ECONOMIC ANALYSIS OF ENGINEERING PROJECTS (ISE 561) Spring 2016

Th, 6:40pm – 9:20pm, Room OHE100B

Professor: Dr. Virgil Adumitroaie
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Course Text: Park, Chan S. and G.P Sharp-Bette, Advanced Engineering Economics, John Wiley & Sons, Inc., 1990.
Optional 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.

Pre-requisites: An undergraduate course in Engineering Economy (e.g. ISE 460) or similar. A course in traditional Economics is NOT an appropriate substitute for this prerequisite. 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 pocket 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 in significant measure on graded homework, and thus we take very seriously the academic integrity issue inherent in this activity. Do your own work.)

Class Participation: Attendance will be taken periodically; it is expected that students will want to attend every class meeting. Active participation in the class and on the DEN discussion board will be noted.

Office Hours: Prof. Adumitroaie is available for office hours by appointment on Th, 5:30pm - 6:30pm in GER 216C. The TA, TBD, is available TBD, in GER 309.

Homework: All homework assignments are due at 11:59pm on the dates indicated below and will be submitted via the DEN website. It is your responsibility to make sure you have submitted the correct files and to verify after submission that the uploaded files are readable. 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
Jan 1.	1	Engineering economic decisions. Financial statements. Cash flows, present value, future value.	Assigned: #1
Jan 21	2	Interest and equivalence. Transform techniques. Discrete and continuous compounding.	Due: #1 Assigned: #2
Jan 28	3	Inflation. Depreciation and corporate taxation. After-tax cash flow analysis.	Due: #2 Assigned: #3
Feb 4	4	Generalized cash flows. Cost of capital. Selecting MARR.	Due: #3 Assigned: #4
Feb 11	5	Measures of investment worth using net present value, IRR, B/C and payback methods.	Due: #4 Assigned: #5
Feb 18	6	Decision rules for ranking alternatives. Total investment. Incremental analysis.	Due: #5 Assigned: #6
Feb 25	7	Use of linear programming. Discrete capital budgeting models.	Due: #6 Assigned: #7
Mar 3	8	Utility theory overview. Mean-Variance analysis.	Due: #7 Assigned: #8
Mar 10	9	**MIDTERM EXAM** Based on lectures 1 - 7	
Mar 17	**No Class**	*Spring Recess*	
Mar 24	10	Measures of investment worth under risk. Statistical distributions of NPV.	
Mar 31	11	Methods for comparing risky projects. Decisions under uncertainty.	Due: #8 Assigned: #9
Apr 7	12	Monte Carlo simulations. Portfolio theory.	Due: #9 Assigned: #10
Apr 14	13	Decision tree analysis. Replacement analysis.	Due: #10 Assigned: #11
Apr 21	14	Real options. Selection of technology R&D Portfolios.	Due: #11 Assigned: #12
Apr 28	15	Expert Elicitation. Post-decision analysis. Review for Final Examination.	Due: #12
May 5	16	**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.