

Industrial & Systems Engineering (ISE)

ISE 506: Lean Operations (4 units)

Systems Architecting & Engineering (SAE)

SAE 551: Lean Operations (4 units)

The study of lean principles and practices as applied to automotive, aerospace, healthcare, and other industries.

Semester	20241 Spring 2024
Lecture Time	4:00 – 7:50 PM Friday
Room	OHE 100D
Instructor	Prof. Ted Mayeshiba (mayeshib@usc.edu) (best way to contact) Office Hours: https://calendly.com/ise_mayeshib Email for personal issues only Response to emails nominally within 24 hours
Course Producer	Ashish Singh Panwar (panwara@usc.edu)

Introduction and Purposes

- **Objective:** To enhance the students' understanding and appreciation of the importance of lean operation concepts for manufacturing and service enterprises, their resources, the related challenges and problems, and the related tools and technologies. Systems thinking will be emphasized.
- **Description:** Study of various aspects of integrated manufacturing and service enterprises including management, design and production functions, interfaces, and related resources and information systems.
- **Approach:** This course introduces the role of lean *thinking* in the manufacturing or service (operations) enterprise and its connections with society, economy, and environment. The course addresses both theoretical and applied aspects of the topic. Course materials are presented in a “[flipped](#)” course format. Concluding assessment of learning is provided through the application of learned principles to a process with which the student is familiar and submits as an end of term project. In pursuit of this goal, to the extent possible, the course will use a collaborative learning approach; meaning participation in class is critical to everyone's learning experience. The instructor then functions more as a facilitator to accomplish this goal.

Approach

Society has reached the point where one can push a button and be immediately deluged with technical and managerial information. This is all very convenient, of course, but if one is not careful there is a danger of losing the ability to think. We must remember that in the end it is the individual human being who must solve the problems.

—Eiji Toyoda, Creativity,
Challenge and Courage,
Toyota Motor Corporation,
1983

■ Intended Learning Outcomes:

- Demonstrate application of subject material through a paper describing the application of Lean concepts learned in class to a project of the student's choosing.
- Experience positive team participation and contribution to a team during active learning exercises and in subsequent after-action reviews
- Prepare the learner to effectively participate in subsequent [continuous improvement](#) teams to which they may be assigned.

Presentation of Learning Materials

The course relies heavily upon student interaction. It is the instructor's belief that learning is best done in a collaborative environment. ALL students bring value to the learning experience of others. Because this class is both for the benefit of on campus students and DEN students, the class is presented in a "flipped" format. In short, the following are expectations of learners participating in the course.

Before class: (Prework)

- Listen to pre-recorded lecture materials, curated videos, audio media, text media as assigned
- Students will be given assessments (quizzes) on materials assigned (Quizzes in this section are Pass / Fail and not counted toward the final grade but are used to assess retention of materials and encourage learning. Quizzes may be taken as many times as necessary to pass.)

NOTE: The student may notice that there is substantial time spent engaging in lecture materials outside of class. This is intentional. Instead of sitting in class, asynchronous learning may occur outside of class through lecture materials. This may reduce the time needed in class materially. This increases the opportunity for learners to ask questions BEFORE the class. This results in a "time shift" from in class to PREWORK time.

During class:

- Review of last sessions activities (Discussion board review) (NOTE: Students who are unable to attend class "live" will find this as their opportunity to participate in class discussions)
- Discussion about Prework.
- Interaction with instructor and other students through simulations / discussions extending prework concepts

After class:

- Reflective activity reviewing / summarizing in class activities. If there was a team activity, teams are expected to reflect on in-class activities by preparing a short presentation summarizing learned points for presentation at next class session
- Discussion board postings are encouraged (postings to be reviewed during next class)

Presentations:

ALL student presentations will take the following form (on campus and DEN):

- Presentations should be submitted as a recording.
- Presentations should be no more than 2 minutes in length (per person if team submission) (e.g., 8 minute total for a four person team)

Project:

The **goal** of the project is to demonstrate that you understand and can properly apply the concepts presented in the class through the accomplishment of a structured analyses of a process as presented in the class. The process may be one of a personal, work or organizational nature. Examples of past processes include preventing "stock outs" in a office coffee club, getting a child to bed at night, getting a family ready in the morning, increasing the "turnover" of

tables in a restaurant, improving operations in a work project. Topics will be reviewed by the instructor and approved by week 4 of the class. Additional details regarding the project will be posted on the Course Website.

Course Website

This course will rely on the DEN D2L course website, located at <http://den.usc.edu>. Go to the website, login, and click either the ISE506 or the SAE 551 link. The toolbar on the left-hand side of the page will provide access to course announcements, live and recorded lectures, assignment submission, discussion board, and other information. Each week will outline that weeks Pework and a preview of the weeks class activities.

Course Text

- Required Texts:
 - Lean Enterprise Value, Murman, et al., Palgrave, 2002, ISBN 0-333-97697-5 (LEV)
 - Lean Thinking, Womack and Jones, Simon & Schuster, 2003, ISBN 0-7432-4927-5. (LT)
 - The Toyota Way, Liker, Jeffrey K. McGraw-Hill, 2021, ISBN 978-1-260-46851-9 (TW)
- Reference Text for those who are approaching this course with limited sense of a technical workplace or context of Lean, it is recommended that these books be read to offer background. Items will be taken from these texts in the course of class, and it may help in understanding these topics. (Optional):
 - The Goal, Goldratt & Cox, North River Press, 2004, ISBN 0-88-427178-1
 - The Machine That Changed the World, Womack, Jones, and Roos, 1990, ISBN 0-89256-350-8 (MTCTW)
 - On the Mend, Toussaint, Gerard, Adams, Lean Enterprise Institute, Inc. 2010, ISBN 978-1-934109-27-4

Course Schedule

Week	Class Date	PREWORK	IN CLASS Activity	After Class Activity
1	12-Jan		Course Introduction / Overview Start of Journey	Submit 5S Exercise Submit Toast drawing
2	19-Jan	Foundational Concepts	Review / Answer questions Sim Round 1 Simulation review / changes Sim Round 2	TEAM: Reflection of Simulation Exercise Due week 3
3	26-Jan	Value Stream Mapping	Review previous class Review Prework / Questions VSM Analysis (Value Stream Management)	TEAM: VSM Analysis of Simulation and proposed changes INDIVIDUAL: Submit abstract and VSM of project (draft) (0 points awarded – review only)
4	2-Feb	Lean Supply Chain Basics	Review LSC basics TEAM Simulation Analysis and Change Presentations Sim Round 3 Simulation results / changes Sim Round 4	TEAM: Reflection of Simulation Exercise, VSM Analysis, proposed changes due week 6
5	9-Feb	Beer Game (1 hour) (all team members must be "live")	Team presentation - Beer Game Results	INDIVIDUAL: Submit abstract and VSM of project
6	16-Feb	Lean Product Design Basics	Design change introduced TEAM Simulation Change Proposals – Presentations Sim Round 5 Simulation results / changes Sim Round 6	TEAM: Reflection of Simulation Exercise
7	23-Feb	Lean for the office Accounts Payable Case Study	Review AP case study Variability Simulation	Discussion Board: Reflections of the effect of variability on systems performance and customer satisfaction
8	1-Mar	Quality	Quality discussion Taguchi Trojan Bead Company Demo	Discussion Board: Reflections of the effect of quality on systems performance and customer satisfaction
9	8-Mar		MIDTERM 1 No class scheduled	INDIVIDUAL: Outline of project and relationship of: Lean foundational concepts, supply chain, design, variability, and quality to your process
	15-Mar	SPRING BREAK		

Week	Class Date	PREWORK	IN CLASS Activity	After Class Activity
10	22-Mar	Lean Product Development	Product Development Simulation	TEAM: Reflection of Simulation Exercise, VSM Analysis
11	29-Mar	People	Bird / Mouse exercise	Discussion Board: Reflections of the effect of people on systems performance and customer satisfaction
12	5-Apr	Data, Information, Knowledge / Barilla Study	Barilla Discussion "One truth" discussion	Discussion Board: Reflecting on your experience, what is effect on people and systems performance when more than "one truth" exists?
13	12-Apr	Enterprise View - case studies	Discussion	Discussion Board: Reflecting on your experience, please reflect on an organization and relate how that organization was / was not a learning organization.
14	19-Apr		MIDTERM2 – No class scheduled	
15	26-Apr		Presentations due at 4:00PM PDT	
FINAL	3 May 4:30p- 6:30P	Presentations (Refer to the final exam schedule in the USC <i>Schedule of Classes</i> at classes.usc.edu)		

Assignment in **red** are counted as participation

Assignment in **blue** are counted as homework

Students are expected to frequently check announcements on the course website and their email account registered with DEN for any schedule updates or changes.

Assignment Submission

- All assignments must be submitted through the Assignment Manager (the “Assignments” tab) on the DEN D2L course website.
- Some major course assignments, when directed by the instructor, will be submitted to the TurnItIn system. TurnItIn is a plagiarism-detection system that compares student submissions with other submissions, past course submissions, and information available on the Internet. Any submissions reviewed by TurnItIn and any that do not follow Academic Integrity standards will be referred to USCStudent Affairs.
- To submit an assignment through the Assignment Manager or *TurnItIn* system, click the “Assignments” link on the left-hand side of the course website, find the appropriate assignment on the page, and click “View/Complete” for that assignment. After filling in the appropriate fields and uploading the completed assignment, click the “Submit” link.
- If you have any technical issues with the submission process, email the professor immediately. In lieu of email to professor, take a picture of the assignment with date and time, and email within 24 hours to obtain credit.
- Assignments are due at the beginning of class. If assignments are submitted after the due date and time, they will receive a penalty of 10% if less than three days past due and a penalty of 50% if less than five days but more than three days past due. Submissions over five days past due will receive zero credit.
- Assignments must plainly state on the first page, participants (if team assignment) or your name.
- All submissions should be in either the Microsoft Word (.doc), Adobe PDF, or Microsoft PowerPoint (.ppt) format. If you need to use a Microsoft Excel table, please copy or insert these images into a Word, PDF or PowerPoint format prior to submission

Grading

Homework (3 pts. X 5)	15%
Midterm Exams (15 pts. X 2)	30%
Final Project Report	30%
Final Presentation (7 minutes)	10%
Participation (1.5 pts. X 10)	15%
Total	100%

- **Homework** assignments will be graded based on depth and quality of analysis, and correctness, as well as number and quality of references, and amount of new information (information is not simply repeated from lecture) when applicable.
- **Attendance** is not part of the course grade. However, **participation** either in the classroom or on the discussion board is incorporated into the course grade. Participation on Discussion Boards must be posted by the day before class for full credit (Th. 11:59), so others may respond or otherwise prepare for class discussion.

- Elements of **participation** in the course may take different forms.
 1. Team homework / presentations are considered participation.
 2. Participation in *Discussion Boards as assigned* (see Discussion Boards below for more details) on D2L count to participation in class.
 3. Other participation in Discussion Boards outside assignments will be counted toward homework points.
- The **midterms** will be conducted online through the course website. Both on-campus and DEN students will complete the exam online. The exam will be available for a predetermined time window (usually 4PM – 8PM, Pacific Time) on the scheduled date. Any students who have a conflict with this date must notify the professor and the TA no later than two weeks before the exam.
- The **final project** is a written report and oral presentation on a topic selected by the student and approved by the professor, which will analyze the Lean Operations cycle for a process (such as product manufacturing or service delivery). The project should involve a process analysis using Lean Operations tools and principles as well as demonstrate the student's knowledge and understanding of the material presented in the course. Additional information will be provided on the course website.
 - Report (Written paper, format guidelines will be provided)
 - Presentation (PowerPoint presentation, given in-class or via WebEx by DEN students)

Discussion Board and Questions

- Discussion board threads will be created for every lecture/topic in the course.
- Please check the discussion board frequently
- If you have a question from that lecture or on the assignment from that lecture, please post your question to the discussion board within the corresponding thread.
- If you don't receive a response or your question is not sufficiently answered, only then should you email the professor and the TA. Having questions posted to the discussion board not only reduces the number of duplicate emails we must answer but also ensures that the information we provide is available to all students.

What's Expected of Students

- Students are expected to be able to use the following tools to upload and download their assignments, obtain pertinent course information, and participate in class discussions
 - All students are expected to connect to WebEx during simulations and certain exercises on your mobile device with headset.
 - All students may be required to use their mobile device to participate in POLL ANYWHERE exercises. Please have your device handy.
- Students are expected to follow the standards of appropriate online behavior. The protocols defined by the USC Student Conduct Code must be upheld in all aspects of class. Examples of inappropriate online behavior include but are not limited to:
 - Posting inappropriate material
 - SPAM to the class
 - Online flaming
 - Offensive language
 For more information, please visit <http://www.usc.edu/student-affairs/SJACS/>
- In the event of any technical breakdown, students are expected to contact the professor or TA ASAP by email or text message.

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.

dps.usc.edu