ISE 495abx
Senior Project Design

Spring 2023 — Friday - 9:00 am - 11:50 am
Units: 4 (earned at conclusion of "b" semester)
Location: VHE 217

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Course Description

Preparation and development of the senior project proposal. Open to those who have attained senior standing in industrial and systems engineering.

This course will prepare students for engineering practice through a major design experience based on the knowledge and skills acquired in earlier course work and incorporating appropriate engineering standards and multiple realistic constraints. This activity includes:

- Preparation and development of a senior project proposal.
- Identification and definition of appropriate engineering standards.
- Identification of constraints that will help define and bound the project proposal.

This course serves as the experiential capstone in USC's undergraduate ISE curriculum. Students apply their classroom knowledge to a real project in a real ISE work setting, e.g., on the manufacturing floor, in a healthcare clinical setting, at logistics distribution facilities, etc.

USC's first priority is the education of our students. Our goal includes graduating engineers capable of serving the public good, reaffirming their commitment to core academic principles and equipping our graduates to face contemporary global challenges.

Prerequisites

ISE225 – Engineering Statistics	Either DSO 435 or ISE 382 – Enterprise Data Architecture / Database Systems
ISE460 – Engineering Economy	

Learning Objectives

The students in ISE 495abx will learn to:
- **handle difficulties** associated with defining and organizing a realistic problem statement
- **manage** impediments in obtaining information and approval
- **present and sell** ideas to higher-level management
- convert a project's worth into **financial indicators**
- understand the **importance of continuous exchange** between engineers, management, and employees in solving an existing problem, given a set of constraints
- gain experience in the **organization and management of a technical project** that includes application of industrial engineering tools and methods, time and cost estimates, communication techniques, and project monitoring and follow-up
- **navigate the politics** of a company and how it impacts a team's progress
- **meet aggressive deadlines** with a multidisciplinary team effort
- improve project-based presentation skills, both in-class and in company settings
- establish **contacts** with local industry
- recognize the need for **application of industrial engineering principles** and their corresponding value to an organization
- **describe opportunities** for applying industrial engineering principles to the client's future work assignments.

Format of the ISE Senior Project Design Sequence

The structure of the **ISE 495abx** sequence follows a typical systems development life cycle (SDLC). The SDLC process is a multistep, iterative process structured in a methodical way to provide a framework for technical and non-technical activities to deliver a quality system. The SDLC methodology considers the organizational, personnel, policy, and budgeting constraints of systems project design. The benefits of this methodology have been shown in managing complex projects by providing clear, distinct, and defined phases of work in the element of planning, designing, testing, deploying, and maintaining complex systems.

Students are organized into teams and each team is assigned to solve a representative industrial and systems engineering problem for a client, typically a local firm, nonprofit entity, or public agency. Any number of different manufacturing, service, or business enterprises in any sector might be a source of projects. The team spends an academic year defining the problem and approach and executing their approach to the problem. This is a project activity. The faculty delivering the course act as coaches, offering feedback at specific milestones in the process, and meeting regularly with individual teams to discuss activities, progress, and options; and to offer advice. These meetings are typically weekly and may be scheduled for standing lecture periods or for times feasible for the coaches and teams. At least two coaches may be present for each PDR and CDR presentation by the various teams.

Case studies are assigned throughout the term. These are intended to provide situational context to assist students unfamiliar with working in industry.

Students completing **ISE 495ax** receive a grade of IP (In Progress) at the conclusion of the semester. A letter grade is assigned for both **ISE 495ax** and **495bx** at the conclusion of the second semester in the sequence. Students who complete **ISE 495ax** but do not continue in **ISE 495bx** the following semester receive a grade of NC (No Credit) in **ISE 495ax**. A grade of NC has no impact on a student's GPA, but no credit is earned for the course.

Recommended Preparation:

Both ISE 225 and ISE 460 are pre-requisites for this course. Techniques and tools used in those courses may be used extensively in this course. Use of database architecture or database system may also be used in your project. Your knowledge of these topics and ready access to these references will be of assistance in successfully completing your project.

Required Readings, Supplementary Materials

Product Development for Technical and Non-Technical Managers and Practitioners, 1st Ed., Lu, P. Kendall Hunt (2021), ISBN: 978-1-7924-7707-2. Available at USC bookstore, Amazon or from publisher at: https://tinyurl.com/4rc99deh Rentals are not available at this time.

ISE 495ax is Web-Enhanced with high reliance on Blackboard. Readings and supplementary materials will be posted to Blackboard as needed, accompanied by a posting on Announcements.   All assignments will be submitted via Blackboard. No assignments will be accepted by email or paper unless arrangements have been made in advance. Copies of lecture slides and other class information will be posted on Blackboard. Supplementary materials and other reference guidance will be posted to Blackboard under *Content*.

Description and Assessment of Assignments

Major Project Milestones

Class	Milestone	Grade
495 a	System Functional Review (SFR)	P/F
495 a	Preliminary Design Review (PDR)	P/F
495 b	Critical Design Review (CDR)	Grade (see rubric*)
495 b	Test Readiness Review (TRR)	Grade (see rubric*)
495 b	System Level Review (SVR)	Grade (see rubric*)

Grading Breakdown

Course Component	Weight
System Functional Review (client approval required before progressing to next step) (SFR)	P/F
Preliminary Design Review & Exit (client approval required before progressing to next step) (PDR)	P/F
Critical Design Review and Exit (client approval required before progressing to next step) (CDR) • Presentation (10%) • Paper (10%)	20%
Test Readiness Review (client approval required before progressing to next step) (TRR) • Presentation (5%) • Paper (15%)	20%
System Verification Review (client approval required before progressing to next step) (SVR)	20%
Client Review • Team (15%) • Individual (5%)	20%
Instructors' Evaluation (Individual) • Case Study & Participation (5%) • Interim feedback from the sponsor (5%) • Final Report (10%)	20%
Total (4-unit course; grades posted at end of 495b)	100%

Punctuality is considered in the evaluation of performance. This relates to meetings of your team, punctual class attendance, and scheduled meetings with the instructor(s). Absence or extreme tardiness of a chronic nature will be noted and result in a lower Instructors Evaluation grade. There are no extra credit assignments or makeup assignments for missed or late work. A score of "0" will be assigned.

You must submit a completed and approved PDR to receive an IP (In Progress) grade for **ISE 495ax**. If circumstances beyond the team's control emerging after the 12th week of class, preclude this outcome, a grade of IN (Incomplete) will normally be issued, to be cleared as soon as possible during the next academic semester. Incomplete grades can usually be avoided.

Grading Scale

Course final grades will be determined using the following scale

A	93 – 100
A-	90 - 92
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

*Project Review Grading Rubric

	Below minimum standard	Meets minimum standard	Standard	Exceeds standard	Comprehensive	
Content	Content insufficient to support most aspects of the review	Content inadequately sufficient to all aspects of the review	Content sufficient to support cursory review	Detail content above average to support all aspects of the review	Sufficient content is provided to support a thorough analysis of entire review	5
Analysis and Research	Little to no reflection or examination	Limited reflection and examination	Sufficient analysis to present review but limits reflection and examination	Thorough analysis, reflection & examination	Insightful, thorough analysis with deep examination & reflection	5
Organization / Structure	Segments of review organized but confused and incomplete	Segments of review organized but unclear or lacking data	Structure and organization clear & helpful to understanding many aspects of the review	All topics are included and organized in a clear logical manner in full support of the review	Review is well organized, easy to follow. Question is succinctly framed, and solutions are obvious	5

						5
Presentation Quality / Clarity	Unclear and difficult to understand	Able to verbalize the nature and issues of the review but otherwise not able to adequately support conclusions	Able to verbalize the general nature and issues of the review	Generally clear and concise. Topics, issues, and questions are effectively organized and delivered. Recommendations & conclusions supported in most areas	Presentation is clear & concise. Incorporates appropriate content and references to fully support recommendations & conclusions	
Writing Quality and Clarity	Content is not clear and organized with errors and omissions	Content is organized but contains errors and omissions	Content contains sufficient detail & substance to address review goals. Few errors or omissions	Writing is generally clear with a minimum of unnecessary content. Few errors in grammar, punctuation, or spelling	Writing is crisp, clear and succinct. Incorporates active voice when appropriate with supporting ideas and examples. No errors in grammar, punctuation, or spelling	10
						30

Case Study Grading Rubric

	Below minimum standard	Meets minimum standard	Standard	Exceeds standard	Comprehensive	
Content	Content insufficient to support case	Content inadequate to sufficiently support case	Content sufficient to support case	Content above average to support full case analysis	Content to support through analysis and deep examination	5

Analysis and Research	Little to no reflection or examination	Limited reflection and examination	Sufficient analysis to superficially present case but limits reflection and examination	Thorough analysis, reflection, and examination	Insightful and thorough analysis and deep examination and reflection	5
Organization / Structure	Segments of study unorganized, confused, or incomplete	Segments of study organized but unclear or incomplete	Structure and organization clear and helpful to understanding the issues of the case	All topics are included and organized in a clear logical manner	Study is well organized, easy to follow. Crucial factors involved in the case are easy to follow	5
Presentation Quality / Clarity	Unclear and difficult to understand	Able to verbalize the nature and issues of the case but otherwise not able to adequately address the case	Able to verbalize the general nature and issues of the case	Generally clear and concise. Topics, issues, and questions are effectively organized and delivered	Presentation is clear & concise incorporating content & references to support discussion across domains	5
					Total Points	20

In-Class Participation:

Class participation is expected and will be incorporated into your grade. For any given case, particular students may be identified in advance as "lead discussants". Lead students should expect to be called upon frequently during that session to present perspectives on the case. Should a "lead discussant's" performance not meet expectations then they may be designated lead students' multiple times. Please note that class participation is not the same as class attendance, although one could hardly participate if frequently absent! Up to two excused class absences may occur without a negative impact on your grade. Any unexcused class absences, or more than two excused class absences, will have a very negative impact on class participation grade. During case discussion there is a "no open" laptop (or similar device) policy. Persistent in-class texting or Web surfing will typically result in an "F" grade for

participation and/or other sanctions. Use the following criteria as a guide to your class participation grade:

"A" (range: 90-100)
Contributes each meeting to class participation in a way that clearly indicates knowledge and appropriate application of course concepts (e.g., comparative advantage, industry clusters, market imperfections theory, high-context effect). Consistently demonstrates a superior quality of analysis and logical development of train of thought. Frequently takes the lead in discussions related to assigned cases.

"B" (range: 80-89.99)
Contributes quite frequently to class participation. Demonstrates an informed knowledge of course concepts but is not as insightful as a "A" student or as frequent in participation.

"C" (range: 70-79.99)
Occasionally contributes to class discussion, but often, only offers personal perspectives not grounded in class content. Rarely initiates class discussion.

"D" (range: 60-69.99)
Attends class frequently but rarely contributes to class discussion.

"F" (range: below 60)
Either takes no part in class discussion **or** is dysfunctional to class discussion **or** misses 4 or more classes.

Using the Case Method in this Course

The principal objective of the case study method is to develop student skills in problem solving and decision making. In studying a case, the student's task is to assume the role of the decision maker and consider all the information available to the decision maker at the time of the case.

The quality of your case analysis as a surrogate for experience depends on the same factors as the quality of experience in the real world. The student must review the case thoroughly to derive maximum benefit from the discussion. To base an analysis of a case on one or two isolated facts may enable a student to make a "contribution" to the discussion, but it is unlikely to constitute a worthwhile learning experience.

Although there is rarely a single "right" answer to a case problem, there may be several wrong ones - at least, "wrong" in the sense that it is difficult to convince anyone else that the decision proposed is reasonable. Experience will tend to show that bringing an opinion to a case is not the same as an analysis that is based on logic, the case facts, course concepts, and assumptions that other members of the class are willing to accept as reasonable. In addition, be careful to avoid looking for a single message in each case. You may find only the one that you forced yourself to see. Do not be disappointed if a class ends with more uncertainty about the decision than was apparent when it began. Indeed, confusion is sometimes a higher state of knowledge than ignorance.

Assignment Submission Policy

All work shall be submitted through Blackboard.

Format Requirements for Submissions

- Presentations: MS Power Point (*.pptx)

(NOTE: **NEVER** assume you can present to a client by accessing your google documents. Most companies do not allow access to google tools for security reasons)

- Documents: PDF
- Project Schedules: PDF
- At a minimum, students are expected to be able to:
  o prepare professional papers and presentations in the English language using proper citation
  o use multimedia in **MS PowerPoint** with embedded audio and/or video that begins automatically with the beginning of a presentation (Please test this. Points will be deducted if embedded media do not operate properly)
  o access a computer with a web camera and microphone, preferably with a headset with microphone and headphone
  o be proficient with the use of the BlackBoard system (NO work will be accepted by email unless previous arrangements have been made)
  o convert report files to PDF

Communications Policies

- When writing to Coaches –
  o Please include course number (ISE495a) and client name in subject line of emails
  o Cc: all coaches in all email
- Use your USC email account when contacting the client or Coaches.

PDR Dress Rehearsal Presentation – Coaches

The **Dress Rehearsal** presentation is the review of the PDR prior to presentation to the client. As such, content should be complete and PDR ready. There is probably much more each team will want to say at this point, but the purpose of the **Dress Rehearsal** is only to understand and approve the strategy for the **Final Presentation**. Teams are **strongly** encouraged to make available detail information in a separate file, submitted to *Bb* for review if the instructors have any questions.

The objective of the coaches' feedback is to position the team to execute a successful project. Teams are sometimes asked to revise the presentation and execute it again if the coaches do not believe this standard has been met. A single **Dress Rehearsal** presentation may suffice. **Please Do Not** decide with the client for the **Final Presentation** until this presentation has been reviewed and approved by the instructors, even if the client presses you to do so.

Schedule

The Calendar is **approximate** and **subject to change**, especially this year. The teams and clients are working in an uncertain environment. This is a living document and will be modified as needed based on the course requirements.

Presentations are to be coordinated and scheduled with your coach.

Week	Friday	In Class	Activity	Deliverable (Friday 5:00P)
1	13-Jan	Intro Meeting		
2	20-Jan			Prepare for initial client meeting:
3	27-Jan	Case: Ch.1 (Team 1) Case: Ch.3 (Team 2)	Introductory meeting between Teams & Clients	
4	3-Feb			Initial Specifications: Meet with coach
5	10-Feb	Case: Ch. 4 (Team 3)	SFR Presentation	System Functional Review (revised)
6	17-Feb			
7	24-Feb			PDR Readiness Review (record)
8	3-Mar			
9	10-Mar	PDR Dress Rehearsal Presentations		
	17-Mar		Spring Break	
10	24-Mar		PDR Presentation with Client	Preliminary Design Review + Exit Approval
11	31-Mar			
12	7-Apr			
13	14-Apr	Case: Ch. 5 (Team 4)	CDR plan	Meet Coach: Finalize prototype, progress plan finalize system
14	21-Apr			
15	28-Apr			
Finals Week				

(Projected) FALL 20233				
Week	Friday	In Class	Activity	Project update with coach Schedule progress review meeting with clients
1	25-Aug		Confirm CDR Plan	
2	1-Sep	B Review Case: Ch. 6 (Team 5) Case: Ch. 6 (Team 6)	Detailed Design meeting with client	
3	8-Sep			
4	15-Sep		CDR	
5	22-Sep			
6	29-Sep			CDR Presentation & Report
7	6-Oct	Case: Ch. 7 (Team 7) Case: Ch. 8 (Team 8) Case: Ch. 9 (Team 9)		CDR Exit documents approved
8	13-Oct		Recess	
9	20-Oct		TRR	
10	27-Oct			
11	3-Nov			
12	10-Nov		Veterans Day	
13	17-Nov		SVR	
14	24-Nov		Thanksgiving	
15	1-Dec	Last Day of Term		Final Report Customer Acceptance
Finals			Final Report (revised)	

- You must submit a completed and approved Final Report to receive a passing grade for the **ISE 495abx series**.

Textbook Errata Sheet:

Page 38 – Table 4.2 Requirements Hierarchy

Headings should read:

Customer Requirements	Functional Requirements What the system will do	Non-Functional Requirements How the system works

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. Other forms of academic dishonesty are equally unacceptable. See additional information in SCampus and university policies on Research and Scholarship Misconduct.

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
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
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) - (213) 740-9355(WELL), press "0" after hours – 24/7 on call
studenthealth.usc.edu/sexual-assault
Free and confidential therapy services, workshops, and training for situations related to gender-based harm.

Office for Equity, Equal Opportunity, and Title IX (EEO-TIX) - (213) 740-5086
eeotix.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.

Reporting Incidents of Bias or Harassment - (213) 740-5086 or (213) 821-8298
usc-advocate.symplicity.com/care_report
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.usc.edu

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) 821-4710
campussupport.usc.edu
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
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, 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
Non-emergency assistance or information.

Office of the Ombuds - (213) 821-9556 (UPC) / (323-442-0382 (HSC)
ombuds.usc.edu
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) 442-33*40 or otfp@med.usc.edu
chan.usc.edu/otfp
Confidential Lifestyle Redesign services for USC students to support health promoting habits and routines that enhance quality of life and academic performance.