UNIVERSITY OF ALBERTA

Mechanical Engineering

AY2020/2021 Winter Term Section B1 (92040)
ENG M 401 Financial Management for Engineers

by

Ma, Yongsheng Ph.D. P.Eng.
https://sites.ualberta.ca/~yongshen/

Lecture sessions: zoom meeting series
https://ualberta-ca.zoom.us/j/94539542735?pwd=UE1EdmlZVGxpcFkxUUZPS1l3MjZZQT09
Meeting ID: 945 3954 2735, Passcode: EM401
Mondays, Wednesdays, and Fridays
From January 11 to April 16, 2021, Time: 11:00 - 11:50 AM

label should be used for all lindid's

My office Hour: Wednesdays 1:00-2:00 PM. Join Zoom Meeting
https://ualberta-ca.zoom.us/j/97720766976?pwd=dC8rOGlNZTV2SWRkSS9XTWtWSkd0dz09
Meeting ID: 977 2076 6976, Passcode: EM401

Teaching Assistants

Mechanical Engineering

TA: Mr. Tianyu Zhou, E-mail: tzhou4@ualberta.ca
Office hours: Wednesday 4:00-4:40 PM &
Friday 3:00-3:40 PM.
Office hour zoom link: https://ualberta-ca.zoom.us/j/6535634232?pwd=REM3WGVDRVc1bU4rQURWSFg2TlUwZz09
Password: EM401.

Marker: To be confirmed.

Course Overview:

Mechanical Engineering

Why learn this:

- You will work.
- You will likely work in a commercial enterprise.
- You will be managed.
- Somebody does this and it affects your job.
- Understanding reduces the sense of powerlessness.
- You may want to do this kind of work.
- You may be forced to do this kind of work.
- You may want to own/manage your own business.

You will live and work in a commercial world; knowledge of business gives personal power

Course Objectives

Mechanical Engineering

- Objectives
  - Concepts of commercial values
  - Core techniques to measure and compare investment project values
  - Using financial statements (tool building). — accounting
  - Investment Analysis — by companies/employers
    - Discounted cash flow methods, and payback.
    - Risk.
    - Valuation.
  - Using financial analysis to operate a company.

— time values of money

Course Text and Exercises

Mechanical Engineering

- "*Contemporary Engineering Economics: A Canadian Perspective*, Third Canadian Edition Plus Companion Website with Pearson, by Chan S. Park (Author), Ming J. Zuo (Author), Ronald Pelot (Author)." It is available from the university bookstore.
- The 3rd edition is substantially different from the earlier editions, and **is required** for this course because this textbook contains the required readings and the assignment problems.
- The companion website provides eText, Excel files, interest factors, study guide questions, sample end-of-chapter problem solutions, tutorials, etc. Online access of the textbook and the companion website may be purchased from the publisher.
- Assignments and their answers will be available on eClass.

Qs + As

How to succeed in this course

Mechanical Engineering

- Tool building versus thought building
  - you can't learn how to make an arrow just by listening to a lecture

- Keys to success:
  - Textbook, online study questions and solutions, selected text questions with solutions
  - Assignments to master tool building.
  - Access to a spreadsheet program.
  - Clear, brief and thoughtful writing.
  - Think like a business manager (for 4 months only!).
  - Simple math, complex thought about ambiguous situations.

- Exams are open-book & open-notes type. Emphasis in writing is on thoughtfulness, clarity and brevity.

Marks:

Mechanical Engineering

- Marks are a required output for both the students and the professor
- Weighting:
  - 5 Assignments @ 4% each — 20%
  - 1st In Class Mid Term — 20%
  - 2nd In Class Mid Term — 20%
  - Final exam — 40% ← April 28
  - Total — 100%

Note:

- Carry out your assignments and exams independently!!

- Resulting % marks will ***NOT*** be scaled
- Grades will be assigned to fit into a 12+ baskets.

Left or right side of the brain?

Mechanical Engineering

- Chapter based study questions: park them in the right hand side of the brain. These issues are different from engineering problems, they need reflection and intuition.
- Some problems have both
- Exams have a lot of material so that those that haven't read prior to the exam don't do as well as the prepared. Exam marks tend to be high.
- Business problems sometimes are ambiguous and do not have one clear answer, unlike engineering problems. Think carefully.

Course Requirement:

Mechanical Engineering

- Answer all your study questions from the online website. The solutions are available online from the publisher's companion website (Self-learning).
- Carry out those review questions selected from the textbook or distributed via eClass. The solutions are to be made available on eClass.
- 5 Assignments: selected problems from the textbook. Problem numbers are issued in class according to the class schedule (evaluated)

Assignment Submissions:

Mechanical Engineering

Assignment contents are based on selected problems from the textbook or prepared by the TA pertaining to the conceptual application of course materials. Problems are to be issued via eClass as the course progresses.

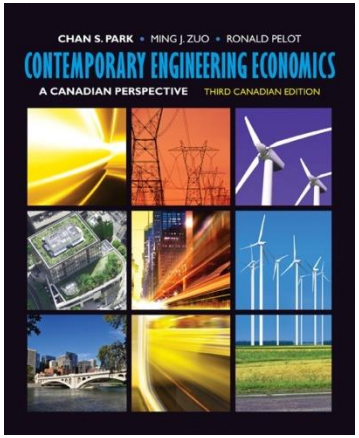
- *Time Due:* At 11:00 AM just before the selected classes, according to the class schedule.
- *Place Due:* Online attempts (max 3) via eClass. They are marked automatically
- *Late Submissions:* **No late assignment attempts are accepted.** Please note that the assignment solutions may be published on the course web-page soon and discussed in class immediately after they are due.

Course Requirement:

Mechanical Engineering

- CHECK eClass FREQUENTLY.
- Understand course requirement -> course syllabus
- Attend classes – you cannot afford to miss…
- Plagiarism and cheating can be easily detected. Don't do.

Engineering Economic Decisions



Lecture No.1
Chapter 1
Contemporary Engineering Economics
Third Canadian Edition

Chapter 1 Objectives

- What is the role of engineers in business?
- What are the types of business organization?
- What are the nature and types of engineering economic decisions?
- What makes the engineering economic decisions difficult?
- What are the four fundamental principles of engineering economics?

Engineering Economic Decisions

- Engineering economic decisions refer to any investment decision related to an engineering project.
- What is the engineer's role in economic decisions?
  - Engineers must plan for capital expenditures (equipment purchases) that enables a firm to design and produce products economically.

– on behalf of the company

A Manager's Skill Set:

- Financial analysis: can read the health of a business from its statements. Can distinguish cash and income.
- Financing: can raise money from different sources.
- Can organize an enterprise, and knows the risks and tax consequences of alternate structures (limited exposure in this course).
- Knows basic contract law, can acquire and protect intellectual property. (Not in the scope of this course)

A Manager's Skill Set (2):

Mechanical Engineering

- Marketing: can identify a need, target a market niche, understand and "sell" the benefit, and knows the choices of channels to market.
- Selling: knows "features and benefits", overcoming objections, and closing. Can "ask for the order".
- Human resources: knows employment law, union legislation and contracts, severance, and benefits (not in the scope).

A Manager's Skill Set (3):

Mechanical Engineering

- People management: knows management styles and personality variations, can lead (communicate, motivate, assess, and on occasion discipline). (Not in the scope)
- Operations management: can budget and operate for steady growth, can continuously improve and push responsibility downwards.
- Project management: can run a one time effort on schedule and budget; can plan and track performance. (Not in the scope of this course)

proposals / justification

Enough for day-to-day management

A Manager's Skill Set (4):

- Historical and social insight: knows enough history and current affairs to place issues (e.g. unions) in context. (Limited exposure)
- Strategic planning: can assess synergies in products, locations, supply chains, customers. (Limited exposure)

Types of Business Organizations

- **Proprietorship:** a business owned by one individual
- **Partnership:** a business with more than one owner
- **Corporation:** a legal entity created under provincial or federal law, entity is separate from its owners and managers

S.M.E

above medium-size

Common Types of Strategic Engineering Economics Decisions

- Equipment and Process Selection
  - Selecting the best alternative out of several alternatives that meet a project's requirements
- Equipment Replacement
  - Considering the expenditure necessary to replace existing equipment
- New Product and Product Expansion
  - Decisions about expenditures aimed at increasing company revenues

Common Types of Strategic Engineering Economics Decisions (continued)

- Cost Reduction
  - Attempts to lower a firm's operating costs.
- Improvement of Product Quality
  - Decisions to continuously improve the quality of a product and eliminate faulty designs.

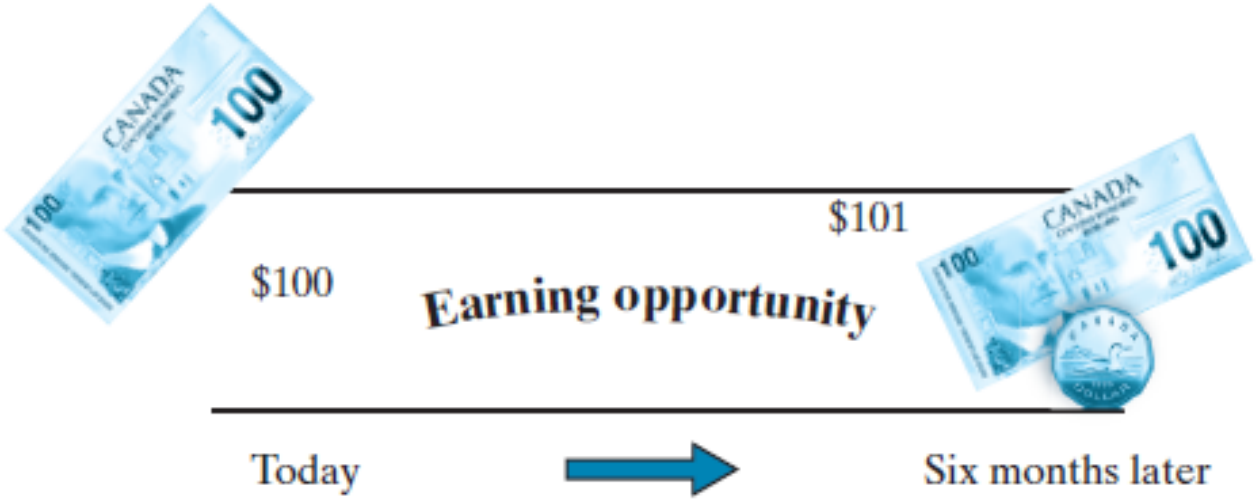
What Makes the Engineering Economic Decision Difficult?

- The engineer must estimate or forecast:
  1. The required investment in a project
  2. The product demand
  3. A selling price
  4. A manufacturing cost
  5. A product life

Fundamental Principles of Engineering Economics

- Principle 1: A nearby penny is worth a distant dollar
- Principle 2: All that counts are the differences among alternatives
- Principle 3: Marginal revenue must exceed marginal cost
- Principle 4: Additional risk is not taken without the expected additional return

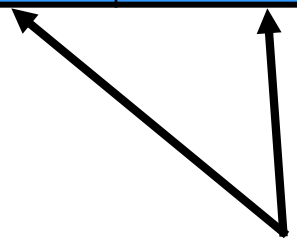
Principle 1: A nearby penny is worth a distant dollar



- A fundamental concept in engineering economics is that money has a time value associated with it because we can earn interest on money invested today.

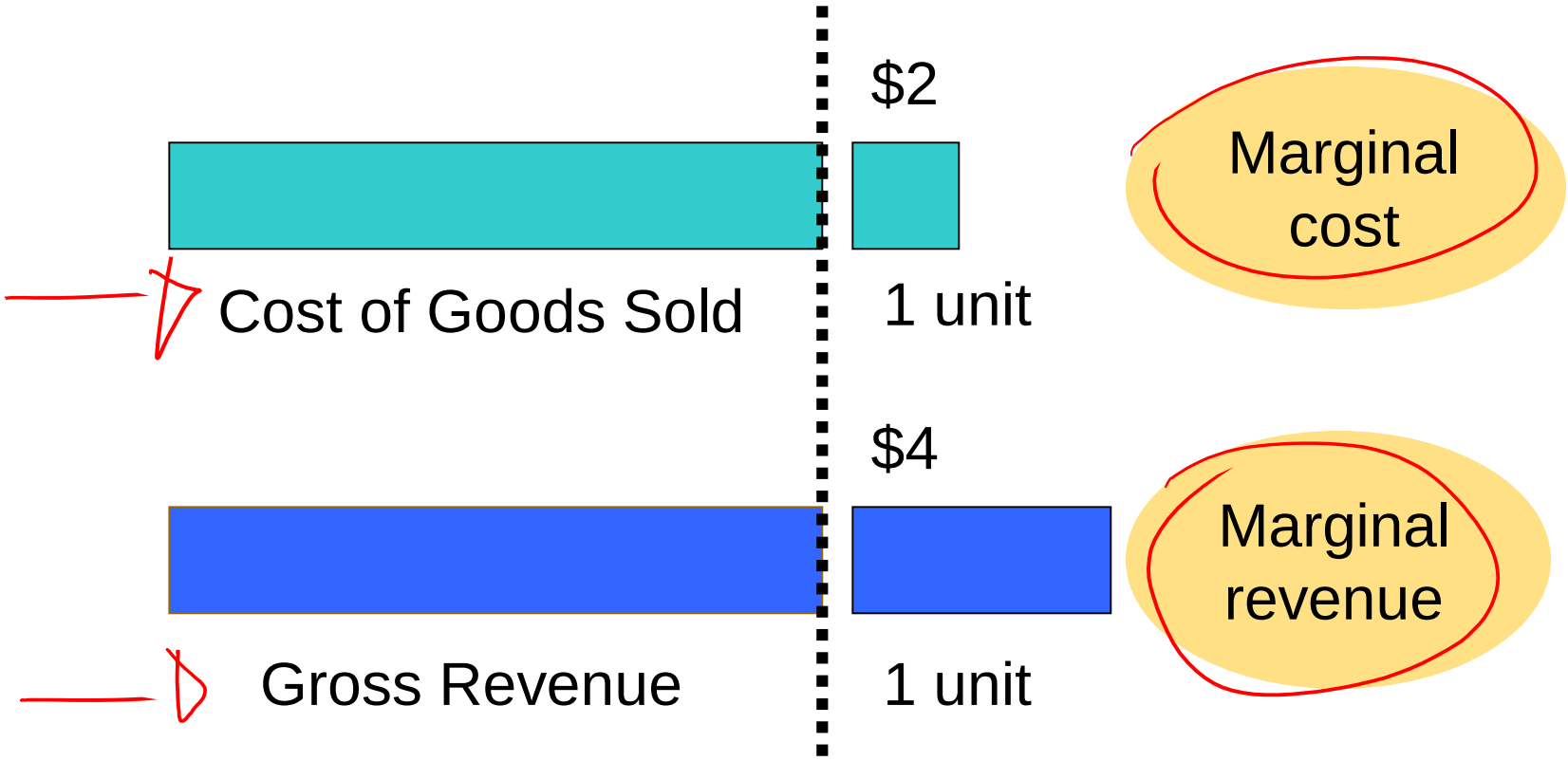
Principle 2: All that counts are the differences among alternatives

Option	Monthly Fuel Cost	Monthly Maintenance	Cash Outlay at Signing	Monthly Payment	Salvage Value at End of Year 3
Buy	$960	$550	$6,500	$350	$9,000
Lease	$960	$550	$2,400	$550	0



Irrelevant items in decision making

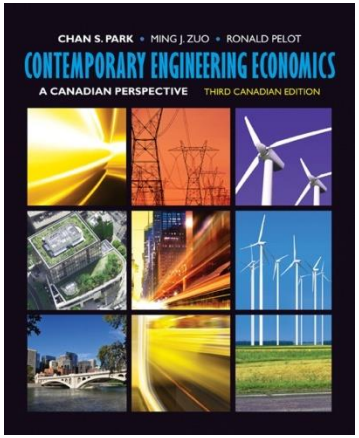
Principle 3: Marginal revenue must exceed marginal cost



Principle 4: Additional risk is not taken without the expected additional return

Investment Class	Potential Risk	Expected Return
Savings account (cash)	Low/None	1.5%
Bond (debt)	Moderate	4.8%
Stock (equity)	High	11.5%

Summary



The four fundamental principles that must be applied in all engineering economic decisions are (1) the time value of money, (2) differential (incremental) cost and revenue, (3) marginal cost and revenue, and (4) the trade-off between risk and reward.