

CE 4077 / ME 4147 ENGINEERING ECONOMY
Course Objectives & Overview

B. Janson
Fall 2009

This course covers the basic concepts of engineering economics as applied to the evaluation of capital investment alternatives in both the private and public sectors of our economy. Attention is given to the time value of money by showing the equivalence of varying cash flows over time. Price changes, depreciation allowances, and other tax policies are also shown to affect the preferred choice among mutually exclusive or jointly considered alternatives.

Two critical components of conducting reliable engineering economic analyses are well-founded estimates of costs and benefits. Much of this course will assume that these inputs to the analysis have been well developed. Changing economic conditions and/or other factors can sometimes prevent the realization of one's investment goals and forecasts. Due to these "exogenous" uncertainties (i.e., factors outside the analysis) as discussed near the end of the course, conducting a valid comparison on the basis of available information, and realizing the predicted outcome of one's decision, can be quite different events.

The required textbook is *Engineering Economy* (14th Edition) by Sullivan, Wicks, and Koelling (Prentice-Hall, 2009). We will cover Chapters 1-10. Pages covered by each lecture are shown on the next page. Graduate courses in engineering management or business that you might take in the future cover more of the Special Topics in Part III.

There are many other textbooks on the topic of engineering economics. Some of the more commonly used ones are:

Park C.S. (2007). *Contemporary Engineering Economics* (4th Edition), Prentice-Hall, Inc.

Newnan D.G., Eschenbach T.G., & Lavelle J.P. (2004) *Engineering Economic Analysis* (9th Edition), Oxford Press.

Thuesen G.J. & Fabrycky W.J. (2001). *Engineering Economy* (9th Edition), Prentice-Hall, Inc.

Blank L.T. & Tarquin A.J. (1998) *Engineering Economy* (4th Edition), McGraw-Hill, Inc.

Steiner H.M. (1996) *Engineering Economic Principles* (2nd Edition), McGraw-Hill, Inc.

Your problem sets and exams will require basic hand calculators. Although spreadsheet software such as Excel is ideal for solving engineering economic problems, the risk of using spreadsheets too heavily is that you cannot use them during exams. Hence, do not substitute computer expertise for knowledge of principles. You must fully understand the methods and concepts to do the exams with only a hand calculator.

Although cooperative learning among yourselves can be helpful, you are expected to perform and present your own work. Copying someone else's assignment or cheating on exams will not be tolerated and will be handled according to University policies if found to occur. You are responsible for observing the University's Student Code of Conduct regarding these matters.

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Course Outline and Readings

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Date	Lecture # and Topic (asterisk * indicates problem set due)	Pages
Chapter 1: Introduction		
8/18	1. Sections 1.1-1.6	1-18
Chapter 2: Basic Concepts		
8/20	2. Sections 2.1-2.3.....	19-42
8/25	3. Sections 2.5-2.6.....	42-53
Chapter 4: Time Value of Money Calculations		
8/27*	4. Sections 4.1-4.6.....	114-130
9/1	5. Sections 4.7-4.9.....	130-144
9/3*	6. Sections 4.10-4.12.....	144-161
9/8	7. Sections 4.13-4.15.....	161-168
9/10*	8. Sections 4.16-4.18.....	168-174
Chapter 5: Economic Feasibility of Independent Projects		
9/15	9. Sections 5.1-5.3.....	190-200
9/17	10. * * * First Exam (Chapters 1, 2 & 4; closed book and notes) * * *	
9/22	11. Sections 5.4-5.6.....	201-217
9/24*	12. Sections 5.7-5.10.....	217-224
Chapter 6: Comparison of Mutually Exclusive Projects		
9/29	13. Sections 6.1-6.4.1.....	238-251
10/1*	14. Sections 6.4.2.2 (using external rate of return only).....	261-267
10/6	15. Section 6.5-6.9	264-283
Chapter 7: Depreciation and Income Taxes		
10/8*	16. Sections 7.1-7.5.....	300-320
10/13	17. Sections 7.6-7.9.....	320-331
10/15*	18. Sections 7.10-7.12.....	331-343
Chapter 8: Inflation and Price Changes		
10/20	19. Sections 8.1-8.2.....	356-364
10/22*	20. Sections 8.3-8.4 (not covering exchange rates)	364-371
Chapter 9: Capital Replacement Problems		
10/27	21. Sections 9.1-9.4.....	389-397
10/29	22. * * * Second Exam (Chapters 5-7; closed book and notes) * * *	
11/3	23. Sections 9.5-9.6.....	397-404
11/5*	24. Sections 9.7-9.8.....	404-408
Chapter 11: The Benefit-Cost Ratio Method		
11/10	25. Sections 10.1-10.6.....	431-439
11/12*	26. Sections 10.7-10.9.....	440-453
11/17	27. Sections 10.10-10.12.....	453-458

Chapter 7: Cost Estimation Techniques

11/19* 28. Sections 3.1-3.2..... 71-82

11/23 – 11/27 * * * Thanksgiving Break (no classes) * * *

12/1* 29. Sections 3.3-3.4.2..... 82-93

12/3 30. * * * Review for Final Exam * * *

* * * Final Exam (any topic covered by the 12 problem sets, but Chapters 3, 8, 9 & 10 will be emphasized; closed book and notes)

Final exam will be on either Tuesday 12/8 or Thursday 12/10 at the regular class time.

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Problem Sets, Exams, and Grading

Fall 2009

Final grades will be weighted 25% for each exam grade and 25% for your average problem set grade (2% for each of 12 sets plus 1 extra point if you submit all 12 sets). Problem sets are due each Thursday. Problem sets submitted by 5 PM Friday of the week due will not be penalized, but any problem set not received by 5 PM Friday of the week due is too late.

Exam and problem set grades depend mainly on clear presentation and approach and not on calculation errors. Problem sets are graded A+ = 100, A = 95, B = 85, C = 75, D = 65, (plus = +3, minus = -3), and F = 0 (submitted too late). Thus, small differences in problem set grades are not likely to affect your final grade, but submitting them too late or not at all can definitely pull down your final grade.

Due Date Problem Set Topic and Problems

8/27 1. Introduction and Basic Concepts
Chapter 1: 3, 5, 9; Chapter 2: 1, 2, 12, 18, 20, 40

9/3 2. Basic Concepts and Present Time Analyses
Chapter 4: 5, 6, 14, 21, 24, 25

9/10 3. Time Value of Money Calculations
Chapter 4: 27, 34, 36, 49, 59, 60

9/17 * * * First Exam (No Problem Set Due) * * *

9/24 4. Time Value of Money & Economic Feasibility
Chapter 4: 70, 71, 77, 82, 94, 115

10/1 5. Economic Feasibility of Independent Projects
Chapter 5: 2, 9, 16, 28, 31

10/8 6. Comparison of Mutually Exclusive Projects
Chapter 5: 34, 40, 54, 58; Chapter 6: 2, 4

- 10/15 7. Comparison of Mutually Exclusive Projects
Chapter 6: 12, 27, 45, 51
- 10/22 8. Depreciation and Income Taxes
Chapter 7: 6, 8, 11, 12, 13, 24
- 10/29 * * * Second Exam (No Problem Set Due) * * *
- 11/5 9. Inflation and Price Changes
Chapter 8: 3, 6, 9, 16, 18, 27
- 11/12 10. Capital Replacement Problems
Chapter 9: 1, 3, 6, 11, 12, 15
- 11/19 11. Comparison of Projects with the B/C Method
Chapter 10: 2, 3, 6, 12, 14, 16
- 12/1 12. Cost Estimation Techniques (note that this is a Tuesday)
Chapter 3: 6, 8, 11, 15, 17, 20

Catalog Data: **C E 4077-3. Engineering Economy.** Application of economic and financial principles to the evaluation of engineering alternatives. Calculation of annual costs, present worth, and prospective rates of return on investment. Review of systems analysis techniques, including simulation, linear programming, and project scheduling. Prereq: junior standing. Cross-listed with M E 4147.

Textbook: W.G. Sullivan, E.M. Wicks, and C.P. Koelling, Engineering Economy, latest edition, Prentice Hall.

Relationship of course to program outcomes:

- a. The ability to apply knowledge of mathematics, science, and engineering.
- b. The ability to design and conduct experiments, as well as to analyze and interpret data.
- e. The ability to identify, formulate, and solve engineering problems.
- h. The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context.
- i. The recognition of the need for and an ability to engage in life-long learning.
- j. The knowledge of contemporary issues.

Contribution of the course to meeting professional component:

Other: 3 credits or 100%

Prepared by: Bruce Janson Date: August 2009