

ISE 460 Engineering Economy (3 units) – Spring 2023

Lecture: Tu/Th : 11:00-12:20
Location: OHE 136
Discussion: Fr 12:00 – 12:50
OHE 136

Instructor: Randolph Hall
Office: GER 202b
Office Hours: Tu/Th 10:00-10:45 (in person)
W 4:00-5:00 (zoom)
<https://usc.zoom.us/j/92379010084?pwd=cldxY0ZEMm5VejY3cmdnTIJSSjU1QT09>
Meeting ID: 923 7901 0084
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Teaching Assistant: Mohammadmedhi Nahghiaei
Office: Online/ by appointment for in-person
Office Hours: M/TH 3:00- 4:00 PM (Zoom)
Meeting ID: 375 710 432
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Catalogue Course Description

Principles of economic analysis for choice of engineering alternatives and engineering systems. Pre-tax and after-tax economy studies.

Expanded Course Description

Through the

- Technologies they create and the companies they establish;
- Development programs they lead and the infrastructure they design; and
- Skills they apply in financial industries,

engineers must analyze the financial implications of choices and decisions.

Engineering economy is a course about making wise engineering decisions in light of predicted costs, returns, benefits and risks.

Students will learn the techniques of financial analysis in engineering through the methods of cash flow, tradeoff and cost-benefit analysis, as well as learn how to use spreadsheets for financial analysis. Students will also learn about applications of engineering economy through case studies, as well as discussion of current issues in

engineering, including the ethical implications of engineering decisions and non-monetary (e.g., environmental, safety, reputation) outcomes.

Learning Objectives

- Understand concepts of the time value of money, including present and future worth, cash flow equivalence and rates of return.
- Assess engineering alternatives and case flows in light of predicted costs, returns, benefits and risks.
- Use of Excel to analyze options in technology development, start-up creation, investment, equipment replacement and design
- Develop and analyze effects of taxes, inflation, depreciation, loan principal payments and loan interest payments.
- Trade-off and cost/benefit analysis
- Professional ethics in engineering decisions, including non-monetized effects of engineering decisions .

Prerequisite:

Upper division standing is preferred

Course Notes

Course will emphasize learning through case study analysis and discussion surrounding engineering decisions. Class participation is strongly encouraged.

Technological Proficiency and Hardware/Software Required

Microsoft Excel will be used throughout the course. No prior experience with Excel is required. Many instructional videos are available on use of Excel. Here are three:

Excel basics: <https://www.youtube.com/watch?v=rwbho0CgEAE>

Excel formulas and functions: <https://www.youtube.com/watch?v=7V4xF3zCSol>

Use of Excel for analysis of cash flow: <https://www.youtube.com/watch?v=19n-4yf9jIE>

USC Technology Rental Program

We realize that attending classes online and completing coursework remotely requires access to technology that not all students possess. If you need resources to successfully participate in your classes, such as a laptop or internet hotspot, you may be eligible for the university's equipment rental program. To apply, please submit an [USC Technology Rental Program Application](#).

USC Technology Support Links

[Blackboard help for students](#)

[Software available to USC Campus](#)

Required Materials

Cases in Engineering Economy, W.R. Peterson and T.G. Eschenbach, 2nd Edition, 2009.

Engineering Economic Analysis, D.G. Newman, T.G. Eschenbach and J.P. Lavelle, 14th Edition, 2020.

Tools and Weapons: The Promise and the Peril of the Digital Age, Brad Smith, 2021 – will be distributed free of charge.

Description and Assessment of Assignments

Group Case Study: Each student will submit one case study analysis during the semester as a group project, following guidelines in *Cases in Engineering Economy*. Each group will prepare a 20 minute presentation, which will be followed by questions from class members.

Students can join or form groups by signing up online at Signup Genius
(address to be announced)

First come first served -- 3 persons per group – sign up by January 27
(assignments will be random after deadline)

Written case reports should be succinct and clear, following the example provided in the book. Oral presentations should present the content of the case report with powerpoint slides. All group members must participate in the presentation, dividing time roughly equally among group members. **Group case study reports are due prior to the group presentation, and should be submitted in PDF form by email to the professor.**

Each student will receive a three part grade on a 10 point scale: (1) written case study (50%), (2) group oral presentation (30%), and (3) individual portion of presentation (20%). The TA and Professor will jointly assign the case study grade.

Students will receive comments within a few weeks after completing their presentation and assignment. A final grade will be assigned at the end of the semester, after all students have presented. Grading will take into consideration expected learning through the course of the semester.

Problem Sets: Problem sets will be taken from *Engineering Economic Analysis* and graded automatically through Oxford Learning Link Direct.

Participation

Class participation is strongly encouraged, particularly in case study discussion. Students will each week submit a self-assessment of their contributions. Grade for semester will be on a 5 point scale, with 5 reserved for those who make an exceptional contribution, 4 for those who synchronously attend most case study discussions and contribute on occasion, 3 for those who attend most discussions with limited contribution, and 2 or 1 for those who do not attend or submit self-assessments.

Grading Breakdown

Component	% of Grade
Group Case Study Presentation/Write Up	10
Problem Sets (12 assignments)	15
MT1	20
MT2	20
Final	25
Participation	10
Total	100

Grading Scale

Grade distribution will be similar to department average.

Assignment Submission

Problem sets will be completed online through Oxford Higher Education Learning Link Direct. .

Case studies must be submitted in hard copy at the start of class for date assigned.

Late submissions are not accepted.

Attendance

To gain the most from the course, students should participate in classroom discussion, which requires synchronous attendance.

Classroom norms

Students are encouraged to

- Raise their hands to ask questions and participate in discussion

- Share their outside-the-classroom experiences that related to the topics being presented or discussed
- Search and share information that helps students learn more about engineering economy
- Respect others by not interrupting or making it hard for other students to express their ideas or learn.
- Come to class prepared for the topic of the day.

Synchronous Session Recording Notice

Class sessions will be recorded and provided to all students asynchronously. DEN students are encouraged to participate synchronously.

Class videos will be posted in our Desire2Learn platform: [Login - USC Viterbi School of Engineering \(uscden.net\)](#). All students are expected to be able to access video information in our course page form here by simply logging in with your USC NetID after registering for the course. You may contact DEN@Viterbi technical support center office in case of any difficulty logging on or seeing our course at dentsc@usc.edu

Sharing of Course Materials Outside of the Learning Environment

The instructor hereby grants permission to students to share course materials that he created, subject to the terms of Creative Commons CC BY-NC attribution-ShareAlike license, as specified here: <https://creativecommons.org/licenses/by-nc/4.0/> . The course instructor does not grant permission for the distribution of course materials that he created beyond the CC BY-NC license. Commercial use or posting on commercial websites, such as CourseHero, are not permitted.

COVID-19 Safety

All university COVID-19 safety protocols will be followed and enforced in the classroom. The latest protocols can be found at [USC COVID-19 resource center website](#). In person instruction will be used to the maximum extent permitted by the university.

Course Evaluation

Course evaluation occurs at the end of the semester university-wide. It is an important review of students' experience in the class.

Course Schedule: A Weekly Breakdown

Week	Topics/Daily Activities	EEA Chapt	CEE Chapt	PS Due	Topic
1	Jan 10,12	1,2	na	Na	Making Economic Decisions, Estimating Costs & Benefits, Innovation & Ethics
2	Jan 17,19	3,4	na	1/16	Interest and Equivalence Excel for Cash Flows Repeated Cash Flows
3	Jan 24,26	4	1-4	1/23	Repeated Cash Flows, Case Study Methods
4	Jan 31, Feb 2	5	na	1/30	Present Worth Analysis
5	Feb 7,9	5,6	na	2/10	Present Worth Analysis
6	Feb 14,16	6	na	na	Midterm 1, 2/14 Annual Cash Flow Analysis
7	Feb 21,23	7	na	2/20	Rate of Return Analysis
8	Feber 28,Mar2	8	Case	2/27	Choosing the Best Alternative
9	Mar 7,9	9	Case	3/6	Other Analysis
10	Mar 21,23	15	Case	3/20	Minimum Annual Rate of Return
11	Mar 28,30	15,11	na	na	Midterm 2, 3/28 Depreciation
12	Apr 4,6	11,12	Case	4/7	Taxes
13	Apr 11,13	14	Case	4/14	Inflation & Price Change
14	Apr 18,20	16	Case	na	Public Sector Decision Making
15	Apr 25,27	n/a	Case	4/24	Summary

Academic Conduct

Plagiarism – presenting someone else’s ideas as your own, either verbatim or recast in your own words – is a serious academic offense with serious consequences. Please familiarize yourself with the discussion of plagiarism in [SCampus in Part B, Section 11](#), “Behavior Violating University Standards.” Other forms of academic dishonesty are equally unacceptable. See additional information in [SCampus and university policies](#) on scientific misconduct.

Disability Services and Programs:

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 the TA as early in the semester as possible. DSP is located in STU 301 and is open 8:30am – 5:00pm Monday through Friday. The phone number for DSP is 213.740.0776.

About the Instructor: Randolph Hall

Deans Professor, Epstein Department of Industrial and Systems Engineering
Director and Senior Research Fellow
Center for Risk and Economic Analysis of Threats and Emergencies (CREATE)



As Vice President of Research for 14 1/2 years, Dr. Hall led research initiatives across the university, overseeing research advancement, administration, and research ethics. He led the creation of USC's strategic plans for diversity and inclusion in research and scholarship, research administration systems (TARA), science and technology facilities, and alignment of health programs across the university. His other initiatives included rigor and transparency in the conduct of research, research mentoring, and the reinvention of research practices through creativity and collaboration. As Vice President, Dr. Hall integrated USC's central research offices into a single organization, created the DC Office of Research Advancement and the Center for Excellence in Research, and helped establish many new research centers through competitive external funding.

Dr. Hall has served in numerous national research leadership groups, including the Association of American Universities and the Association of Academic Health Centers. He also served as Board Chair, and currently serves as senior fellow, for the University Industry Demonstration Partnership (an international industry/university membership organization). He is a member of the National Academies Roundtable on Aligning Incentives for Open Science.

As Professor in the Epstein Department of Industrial and Systems Engineering, Dr. Hall's current research focuses on how universities innovate in their practices for education, research, and clinical care, and how they overcome obstacles to change. He is also conducting research on COVID-19 transmission and healthcare delivery. Much of his research is conducted with USC undergraduates. Other research experience includes founder/principal investigator for two national research centers: CREATE and the National Center for Metropolitan Transportation Research (METRANS). As chair of ISE, Hall led Industrial and Systems Engineering to become the first named academic department at the University of Southern California, having risen to a top-15 department nationally, propelled by a major endowment gift from USC Viterbi alum and USC Trustee Daniel Epstein.

Dr. Hall is the author of *Queueing Methods for Services and Manufacturing* and editor of the *Handbook of Transportation Science*, *Patient Flow, Reducing Delay in Healthcare Delivery*, and the *Handbook of Healthcare System Scheduling*. He is author of the forthcoming book: *Breaking Tradition: Trust and Innovation in the American University*. He has numerous research publications in the fields of innovation, transportation, highway automation, logistics, healthcare operations, system engineering, and queueing. Dr. Hall obtained all of his degrees (BS, MS, and PhD) from the University of California at Berkeley.

<https://www.linkedin.com/in/randolph-hall-usc/>

<https://www.researchgate.net/profile/Randolph-Hall>

<https://covid19datasource.usc.edu/>

Support Systems

[Counseling and Mental Health](#)

phone number (213) 740-9355

On call 24/7

Free and confidential mental health treatment for students, including short-term psychotherapy, group counseling, stress fitness workshops, and crisis intervention.

[National Suicide Prevention Lifeline](#)

Phone number 1 (800) 273-8255

On call 24/7

Free and confidential emotional support to people in suicidal crisis or emotional distress 24 hours a day, 7 days a week.

[Relationship and Sexual Violence Prevention Services \(RSVP\)](#)

Phone Number (213) 740-9355(WELL), press "0" after hours

On call 24/7

Free and confidential therapy services, workshops, and training for situations related to gender-based harm.

[USC Office of Equity, Equal Opportunity, and Title IX](#)

Phone number (213) 740-5086

Title IX Office (213) 821-8298

Information about how to get help or help someone affected by harassment or discrimination, rights of protected classes, reporting options, and additional resources for students, faculty, staff, visitors, and applicants.

[Reporting Incidents of Bias or Harassment](#)

Phone number (213) 740-5086 or (213) 821-8298

Avenue to report incidents of bias, hate crimes, and microaggressions to the Office of Equity, Equal Opportunity, and Title IX for appropriate investigation, supportive measures, and response.

[The Office of Disability Services and Programs](#)

Phone number (213) 740-0776

Support and accommodations for students with disabilities. Services include assistance in providing readers/notetakers/interpreters, special accommodations for test taking needs, assistance with architectural barriers, assistive technology, and support for individual needs.

[USC Campus Support and Intervention](#)

Phone number (213) 821-4710

Assists students and families in resolving complex personal, financial, and academic issues adversely affecting their success as a student.

[Diversity at USC](#)

Phone number (213) 740-2101

Information on events, programs and training, the Provost's Diversity and Inclusion Council, Diversity Liaisons for each academic school, chronology, participation, and various resources for students.

[USC Emergency](#)

UPC phone number (213) 740-4321

HSC phone number (323) 442-1000

On call 24/7

Emergency assistance and avenue to report a crime. Latest updates regarding safety, including ways in which instruction will be continued if an officially declared emergency makes travel to campus infeasible.

[USC Department of Public Safety](#)

UPC phone number (213) 740-6000

HSC phone number (323) 442-1200

On call 24/7

Non-emergency assistance or information.