planning, decision support systems for energy sector and energy related databases. Laboratory sessions will be used for demonstration of these softwares and will also help students to learn on their own.
- Assignments are an integral part of this course. This is not a subject that can be mastered only by reading a book or a paper, assignments are a key part of the learning experience.
- Laboratory sessions will be conducted in *Graduate Computer Lab, 4-19* in the *Mechanical Engineering Building*.
- 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, please be sure that the professor has an up to date e-mail address for you. If you change e mail address, send your old address and your new 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.
- For computer softwares following manuals/books/guides can be used (a copy of these will be available in the laboratory):
 - Imagine That Inc. EXTEND™ v6, Professional simulation tools, User's Guide, San Jose, CA, USA, 2002. URL: <http://www.imaginethatinc.com>
 - Visual Decision Inc. Decision Lab 2000 – Executive Edition, Getting Started Guide, Montreal, QC, Canada, 1999. URL: <http://www.visualdecision.com>
 - Stockholm Environment Institute. Long-range Energy Alternatives Planning Systems Model (LEAP). User Guide 2006, Boston, MA, USA, 2006. URL: <http://www.energycommunity.org/documents/Leap2006UserGuideEnglish.pdf>
- Some reference books for simulation and modeling:
 - Leemis LM and Park SK. Discrete-event simulation: a first course. Pearson Prentice Hall, Upper Saddle River, New Jersey 07458, USA, ISBN: 0-13-142917-5, 2006.
 - Banks J, Carson JS, Nelson BL, Nicol DM. Discrete-event system simulation – fourth edition. Prentice Hall, Upper Saddle River, New Jersey 07458, USA, ISBN: 0-13-144679-7, 2005.
 - Laguna M and Marklund J. Business process modeling, simulation and design. Prentice Hall, Upper Saddle River, New Jersey 07458, USA, ISBN: 0-13-091519-X, 2004.
- Some websites:
 - <http://www.energycommunity.org>
 - <http://www.eia.doe.gov>
 - <http://www.epa.org>
 - <http://www.grida.no/climate/ipcc/emission/index.htm>
 - <http://www.undp.org/>
 - http://www.imaginethatinc.com/aca_papers.html
 - http://www.imaginethatinc.com/sols_papers.html
- Additional reading material will be given during the course.

Comments and Guidelines for Assignments

There will be **four assignments** in this course. Assignment submission guidelines are given below.

Assignments	Guidelines
Assignment 1	<ul style="list-style-type: none"> • Based on simulation with <i>EXTEND</i>. • 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 October 17, 2011 by 6 PM in class. Late submission will not be accepted.
Assignment 2	<ul style="list-style-type: none"> • Based on an assigned case study to each individual/group. Case study will be given by the instructor in the class.

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Assignments	Guidelines
	<p><u>Report</u></p> <ul style="list-style-type: none"> • Review 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 October 24, 2011 by 6 PM in class. Late submission will not be accepted. <p><u>Presentation – October 24, 2011</u></p> <ul style="list-style-type: none"> • The presentation should be aimed for about 15 minutes (i.e. have about 15 slides). • Follow the presentation guidelines given below.
Assignment 3	<ul style="list-style-type: none"> • Based on using Decision Support System for a specific case. Case would be decided by each group in consultation with the instructor. <p><u>Project Proposal</u></p> <ul style="list-style-type: none"> • Proposal report must not be more than 2 pages of text. Follow guidelines given in General Report Format for preparing the report. • Proposal report must contain systems to be compared and list of criteria to be used for comparison. • Additional guidelines will be given with the assignment, if required. • Project proposal is due on November 14, 2011 by 6 PM in class. Late submission will not be accepted. <p><u>Final Report</u></p> <ul style="list-style-type: none"> • Final report must not be more than 10 pages of text. Follow guidelines given in General Report Format for preparing the report. • Final report must contain brief description of the systems to be compared and criteria to be used for comparison. • In addition it should also contain: <ol style="list-style-type: none"> a. Title page, table of content, list of tables, list of figures, list of nomenclature (if required), references; b. Executive summary; c. Introduction/Background – statement of problem, objectives, scope, limitations; d. Input data and assumptions on alternatives and criteria (use tables if required); e. Model/system description; f. Results with relevant tables and graphs (output of model); g. Discussion of the results including limitations; h. Conclusions. • Additional guidelines will be given with the assignment, if required. • Report is due on November 28, 2011 by 6 PM in class. Late submission will not be accepted. <p><u>Project Presentation – November 28, 2011</u></p> <ul style="list-style-type: none"> • The presentation should be aimed for about 15 minutes (i.e. have

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	<p>about 15 slides).</p> <ul style="list-style-type: none"> Follow the presentation guidelines given below.
Assignment 4	<ul style="list-style-type: none"> Based on using either EXTEND or LEAP for a specific case. This assignment will be done by students in groups of two or three. Group should be formed by October 3, 2011. <p><u>Proposal Report</u></p> <ul style="list-style-type: none"> 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; (2) progress towards the goals and synopsis of findings to date (3) remaining tasks and timelines, (4) list of researched/identified resources whether used to date or planned to be used, (5) challenges, if any. The evaluation of proposal report will be based on the progress made to date and how well the report addresses the five issues mentioned above. Additional guidelines will be given with the assignment, if required. Proposal report is due on Oct. 21, 2011 by 5 PM by e-mail. Late submission will not be accepted. <p><u>Final Report</u></p> <ul style="list-style-type: none"> Final report must not be more than 25 pages of text. Follow guidelines given in General Report Format for preparing the report. Final report should contain: <ul style="list-style-type: none"> i. Title page, table of content, list of tables, list of figures, list of nomenclature (if required), references; j. Executive summary; k. Introduction/Background – statement of problem, objectives, scope, limitations; l. Input data and assumptions (use tables if required); m. Model/system description; n. Results with relevant tables and graphs (output of model); o. Discussion of the results including limitations; p. Conclusions. Additional guidelines will be given with the assignment, if required. Report is due on December 9, 2011 by 4 PM to instructor/MECE office. Late submission will not be accepted. <p><u>Presentation – December 5, 2011</u></p> <ul style="list-style-type: none"> The presentation should be aimed for about 30 minutes (i.e. have about 30-35 slides). Follow the presentation guidelines given below.

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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 all 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.

Presentation Guidelines

- Presentation should be *in point form* (Power point).
- Presentation should include main findings and analysis based on model output.
- The presentation should be as interactive as possible.
- The presentation should be aimed for the specified time.
- A copy of the presentation should be submitted to the instructor for evaluation.

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Marking Scheme

<i>Items</i>	<i>Weighting</i>
Assignment 1 – Simulation	10%
Assignment 2 <ul style="list-style-type: none">• Report• Presentation	10% 5%
Assignment 3 <ul style="list-style-type: none">• Proposal report• Final report• Presentation	5% 15% 10%
Assignment 4 – Group project <ul style="list-style-type: none">• Project proposal report• Final project report• Group presentation	5% 25% 10%
Class participation	5%
Total	100%

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ENG M 643 Section X1 – TENTATIVE (!) Lecture Outline

No.	Lecture Topic	Comments/Remarks
1 Sept. 12	<ul style="list-style-type: none"> • Course overview. • Overview of current energy usage (overall energy consumption, world perspective, Canadian perspective). 	
2 Sept. 19	Simulation and modeling	
3 Sept. 26	Exposure to <i>EXTEND</i>	<ul style="list-style-type: none"> • Assignment 1 – Given out. • Group formation for Assignment 1.
4 Oct. 3	Energy forecasting and planning	<ul style="list-style-type: none"> • Assignment 2 - Given out. • Group formation for Assignment 2. • Group formation deadline for Assignment 4.
Oct. 10	No Class	Thanksgiving
5 Oct. 17	Exposure to Long Range Energy Alternative Planning Systems Model (<i>LEAP</i>)	<ul style="list-style-type: none"> • Assignment 1 - Report due. • Assignment 4 - Group project proposal - Report due by Oct. 21, 2011 by 4 PM (by e-mail).
6 Oct. 24	Case study presentations – Assignment 2	<ul style="list-style-type: none"> • Assignment 2 - Report due.
7 Oct. 31	Decision Support System – Energy Sector	<ul style="list-style-type: none"> • Assignment 3 – Given out • Group formation for Assignment 3
8 Nov. 7	Exposure to <i>Decision Lab 2000</i>	
9 Nov. 14	Energy sector emission database models	<ul style="list-style-type: none"> • Assignment 3 – Project Proposal - Report due.
10 Nov. 21	Exposure to <i>GEMIS</i> and <i>CO2DB</i> models	
11 Nov. 28	Presentation on Decision Support System - Assignment 3	<ul style="list-style-type: none"> • Assignment 3 – Final report due.
12 Dec. 5	Group project presentations - Assignment 4	<ul style="list-style-type: none"> • Assignment 4 - Group project - Final report due on Dec. 9, 2011 by 4 PM.