USC Viterbi
School of Engineering

ISE 495a and ISE 495b: Senior Project Design
Fall 2017 —Mon, Wed, Fri.—8:00-9:20am
Location: KAP160, GER206

Coach: Theodore Mayeshiba	**Coach: Raymond Rakhshani**
Office: GER309A	**Office:** GER309A
Office Hours: By appointment.	**Office Hours:** By appointment.
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Course Description

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.

- 495b
  1. Preparation and development of the senior project proposal
  2. Identification and definition of appropriate engineering standards
  3. Identification of constraints which will help define and bound the project proposal
  4. Group work on an industrial engineering design problem in the assigned organization
  5. A design of a system, component, or process to meet the desired needs of the client within defined, agreed constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability and sustainability as examples

The Course
Overview

This course serves as the experiential capstone in the undergraduate ISE curriculum -- to apply your classroom knowledge to a real project in a real work setting. In the past decade the U.S. manufacturing industries such as automotive and aerospace adopt, implement and evolve "Lean" approaches based upon the Toyota Production System, Six Sigma, and other enterprise change models. Lean has led to significant reductions in cost and time to produce products with superior quality and performance. It is from this framework and perspective, that the student will see how ISE tools can be used to analyze and frame problem statements in real life situations.

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

Prerequisite / Co-requisite

Not available for graduate credit
Senior standing in industrial and systems engineering
Open only to industrial and systems engineering students

495B Prerequisite(s): ISE 435 and one from (ISE 370 or ISE 470) and (ISE315 or ISE495a)

Co-Requisite (s): None
Concurrent Enrollment: None

Recommended Preparation:

- Review notes from ISE105 or read text: **Introduction to Industrial and Systems Engineering**, *Turner, et al*, Prentice Hall, ISBN 0-13-481789-3
- Many projects require a formal statistical analysis. If unfamiliar, read: **Engineering Statistics**, 5th Ed, *Montgomery, Runger, and Hubele*, John Wiley and Sons, New York, NY
- Many projects require an analysis as outlined in ISE460: *Park*, *Chan S.,* **Contemporary Engineering Economics**, 5th Edition, Prentice Hall, (2011)
- Capable of preparing professional papers and presentations in the English language using proper citation
- Ability to produce documents in MS PowerPoint with embedded audio and/or video which begins automatically upon first click
- You will be expected to provide project management reports including:
  - WBS
  - Baseline schedule
  - Weekly updates comparing project completion to baseline

Course Notes

This course is Web-Enhanced with high reliance on Blackboard. All assignments will be submitted to 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 as well (Course Documents).

Technological Proficiency and Hardware/Software Required

- Access to a computer with a web camera, microphone. Preferably with a headset with microphone and headphone.
- Proficiency with the use of BlueJeans
- Proficiency with the use of the BlackBoard system. NO work will be accepted by email unless previous arrangements have been made.
- Proficiency to use multimedia on MS PowerPoint including inclusion of audio files which begin automatically with the beginning of your presentation

Required Readings and Supplementary Materials

Texts

- Installing Efficiency Methods, C. E. Knoeppel, The Engineering Magazine Company, 1917 republished by Google Books. Available on Blackboard site under Course Documents. (complete prior to class 9/9)

Grading Breakdown

	495B
Progress Update Reports to client & professors (10 submissions at 1% each	10%
Maintenance of project progress to baseline and WBS update to professors only 10 submissions at 1% each	10%
1st Midterm	20%
2nd Midterm	15%
Final Sponsor Evaluation	20%
Final Paper / Presentation	10%
Instructors Evaluation • Peer Evaluations • Interim feedback from sponsor and representatives • WBS contribution for each progress report • Interaction with team members • Discussion section contribution • Attendance	15%
Total	100%

Punctuality will be considered in the evaluation of performance. This means for meetings of your team, punctual class attendance as well as 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.

Statement for 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 the professor(s) 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. https://dsp.usc.edu/register/

Statement on Academic Integrity

USC seeks to maintain an optimal learning environment. General principles of academic honesty include the concept of respect for the intellectual property of others, the expectation that individual work will be submitted unless otherwise allowed by an instructor, and the obligations both to protect one's own academic work from misuse by others as well as to avoid using another's work as one's own. All students are expected to understand and abide by these principles. *Scampus,* the Student Guidebook, contains the Student Conduct Code in Section 11.00, while the recommended sanctions are located in Appendix A: http://www.usc.edu/dept/publications/SCAMPUS/gov/. Students will be referred to the Office of Student Judicial Affairs and Community Standards for further review, should there be any suspicion of academic dishonesty. The Review process can be found at: http://www.usc.edu/student-affairs/SJACS/.

Emergency Preparedness/Course Continuity in a Crisis

In case of a declared emergency if travel to campus is not feasible, USC executive leadership will announce an electronic way for instructors to teach students in their residence halls or homes using a combination of Blackboard, teleconferencing, and other technologies.

Schedule: See calendar on the following page.

(Timing is **approximate** and subject to **change**. This is a living document, and will be modified based on the course requirements.)

NOTES:

- 495B activities are highlighted in red for reference only
- Notation for classes on Fridays are listed below

Week	Monday				Wednesday			Friday		

Week	Date	Topic	HW	Date	Topic	HW	Date	Topic	HW
1	8/21	Orientation (KAP160)		8/23	Project intro. Lean / DMAIC (KAP160)		8/25	Discussion 1; Project Review (GER206)	Select Project
2	8/28	VSM1 (KAP160)		8/30	VSM2 (KAP160)		9/1	SIM-ULATION (GER206)	Midterm1
3	9/4	Holiday		9/6	People	Finish reading Knoppel (CH1-5)	9/8	9/8 Discussion 2 Knoppel (KAP160)	
4	9/11	Teams Lecture	MT 1 due	9/13	Quality / Variance		9/15	Protime Training	
5	9/18		-WBS -B/line sched	9/20	495b Present. Define Measure	Baseline approve publish	9/22	TPM / Theory Of Constraint (TOC)	Weekly Report 1* *due Friday 17:00
6	9/25			9/27			9/29	(A) SIM Session 1	Report 2*
7	10/2			10/4	495b (DMA) Dress rehearsal		10/6	(A) SIM Session 2	Report 3*
8	10/9	5S (KAP160)		10/11			10/13		Report 4*
9	10/16			10/18			10/20		Report 5*
10	10/23			10/25	Discussion 3 (A3 review) (GER206)		10/27		Report 6*
11	10/30			11/1			11/3		Report 7*
12	11/6			11/8	(A/B) Midterm 2 Review		11/10		Report 8*
13	11/13	Midterm 2		11/15			11/17	Dress Rehearsal	Report 9*
14	11/20			11/22	HOLIDAY		11/24	HOLIDAY	
15	11/27	(A) Dress Rehearsal		11/29	(A) Dress Rehearsal		12/1	*(A) Dress Rehearsal	Report 10*

Activities

Simulation

The simulation is a Learning Activity which is the basis of your first midterm. It is an experiential activity requiring your presence from roughly 9A – 4P on the schedule day. The student is expected to apply principles of Value Stream Mapping, in conjunction with other industrial engineering techniques and materials, to resolve an "existing, underperforming" system. To the extent that you can show logic, proper tool usage and data captured during the simulation will determine the student's success. There are no alternatives to participation in this event.

Weekly Reports

Weekly reports are due at 17:00 on assigned Fridays. It is composed of two parts.
   a. A report to the client (short, email is appropriate with professors on cc) that covers
        a. What you accomplished last week
        b. What you plan on doing next week
        c. Any problems that you are encountering and requesting help
   b. To the professors, please send a MS Project Gantt chart showing the baseline for the project and the activities status as of Friday when the report is written. Any changes to the WBS from the original should be reported and noted on a separate sheet.

Presentations "A" Semester

Define / Measure ("A" Midterm Presentation)
This presentation is nominally 5 slides (max 6 minutes)
   1. Title slide – persons on the team are listed
   2. Context setting slide (background) – Who is the client? What is the client's problem?
   3. What measures / data have you collected to confirm the client's initial statement?
   4. Considering the collected data, how does the TEAM _**define**_ the problem at hand?
   5. What's the next step? Your goal is to find the root cause problem.

Define / Measure / Analyze ("A" Dress Rehearsal and Final Presentation to client at end of "A" semester))
This presentation is nominally 9-12 slides (max 9 minutes)
   1. Title slide – persons on the team are listed
~~Context setting slide (background) – Who is the client? What is the client's problem?~~
   2. What measures / data have you collected to confirm the client's initial statement?
   3. Considering ALL the collected data, how does the TEAM _**define**_ the problem at hand, (likely revised)?
   4. Analyze the data. What is the root cause problem?
   5. What's the next step? Your goal is to suggest a countermeasure. Your presentation is to convince the client that your countermeasure has a likelihood of succeeding. How does your team define success? Present timeline / schedule for implementation.

Presentations "B" Semester

Define / Measure / Analyze / Implement ("B" Midterm Presentation)
This presentation is nominally 5 slides (max 6 minutes)
1. Title slide – persons on the team are listed
~~Context setting slide (background) – Who is the client? What is the client's problem?~~
2. Does the latest data you collected continue to confirm the client's problem you defined? (2 slides)
~~Considering the collected data, how does the TEAM *define* the problem at hand?~~
3. What's the next step? Show Gantt chart showing progress and anticipated completion date and remaining steps to completion (2 slides)

DMAI Control ("B" Dress Rehearsal and Final Presentation to client at end of "B" semester
1. Title slide – persons on the team are listed, credit to client rep who was instrumental in helping complete the project.
2. Review measures / data have you collected to confirm your Team's DEFINE statement compared to the client's initial statement?
3. Review analysis of data that led to your countermeasure.
4. Introduction of countermeasure
5. Description of countermeasure in detail
6. What's the next step? Your documents, work product that is being left behind so the client can continue improvement efforts.
7. Reference what is in the final report and delineate work product submitted at client presentation
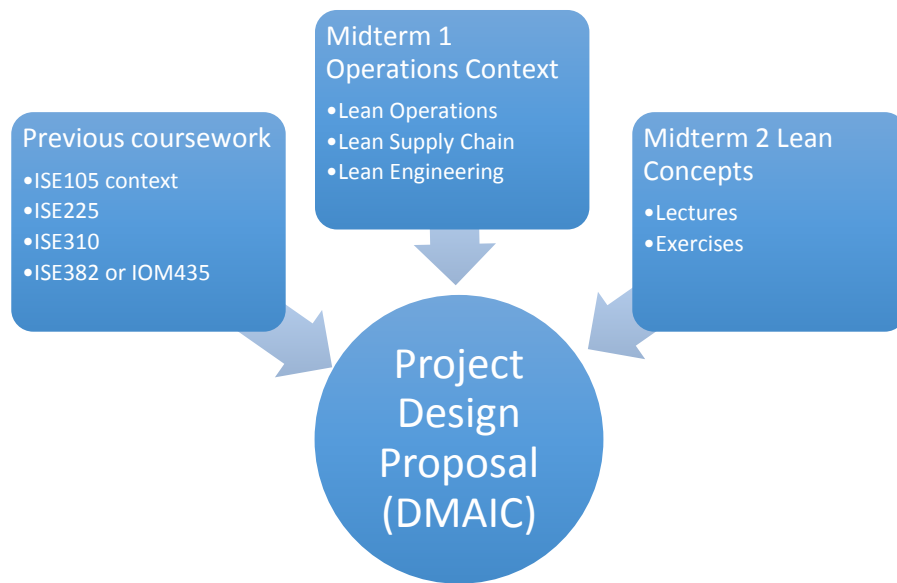
495A Presentation / Report Grading Rubric

Phase	Below Expectation	Expectation	Exceeds Expectation
Define (Presentation)	Problem Statement from client	Problem Statement from client Definition of problem • Key measures used in evaluating success • Client overview • Eng'r standards applicable to approaching this problem	Problem Statement from client Definition of problem • Key measures used in evaluating success • Client overview • Eng'r standards applicable to approaching this problem • Impact on business issues • SIPOC, Pareto, other tools to validate • Identification of possible constraints • WBS breakdown
Measure (Developed during weekly reports)	All items in Define plus: Identification of key input and output variables VSM	All items in Define plus: Identification of key input and output variables VSM Quantify "current state"	All items in Define plus: Identification of key input and output variables VSM Quantify "current state" Identify "future state"
Analyze (Dress rehearsal presentation)	Use of concepts covered in previous coursework to perform "gap analysis"	Use of concepts covered in previous coursework to perform "gap analysis" Discussion of alternative solutions	Use of concepts covered in previous coursework to perform "systems analysis" Discussion of alternative solutions Select single "best" alternative

495B Presentation / Report Grading Rubric

Phase	Below Expectation	Expectation	Exceeds Expectation
Improve Presentation 2	Outline recommended system	Design recommended system	Design recommended system and implement
Control Presentation 3	Discuss suggested method of control to maintain your recommended system	Design a client approved method of control to maintain your recommended system	Design and implement a method of control to maintain your recommended system executed by the client
Report		Engineering standards used Constraints overcome DMAIC review System design summary	

Flow of Course – Organization / Inter-relationship of Topics 495A

Midterm 1 Operations Context
- Lean Operations
- Lean Supply Chain
- Lean Engineering

Previous coursework
- ISE105 context
- ISE225
- ISE310
- ISE382 or IOM435

Midterm 2 Lean Concepts
- Lectures
- Exercises

Project Design Proposal (DMAIC)

Flow of Course – Organization / Inter-relationship of Topics 495B

495A Approved Project Design Proposal

- Define
- Measure (VSM)
- Analyze

Previous coursework

- ISE105 context
- ISE225
- ISE310
- ISE382 or IOM435

Design

- Implementation
  - Engineering Stds
  - Constraints / Limits / Assumptions
- Control

495B Project Design Presentation