ISE 460 Engineering Decisions, Economics & Ethics (4 units)

Lectures: 2 hours, twice per week
Discussion: 1 hour, once per week

Instructor:	Randolph Hall
Office:	GER 202b
Office Hours:	Tu/Th 10:00-10:45 (in person or zoom)
	W 4:00-5:00 (zoom)
	https://usc.zoom.us/j/91701703822?pwd=MWsvNVd4aGllZUNIL25NT3MydEtjdz09
	Meeting ID: 917 0170 3822
	Passcode: 512082
Contact Info:	rwhall@usc.edu
Teaching Assistant:	TBD
Office:	TBD
Office Hours:	TBD
Contact Info:	TBD

Catalogue Course Description

Principles of economic analysis and decision analysis for engineering systems, including applications in financing, developing and comparing new technologies.

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 and ethical implications of choices and decisions.

The course focuses on making wise engineering decisions in light of predicted costs, returns, and benefits, as well as consequences that are not easily quantified or are inherently uncertain.

Students will learn advanced techniques of economic analysis in engineering through methods of tradeoff, cost-benefit and decision analysis under uncertainty. Students will also learn about applications through case studies, as well as through discussion of current issues in engineering, including the ethical and non-monetary implications of engineering decisions.

Learning Objectives

- Assess engineering alternatives in light of predicted costs, returns, benefits and risks.
- Use Excel to analyze options in technology development, start-up creation, investment, equipment replacement and design, including sensitivity analysis.
- Develop and analyze effects of taxes, inflation, depreciation, loan principal payments and loan interest payments.
- Utilize methods of system engineering to develop and analyze alternative investments in complex situations.
- Analyze trade-offs and cost/benefit ratios.
- Analyze complex sequential decisions under uncertainty, and analyze effects of risk and uncertainty on decisions.
- Analyze decisions with multi-attribute objectives, monetary and non-monetary.
- Develop professional ethics in engineering decisions, including assessment of non-monetized consequences.

Prerequisites:

ISE 220 and ISE 315 (note: for 2024, contact professor to request waiver)

Required Texts

Foundations in Decision Analysis, R.A. Howard and A.E. Abbas, 2015. (denoted FDA in the Class Schedule) - ISBN-13: 9780133485950

Engineering Economic Analysis, D.G. Newman, T.G. Eschenbach and J.P. Lavelle, 14th Edition, 2019. (denoted EEA in the Class Schedule) - ISBN-13: 978-0190931919

[note: texts may be available in both on-line and print versions. On-line access may be available through publisher websites]

Description and Assessment of Assignments

Group Case Study Assignment: Each student will submit one group case study analysis. 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, and include a statement as to each person's contribution. 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 one week of 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 course text books. The course will include 12 problem sets.

Participation Self Assessment: Class participation is expected, through attendance <u>and</u> contributions. Contributions can either be an in-class question or comment <u>or</u> a posting on the D2L on-line discussion board. Except for DEN students, all students are expected to attend in person.

Beginning in week 3 of the course: Students will submit a weekly self-assessment of their contributions through D2L, <u>due on Saturday</u>.
- Students receive the maximum 2 points credit each week if they have: attended all class sessions and also made a substantive contribution to class discussion.
- Students receive 1 point credit for attendance without a contribution, or contribution without attendance.
- Students receive 0 points if self-assessment is not submitted, <u>or</u> if there has neither been contribution nor attendance.

The attendance requirement is forgiven when students are ill or have a conflicting requirement to be elsewhere. The reason for non-attendance should be explained in the weekly self-assessment.

Grading Breakdown

Assignment	% of Grade
Group Case Study Presentation/Write Up	10%
Problem Sets	15%
Midterm1	20%
Midterm2	20%
Final	25%
Participation	10%
Total	100%

Grading Scale

Final letter grade distribution will be similar to the department average.   Each assignment will receive a numerical grade. Numerical grades will be converted into a final letter grade at the end of the semester.

Assignment Submission

Problem sets are submitted online, through D2L. Late submissions are not accepted.

Case studies must be submitted in by email prior to the start of class for date assigned.

Classroom Norms

Students are encouraged to

- Raise their hands to ask questions and participate in discussion
- Share their outside-the-classroom experiences that relate 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 ifnromation 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.

For non-DEN students, on-line viewing of courses does not substitute for in-person attendance, unless the student has been excused from attendance.

Sharing of Course Materials Outside of the Learning Environment

The instructor hereby grants permission to students to share course materials, other than examinations, 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.**

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	Readings	Assignments
1	Decision Making Rates of Return Excel Review Introduction to Engineering Ethics	EEA 1,2,7	
2	Choosing Alternatives	EEA 8	PS1
3	Minimum Rate of Return and Other Measures	EEA 9 EEA 15	PS2
4	Depreciation, After Tax	EEA 11, 12	PS3
5	Inflation	EEA 14	PS4
6	Public Sector	EEA 16	PS5, Midterm1
7	Decision Analysis Basics	FDA 1-5	PS6
8	Decisions Under Uncertainty	FDA 6-7	PS7
9	Risk Attitudes	FDA 10-12	PS8
10	Multi-attribute Decisions	FDA 26-28	PS9
11	Case Study Analysis Methods	CEE1-4	PS10, Midterm2
12	Sensitivity Analysis	FDA12,37	PS11
13	Case Studies	Based on student selections	PS12/ Case Study
14	Case Studies	Based on student selections	Case Study
15	Case Studies Course Summary	Based on student selections	Case Study
FINAL	Refer to the final exam schedule in the USC *Schedule of Classes* at classes.usc.edu.		

Statement on Academic Conduct and Support Systems

Academic Integrity:
The University of Southern California is a learning community committed to developing successful scholars and researchers dedicated to the pursuit of knowledge and the dissemination of ideas. Academic misconduct, which includes any act of dishonesty in the production or submission of academic work, comprises the integrity of the person who commits the act and can impugn the perceived integrity of the entire university community. It stands in opposition to the university's mission to research, educate, and contribute productively to our community and the world.

All students are expected to submit assignments that represent their own original work, and that have been prepared specifically for the course or section for which they have been submitted. You may not submit work written by others or "recycle" work prepared for other courses without obtaining written permission from the instructor(s).

Other violations of academic integrity include, but are not limited to, cheating, plagiarism, fabrication (e.g., falsifying data), collusion, knowingly assisting others in acts of academic dishonesty, and any act that gains or is intended to gain an unfair academic advantage.

The impact of academic dishonesty is far-reaching and is considered a serious offense against the university. All incidences of academic misconduct will be reported to the Office of Academic Integrity and could result in outcomes such as failure on the assignment, failure in the course, suspension, or even expulsion from the university.

For more information about academic integrity see the student handbook or the Office of Academic Integrity's website, and university policies on Research and Scholarship Misconduct.

Please ask your instructor if you are unsure what constitutes unauthorized assistance on an exam or assignment, or what information requires citation and/or attribution.

Students and Disability Accommodations:

USC welcomes students with disabilities into all of the University's educational programs. The Office of Student Accessibility Services (OSAS) is responsible for the determination of appropriate accommodations for students who encounter disability-related barriers. Once a student has completed the OSAS process (registration, initial appointment, and submitted documentation) and accommodations are determined to be reasonable and appropriate, a Letter of Accommodation (LOA) will be available to generate for each course. The LOA must be given to each course instructor by the student and followed up with a discussion. This should be done as early in the semester as possible as accommodations are not retroactive. More information can be found at osas.usc.edu. You may contact OSAS at (213) 740-0776 or via email at osasfrontdesk@usc.edu.

Support Systems:

Counseling and Mental Health - *(213) 740-9355 – 24/7 on call*
Free and confidential mental health treatment for students, including short-term psychotherapy, group counseling, stress fitness workshops, and crisis intervention.

988 Suicide and Crisis Lifeline - *988 for both calls and text messages – 24/7 on call*
The 988 Suicide and Crisis Lifeline (formerly known as the National Suicide Prevention Lifeline) provides free and confidential emotional support to people in suicidal crisis or emotional distress 24 hours a day, 7 days a week, across the United States. The Lifeline is comprised of a national network of over 200 local crisis centers, combining custom local care and resources with national standards and best practices. The new, shorter phone number makes it easier for people to remember and access mental health crisis services (though the previous 1 (800) 273-8255 number will continue to function indefinitely) and represents a continued commitment to those in crisis.

Relationship and Sexual Violence Prevention Services (RSVP) - *(213) 740-9355(WELL) – 24/7 on call*
Free and confidential therapy services, workshops, and training for situations related to gender- and power-based harm (including sexual assault, intimate partner violence, and stalking).

Office for Equity, Equal Opportunity, and Title IX (EEO-TIX) - *(213) 740-5086*
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 - *(213) 740-5086 or (213) 821-8298*
Avenue to report incidents of bias, hate crimes, and microaggressions to the Office for Equity, Equal Opportunity, and Title for appropriate investigation, supportive measures, and response.

The Office of Student Accessibility Services (OSAS) - *(213) 740-0776*
OSAS ensures equal access for students with disabilities through providing academic accommodations and auxiliary aids in accordance with federal laws and university policy.

USC Campus Support and Intervention - *(213) 740-0411*
Assists students and families in resolving complex personal, financial, and academic issues adversely affecting their success as a student.

Diversity, Equity and Inclusion - *(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: (213) 740-4321, HSC: (323) 442-1000 – 24/7 on call*

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: (213) 740-6000, HSC: (323) 442-1200 – 24/7 on call
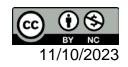Non-emergency assistance or information.

Office of the Ombuds - (213) 821-9556 (UPC) / (323-442-0382 (HSC)
A safe and confidential place to share your USC-related issues with a University Ombuds who will work with you to explore options or paths to manage your concern.

Occupational Therapy Faculty Practice - (323) 442-2850 or otfp@med.usc.edu
Confidential Lifestyle Redesign services for USC students to support health promoting habits and routines that enhance quality of life and academic performance.

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: Managing Change and Innovation Inside Universities*. 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.

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