

**ISE 561**  
**ECONOMIC ANALYSIS OF ENGINEERING**  
**PROJECTS**

**Units: 3 – Spring 2022**

**Tuesday & Thursday 11:00 am – 12:20 pm**

**Location: OHE 100C & Online**

**Instructor: Dr. Shalini Gupta**

**Office: GER 207**

**Office Hours: Online via zoom**

**Thursday- 4 pm – 5 pm**

**Contact Info: [shalinig@usc.edu](mailto:shalinig@usc.edu)**

**Teaching Assistant:**

**Office:**

**Office Hours:**

**Contact Info:**

### **Course Description**

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. 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.

### **Learning Objectives**

- You will learn the following topics. Introduction to engineering economy
- Interest factors and equivalence
- Depreciation and depreciation models

- Tax considerations
- Evaluation of a single investment (including internal rate of return, net present value, cash flows)
- Revenue requirements
- Capital budgeting
- Break-even models (linear and nonlinear)
- Cost comparisons
- Decision Making Under Uncertainty

### **Student Learning Outcomes:**

- Students will be able to determine the equivalent value of money at a specified time given the timing of deposits and interest value.
- Students will be able to select the most attractive interest rate in various compound and simple interest forms.
- Students will be able to determine if an independent investment opportunity is economically attractive.
- Students will be able to determine the least-cost alternative of multiple solutions in a cost comparison scenario.
- Students will be able to identify the best project(s) to perform from a set of potential projects that are independently economically attractive.

### **Course Notes**

D2L

### **Required Readings and Supplementary Materials**

The relevant study material will be provided.

- Principles of Engineering Economic Analysis, White, J.A., K.E. Case, and D.B. Pratt, 6<sup>th</sup> edition, John Wiley & Sons, Inc., 2012.
- Valerie Tardiff and Paul Jensen, Operations Research Models and Methods
- Economic Analysis of Capital Expenditures for Managers & Engineers, G.T. Stevens, Jr.
- Principles of Engineering Economic Analysis, White, J.A., K.E. Case, and D.B. Pratt, 6<sup>th</sup> edition, John Wiley & Sons, Inc., 2012.
- Engineering Economy, Sixth Edition, Leland blank and Anthony Tarquin
- Engineering Economy Ninth Edition, G.J. Thuesen and W.J. Fabrycky

- Engineering Economics Jose A. Sepulveda, William E. Souder, Byron S. Gottfried

### **Description and Assessment of Assignments**

**Course Material:** All assigned sections of the texts, plus topics discussed in lecture by the instructor.

**Exams:** Each exam will cover the material presented up to and including the preceding assignments. Points will be assigned to each section of the exam. No retakes will be allowed. No make-up exam will be given. The exams will not be comprehensive. All answers should be clearly and fully justified. If the steps are not clear, points will be deducted even if the final answer is correct. Any person caught cheating on an examination will be referred to judicial affairs.

**Projects:** The composition of project team will be arranged based on the final enrollment of the class. Additional details and instructions will be made available during the course. Each student must adhere to the following schedule of key milestones and submittals. Work is to be submitted via email unless students are otherwise instructed. Students will submit a comprehensive report at the end of the semester. The project is designed to exercise the skills which you develop over the course of the semester. Additional details will be provided during the course.

**Homework:** Homework problems will address concepts and calculations related to topics covered in the previous week's classes. Some problems will be short, quick calculations; others will be more extensive. The specific assignment will be posted on D2L. Due dates (typically one week later) will be provided on the assignment. Late homework will not be accepted. No exceptions except institution-established emergency reasons; credit for such late homework is with the discretion of the instructor. Everybody has to write his/her own solution independently and make sure to fully understand it. Exchanging solutions, consulting with people other than class members, finding solutions on the web or elsewhere, etc. are not allowed. Violations result in losing the credit for the entire homework set in addition to a significant percentage of the overall course grade, all with the discretion of the instructor. All answers should be clearly and fully justified. If the steps are not clear, points will be deducted even if the final answer is correct.

## **Grading Breakdown**

Exams (1 and 2)	20 % Each
Exams (3)	35 %
Project	20 %
Homework	5 %
Total	100%

## **Grading Scale (Example)**

Course final grades will be determined using the following scale

A	95-100
A-	90-94
B+	87-89
B	83-86
B-	80-82
C+	77-79
C	73-76
C-	70-72
D+	67-69
D	63-66
D-	60-62
F	59 and below

## **Grading Timeline**

7 – 8 Days

## **Academic Integrity**

Any form of cheating, plagiarism, personation, falsification of a document as well as any other form of dishonest behavior related to the obtention of academic gain or the avoidance of evaluative exercises committed by a student is an academic offence under the Academic Code of Conduct and may lead to severe penalties up to and including suspension and expulsion. As examples only, you are not permitted to:

- Falsify data or research results
- Sharing assignments
- Benefit from others' work
- Unfair advantage
- External assistance
- Possession of solutions
- Copy from anywhere without indicating where it came from
- Let another student copy your work and then submit it as his/her own
- Hand in the same assignment in more than one class
- Have unauthorized material/ collaboration or devices in an exam.
- Copy from someone's else exam/assignments
- Communicate with another student during an exam
- Add or remove pages from an examination booklet or take the booklet out of an exam room
- Acquire exam or assignment answers or questions
- Write an exam for someone else or have someone write an exam for you
- Submit false documents such as medical notes or student records

You are subject to the Academic Code of Conduct.

## **Student's Responsibilities**

- Students are required to wear a mask in class. Refusal to comply with university masking policy is a disciplinary matter.
- Students are expected to read the assigned material. Some material may only be covered in class and not made available on the course website.
- Students are expected to be respectful of other people's opinions and to express their own views in a calm and reasonable way. Disruptive behavior will not be tolerated.
- Students are expected to be familiar with the Academic Code of Conduct.

To quote from a USC guidebook: "Behavior that persistently or grossly interferes with classroom activities is considered disruptive behavior, and may be subject to disciplinary action. Such behavior inhibits other students' ability to learn, and an instructor's ability to teach. A student responsible for disruptive behavior may be required to leave class pending discussion and resolution of the problem, and may be reported to the Office of Student Judicial Affairs for disciplinary action."

## Course Schedule: A Weekly Breakdown

<u>Week</u>	<u>Date</u>	<u>Topic</u>	<u>Text Chapters</u>
0	11 Jan.	Introduction and Interest	Chapter 2
1	13 Jan.	Interest and Interest Factors	Chapter 2
	18 Jan.	Interest and Interest Factors	Chapter 2
2	20 Jan.	Interest and Interest Factors	Chapter 2
	25 Jan	Depreciation	Chapter 3
3	27 Jan.	Depreciation	Chapter 3
	1 Feb.	Tax Considerations	Chapter 4
4	3 Feb.	Tax Considerations	Chapter 4
	8 Feb.	Tax Considerations	Chapter 4
<b>5</b>	<b>10 Feb.</b>	<b>Examination 1</b>	
	15 Feb.	Economic Evaluation of a Single Project	Chapter 5
6	17 Feb.	Economic Evaluation of a Single Project	Chapter 5
	22 Feb.	Economic Evaluation of a Single Project	Chapter 5
7	24 Feb.	Minimum Annual Revenue Requirements	Chapter 6
	1 March	Minimum Annual Revenue Requirements	Chapter 6
8	3 March	Capital Budgeting	Chapters 7
	8 March	Capital Budgeting	Chapters 7
9	10 March	Capital Budgeting	Chapters 7
	<b>15 March</b>	<b>Spring recess</b>	
<b>10</b>	<b>17 March</b>	<b>Spring recess</b>	
	22 March	Break Even Models	Chapters 8
<b>11</b>	<b>24 March</b>	<b>Examination 2</b>	
	29 March	Break Even Models	Chapters 8
12	31 March	Cost Comparisons	Chapters 9
	5 April	Cost Comparisons	Chapters 9
13	7 April	Cost Comparisons	Chapters 9
	12 April	Cost Comparisons	Chapters 9
14	14 April	Decision Under Uncertainty	Chapters 15
	19 April	Decision Under Uncertainty	Chapters 15
15	21 April	Decision Under Uncertainty	Chapters 15
	26 April	Project Presentations	
	28 April	Project Presentations	

## Statement on Academic Conduct and Support Systems

### 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” [policy.usc.edu/scampus-part-b](http://policy.usc.edu/scampus-part-b). Other forms of academic dishonesty are equally unacceptable. See additional information in SCampus and university policies on scientific misconduct, [policy.usc.edu/scientific-misconduct](http://policy.usc.edu/scientific-misconduct).

### Support Systems:

*Counseling and Mental Health - (213) 740-9355 – 24/7 on call*

[studenthealth.usc.edu/counseling](http://studenthealth.usc.edu/counseling)

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

*National Suicide Prevention Lifeline - 1 (800) 273-8255 – 24/7 on call*

[suicidepreventionlifeline.org](http://suicidepreventionlifeline.org)

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 and Services (RSVP) - (213) 740-9355(WELL), press “0” after hours – 24/7 on call*

[studenthealth.usc.edu/sexual-assault](http://studenthealth.usc.edu/sexual-assault)

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

*Office of Equity and Diversity (OED)- (213) 740-5086 | Title IX – (213) 821-8298*

[equity.usc.edu](http://equity.usc.edu), [titleix.usc.edu](http://titleix.usc.edu)

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. The university prohibits discrimination or harassment based on the following *protected characteristics*: race, color, national origin, ancestry, religion, sex, gender, gender identity, gender expression, sexual orientation, age, physical disability, medical condition, mental disability, marital status, pregnancy, veteran status, genetic information, and any other characteristic which may be specified in applicable laws and governmental regulations. The university also prohibits sexual assault, non-consensual sexual contact, sexual misconduct, intimate partner violence, stalking, malicious dissuasion, retaliation, and violation of interim measures.

*Reporting Incidents of Bias or Harassment - (213) 740-5086 or (213) 821-8298*

[usc-advocate.symplicity.com/care\\_report](http://usc-advocate.symplicity.com/care_report)

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

*The Office of Disability Services and Programs - (213) 740-0776*

[dsp.usc.edu](http://dsp.usc.edu)



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 Support and Advocacy - (213) 821-4710*

[uscса.usc.edu](http://uscса.usc.edu)

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

*Diversity at USC - (213) 740-2101*

[diversity.usc.edu](http://diversity.usc.edu)

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*

[dps.usc.edu](http://dps.usc.edu), [emergency.usc.edu](http://emergency.usc.edu)

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) 442-120 – 24/7 on call*

[dps.usc.edu](http://dps.usc.edu)

Non-emergency assistance or information.