

ENGINEERING ECONOMICS

Wood 440 – Fall 2016

Instructor: Dr. Taraneh Sowlati

Office Hours: I have an open door policy and would be happy to help students outside the classroom. My contact info:
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Textbook: Fraser, M.N., Jewkes, E.M., “Engineering Economics – Financial Decision Making for Engineers”, Fifth Edition, Pearson, 2013.

Papers to read (required):

- Akhtari S., Sowlati, T., Day, K. 2014. The effects of variations in supply accessibility and amount on economics of using regional forest biomass for generating district heat. *Energy-The International Journal*, 67: 631-640.
- Ghafghazi, S., Sowlati, T., Sokhansanj, S., Melin, S. 2010. Techno-economic analysis of renewable energy options for a district heating system. *International Journal of Energy Research*, 34 (12): 1109-1120.
- Chau, J., Sowlati, T., Sokhansanj, S., Preto, F., Melin, S., Bi, X. 2009. Techno-economic analysis of biomass boilers for the greenhouse industry. *Applied Energy*, 86 (3): 364-371.

Lectures: Monday, Wednesday, Friday 14:00 – 15:00 (CAWP Classroom)

Lab: Friday 15:00-16:00 (CAWP computer lab)

Teaching Assistants: Sherry Akhtari

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COURSE DESCRIPTION

Rationale

One of the main focuses of the Wood Product Processing program is to produce graduates who have strong business and financial skills since many of the graduates will be employed in small to medium sized facilities in which they would be involved in financial decision-making.

There are several stages to making a good decision. One stage is to be able to determine whether a solution to a problem is technically feasible. Another important stage is to choose the best alternative among the feasible ones. In reality, any alternative must be economically affordable. This reinforces that the economic factors weigh heavily in the decision making process. The field of engineering economy is concerned with the systematic evaluation of the benefits and costs of different projects in order to select the preferable alternative among several technically viable ones using quantitative techniques. It is an integral part of the decision-making process, and therefore it is essential for students in the Wood Product Processing Program to learn this important topic.

Objectives

The emphasis in this course is to introduce the students to the concepts and methods in economics as these apply to practicing engineers in Canada. We will achieve this by identifying the issues which require the application of economics and engineering to solve real life problems.

The course has a pragmatic as well as a theoretical orientation. It is designed to familiarise you with the kinds of opportunities (problems) likely to be encountered in your career where you must deal with financial matters.

More specifically, the objectives of this course are:

- To build a thorough understanding of the theoretical and conceptual foundation on which the practice of financial project analysis is built.
- To satisfy the need of WPP graduates when they have to make informed financial decisions on engineering projects acting as a team member or project manager.

Learning Outcomes

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

- discuss decision making process and principles of engineering economics
- recognize the relationship between time and money (time value of money), the difference between simple and compound interests and calculate them
- calculate mortgage payments, and evaluate the effects of amortization period, mortgage term, interest rate, and payment plan on the total interest
- calculate the effective interest rate based on nominal rate and compounding period, calculate the effective interest rate of credit cards and mortgages
- develop a cash flow for each alternative solution of a project, convert one type of cash flow to another type of cash flow using compounding factors and Excel Financial Functions
- compare different investment alternatives based on quantitative methods, such as present worth method, and choose the best alternative
- calculate the economic life of an asset, and make proper decisions on replacing an asset
- calculate depreciation, taxes, inflation and evaluate their effects on engineering decisions
- recognize the uncertainty inherent in decision making and assess how sensitive the results are to variations in different parameters

Course Organisation

There will be two tests and a final examination (open book) based on materials presented in the course, including the readings 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 the Online Courses on the Faculty of Forestry Website (note that attachments to the notes are not available for downloading) <http://wood440.forestry.ubc.ca>. This will save you most of the note taking, but will require that you actively participate in the classroom dialogue and activities. We will have several industry guest speakers during the term.

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.

Problem Sets

Every week a set of problems will be handed out in the lab and students have to submit their solutions by the end of the lab. In case an assignment requires more time than the lab session, appropriate time will be given to students. Students will work in groups (group of two) and each week students have to work with a different partner.

Case Studies

Three cases will be handed out during the term. Students will work in groups of two, analyze the cases, solve them using the methods learned in this course, prepare a memo, and submit their solution and memo before the specified deadline.

Late Submission Policy

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

Grading

Class and lab participation	10%
Problem sets	10%
Case studies	20%
Test 1	10%
Test 2	20%
Final exam	30%

Tentative schedule

Week	Starting	Subject	Chapter	Important Events
1	Sept. 5	Engineering Economy and Decision Making	1	
2	Sept. 12	Time Value of Money (compound interest, nominal and effective interests)	2	
3	Sept. 19	Cash Flow Analysis (present value, future value, annuity)	3	
4	Sept. 26	Cash Flow Analysis (geometric series, gradient series)	3	
5	Oct. 3	Cash Flow Analysis (deferred annuity and deferred series))/ Review	3	Case Study 1
6	Oct. 10	Comparison Methods I (NPV)	4	Oct. 12: Test 1
7	Oct. 17	Comparison Methods I (AW, Payback)	4	Case Study 2

8	Oct. 24	Comparison Methods II (Rate of return)	5	
9	Oct. 31	Depreciation and Replacement	6, 7	
10	Nov. 7	Replacement/ Review	7	Case Study 3
11	Nov. 14	Taxes	8	Nov. 16: Test 2
12	Nov. 21	Taxes/ Inflation	9	
13	Nov. 28	Inflation/ Review	9	