INDUSTRIAL ENGINEERING
Wood 330 - Fall 2016

Instructor: Dr. Taraneh Sowlati

Contact Info: I have an open door policy and would be happy to help students outside the classroom. My contact info:
Room: FSC 2931
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Papers to read (required):
- Sowlati, T. (2014). Current and future role of information technology in the global forest sector. In The Global Forest Sector: Changes, Practices, and Prospects. E. Hansen, R. Panwar, and R. Vlosky (eds). CRC press
- Feng, Y., D'Amours, S., LeBel, L., Nourelfath, M., (2010). Integrated Bio-Refinery and Forest Products Supply Chain Network Design Using Mathematical Programming Approach. CIRRELT, 50.
- D'Amours, S., Rönnqvist, M., Weintraub, A., (2008). Using Operational Research for Supply Chain Planning in the Forest Products Industry. INFOR, 46, 265-281.
- Ronnqvist, M., (2003). Optimization in forestry. Mathematical Programming, 97, 267-284.
- Sowlati, T. (2016). Modeling of forest and wood residues supply chains for bioenergy and biofuel production. In Biomass Supply Chains for Bioenergy and Biorefining. Jens Bo Holm-Nielsen and Ehiaze Augustine Ehimen (eds.), Elsevier/ Woodhead Publishing Series in Energy.

Useful books and references:
- Heizer, J. Render, B. Operations Management. Canadian Edition. Pearson. 2014.
- Russell, R.S., Taylor III, B.W., Operations Management, Fourth Edition, Prentice Hall. 2003.
- Winston, W.L., Operations Research: Applications and Algorithms, Third Edition, ITP, 1994.
- Meyers, F.D., Stephens. M.P. Manufacturing Facilities Design and Material Handling. Second Edition. Prentice Hall. 2000.
- Dykstra, D.P. Mathematical Programming for Natural Resource Management. McGraw-Hill. 1984.
- Turner, W.C. Mize, J.H., Case, K.E. Nazemetz, J.W. Introduction to Industrial and Systems Engineering. Third Edition. Prentice Hall. 1993.
- Miller, D. M., Schmidt, J.W. Industrial Engineering and Operations Research. John Wiley and Sons 1984.

Lectures: Tuesday and Thursday 9:00-10:30 FSC 2964
Lab: Thursday 10:30-12:30 FSC 2964 and CAWP computer lab

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COURSE DESCRIPTION

Rationale

The emphasis of the Wood Products Processing Program is on producing graduates who perform confidently in a manufacturing setting, recognize the demands of the marketplace and develop designs and plans to produce a product in a safe, efficient and cost effective manner.

Industrial Engineering (IE) is concerned with the design, installation and improvement of integrated systems of people, materials and equipment in all sectors based on mathematics, physics, social sciences together with the principles of engineering and design. It provides a systematic approach to determine the most effective ways for an organization to use resources, make work safer, easier and faster, increase quality and customer service, etc. that ultimately improves competitiveness and increases profitability. Therefore, it is essential for students in the Wood Products Processing Program to be familiar with IE methods and techniques.**Objectives**

This course provides an introduction to the methods and techniques used in Industrial Engineering. The objectives of the course are:

- To provide students with the understanding of Industrial Engineering methods and techniques, their impact on efficiency, productivity and competitive position of a firm.
- To provide students with the knowledge of real-life situations relative to the concept and systems learned.

Learning outcomes

Upon successful completion of this course, the student will be able to:

- describe industrial engineering and industrial engineers activities
- describe why a model is used, types of models, the modeling process and guidelines in developing models
- classify products and processes, describe the characteristics of each
- delineate the importance of supply chains and the bullwhip effect, supply chain management, forest products supply chains and different decision making levels
- describe standard time, its importance in production planning, and employ a stop watch to calculate the standard time of a job
- define different types of inventory, different costs associated with keeping inventory, different inventory management systems, and calculate the optimum order quantity
- describe Monte Carlo simulation and the steps to take to develop a simulation model, develop and run a Monte Carlo simulation model for inventory analysis with variable demand and lead time
- develop linear programming model to solve a problem, use Excel Solver to solve it, and perform sensitivity analysis to evaluate the impact of changes in parameters on the optimum solution

Course organisation

There will be a mid-term and a final examination based on the material presented in the course, including the readings, case studies and class discussions. To pass the course, students need to pass the final exam, in case they fail the final exam, their course mark will be the same as their final exam mark. All the lecture notes are available for downloading from http://wood330.forestry.ubc.ca (note that attachments to the notes are not available for downloading)**.** This will save you most of the note taking, but will require that you take an active part in the classroom dialogue.

Class participation

In order to succeed in this course, students need to be actively engaged in class discussions and activities, and facilitate the learning of others. Class attendance is mandatory.

Weekly labs
A variety of different activities such as field trips, time study, assignments, and case study will be done in the labs. Lecture and lab times will be used interchangeably. Assignments will be done in groups (group of two students) and each week students have to work with a different partner.

Field trips
We will have three field trips to wood manufacturing facilities in the Lower Mainland. All students must attend the field trips. There will be a test on the material learned during the visits.

Time study project
Students will work in groups of two on time study measurement using a stopwatch in the CAWP machine lab, and submit a report before the specified deadline. A short document describing the project will be handed out to students and will be explained in the class.

Supply chain papers and presentations
Students will work in groups, read a paper, discuss it with other groups and present it in the class. The details and requirements will be handed out to students and explained in the class.

Linear programming case study and presentations
Students will work in groups, read a case study and present it in the class. The details and requirements will be handed out to students and explained in the class.

Late submission policy
Please note that when a deadline is set for the submission of problem sets and reports, you must submit them on or before that deadline or there will be a significant penalty, 30% off!

Grading

Class/lab participation	10%
Assignments	10%
Time study project	5%
Field trip test	5%
SCM presentations	10%
LP case study	10%
Mid-term	20%
Final Exam	30%

Tentative schedule - 2016

Week	Starting	Subject	Important Events
1	Sept. 5	**Introduction** (Course syllabus and expectations)	Thursday Sept. 8: No lab
2	Sept. 12	**Industrial Engineering** (What Industrial Engineering is, what tools they use)	Thursday Sept. 15: Field trip to Terminal Forest Products (9:00-12:30)
3	Sept. 19	**Modeling** (What a model is, types of models, uses of models, guidelines in modeling)	Thursday Sept. 22: Field trip to Nickels Cabinets (9:00-12:30)
4	Sept. 26	**Operations** (Operations and their importance, globalization, competition strategy, types of products and processes)	Thursday Sept. 29: Field trip to STOR-X Organizing Systems (9:00-12:30)
5	Oct. 3	**Supply Chain Management** (SCM, its benefits, Bullwhip effect, information technology, SCM in forestry)	Thursday Oct. 6: Test on field trips Video: SCM
6	Oct. 10	**Time Study** (Standard time, importance of time study, time study using stop watch)	Thursday Oct. 13: SCM papers group work and presentations
7	Oct. 17	**Inventory Management** (Why companies keep inventory, inventory costs, inventory control systems, ABC Analysis, basic EOQ model)	Thursday Oct. 20: Time study project Video: Inventory types and costs
8	Oct. 24	**Inventory Management** (Production order quantity model, quantity discount model, safety stock, order quantity)	Tuesday Oct. 25: Midterm Thursday Oct. 27: Inventory management assignment Video: Inventory management
9	Oct. 31	**Simulation** (Simulation, its benefits and limitations, Monte Carlo Simulation and inventory analysis)	Thursday Nov. 3: Simulation assignment
10	Nov. 7	**Linear Programming** (Optimization, Graphical solution, model development, Excel Solver)	Thursday Nov. 10: Excel Solver
11	Nov. 14	**Linear Programming and Sensitivity Analysis** (Range of optimality, range of feasibility, shadow prices)	Thursday Nov. 17: Linear Programming assignment
12	Nov. 21	**Case Study** (LP papers)	Thursday Nov. 24: Case studies and group work
13	Nov. 28	**Presentations and Review**	Thursday Dec. 1: Review