ECONOMIC ANALYSIS OF ENGINEERING PROJECTS (ISE 561) Fall 2015

Thursday, 6:40 – 9:20 pm, Room OHE100B

Professor:	Virgil Adumitroaie	**Teaching Assistant**: TBD	
Office:	GER 216C (Tuesday, by appt.)	Office:	TBD
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Course Text: Park, Chan S. and G.P Sharp-Bette, Advanced Engineering Economics, John Wiley & Sons, Inc., 1990.
Reader: Fleischer, G. A., "Selections from Engineering Economy, A Reader," Revised edition, 2003.

Course References: In addition to the above texts, some course material and in-class problems may come from the sources listed below.

Prerequisite: ISE 500. Recommended preparation: An undergraduate course in engineering economy. Basic computational skills with spreadsheet modeling in Excel.

Course Objectives: This course builds on the economic analysis framework developed in the pre-requisite material. A variety of techniques for evaluating the economic consequences of alternative technology-based decisions will be discussed, including those based on projected cash flows (e.g., net present value [NPV] and internal rate of return [IRR]) as well as those stemming from standard accounting methods (e.g., payback and return on investment [ROI]). The effects of depreciation accounting, tax rates and capital gains taxes will be reviewed in order to provide a firm foundation for carrying out economic studies on an after-tax basis. A portion of the course will be devoted to alternative techniques for evaluating the risk and uncertainty inherent in economic forecast analysis. The latter lectures will be dedicated to portfolio selection methods and their application to prioritization of engineering R&D projects. With the methodologies presented in this course, the student will be able to conduct detailed, theoretically sound analyses of the economic consequences of any proposed projects, plans or policies, on a before- or after-tax basis, and taking into consideration uncertainties inherent in forecasted values.

Course Schedule: See below.

Course Assignments: See below.

Grading: As noted in the attached, there are 12 separate homework assignments, each of which is valued at 20 points (45% of grade). The midterm exam is 120 points (23%) and the final examination is 170 points (32%). The exams will be open book and two pages of notes. You may bring a calculator, but not a laptop.

Under close guidance from the professor, the TA will grade all homework and exams. If dissatisfied with the TA's grading in a specific instance, the student may appeal to the professor to re-evaluate the grade. An appealed grade may be raised, lowered, or remain as originally scored. (Caution: The final grade in this course depends to significant extent on the graded assignments, and thus we take very seriously the academic integrity issue inherent in this activity. Do your own work.)

Class Participation: Attendance will be taken; it is expected that students will want to attend every class meeting. Active participation in the class will be noted, although there will be no explicit credit given for participation.

Office Hours: Prof. Adumitroaie is available for office hours on Tuesday, by appointment, 3:50-4:50 pm in TBD. The TA, TBD, is available TBD, in TBD.

Homework: All written homework assignments are due at 11:59 pm on the dates indicated below and will be uploaded through the DEN Assignment link. Offsite students should upload their paper or fax hardcopy on the day of the class. All relevant reading assignments should be completed before coming to class. Include your name, date, course number and assignment number in your submitted homework.

Late homework will be accepted up to two days past due date with 2 points penalty per day. Homework turned in later than past due date + 3 days will not receive any credit. No homework will be accepted after the last class meeting.

Course schedule and assignments are summarized below. This syllabus is subject to change as announced in class.

DATE	CLASS	TOPIC(S)	HOMEWORK
Aug 27	1	Engineering economic decisions. Financial statements. Cash flows, present value, future value.	Assigned: #1
Sep 3	2	Transform techniques for discrete and continuous compounding.	Due: #1 Assigned: #2
Sep 10	3	Inflation. Depreciation and corporate taxation. After-tax cash flow analysis.	Due: #2 Assigned: #3
Sep 17	4	Cost of capital. Selecting MARR. Generalized cash flows.	Due: #3 Assigned: #4
Sep 24	5	Measures of investment worth. Decision rules for ranking alternatives.	Due: #4 Assigned: #5
Oct 1	6	Use of linear programming. Discrete capital budgeting models.	Due: #5 Assigned: #6
Oct 8	7	Utility theory overview. Mean-Variance analysis.	Due: #6 Assigned: #7
Oct 15	8	**MIDTERM EXAM** Based on lectures 1 - 6	
Oct 22	9	Measures of investment worth under risk. Statistical distributions of NPV.	Due: #7 Assigned: #8
Oct 29	10	Methods for comparing risky projects. Decisions under uncertainty.	Due: #8 Assigned: #9
Nov 5	11	Monte Carlo simulations. Portfolio theory.	Due: #9 Assigned: #10
Nov 12	12	Decision tree analysis. Replacement analysis.	Due: #10 Assigned: #11
Nov 19	13	Real options.	Due: #11 Assigned: #12
Nov 26	**No class**		
Dec 3	14	Selection of technology R&D Portfolios. Post-decision analysis.	Due: #12
Dec 10	15	**FINAL EXAM** Comprehensive	

Course References:

Ayyub, B. M., “Elicitation of Expert Opinions for Uncertainty and Risks,” CRC Press, 2002.

Chien, C.F., "A Portfolio-Evaluation Framework for Selecting R&D Projects" . *R&D Management*, Vol. 32, pp. 359-368, 2002.

Guikema, S.D. and M.W. Milke, "Sensitivity Analysis for Multi-Attribute Project Selection Problems," *Civil Engineering and Environmental Systems*, Vol. 20, No. 3, pp. 143-162, 2003.

Keeney, R. L. and H. Raiffa, “Decisions with Multiple Objectives,” Cambridge University Press, 1993.

Lev B., “Intangible Assets: Concepts and Measurements,” *Encyclopedia of Social Measurement*, Elsevier Inc., Vol. 2, pp.299-305, 2005.

Park, C. S., “Contemporary Engineering Economics,” 4rd ed., Prentice-Hall, 2006.

Weisbin C.R., G. Rodriguez, A. Elfes, and J.H. Smith., "Toward a Systematic Approach for Selection of NASA Technology Portfolios," *Systems Engineering Journal*, Vol. 7, No. 4, pp. 285-302, 2004.

Academic Integrity. The Viterbi School of Engineering adheres to the University's policies and procedures governing academic integrity as described in SCampus (http://www.usc.edu/dept/publications/SCAMPUS/). Students are expected to be aware of and to observe the academic integrity standards described in SCampus, and to expect those standards to be enforced in this course.

Students with Disabilities. Any Student requesting academic accommodations based on a disability is required to register with Disability Services and Programs (DSP) each semester. A letter of verification for approved accommodations can be obtained from DSP. Please be sure the letter is delivered to me (or to TA) as early in the semester as possible. DSP is located in STU 301 and is open 8:30 a.m. - 5:00 p.m., Monday through Friday. The phone number for DSP is (213) 740-0776.