

29:799:460 Introduction to Six Sigma and Lean Manufacturing

Section B7 - Summer 2023

Class Time: T. Th. 6:00 – 9:45 PM

Email: aziz.alshalfan@rutgers.edu

Course Delivery Mode: Online Synchronous

Aziz Alshalfan

Department of Supply Chain Management

Office hours: before/after class,
by appointment (on Zoom)

COURSE DESCRIPTION

This course provides fundamentals of six sigma, lean manufacturing, methodology and tools along with change management and other important strategies to improve the performance of business processes. Through case studies and team exercises, students will practice solving business problems and improving processes using these powerful tools and concepts. Topics covered will include: six sigma improvement methodology and tools, lean thinking tools and cultural approach, dashboards, process mapping, applied statistics and other business improvement techniques. Students will also gain an understanding of: the strategic importance of business improvement, the need for fact based management and how to deploy these tools in different parts of the value chain.

The course is structured as a combination of lectures, class discussions, case studies, readings, and team exercises.

COURSE DELIVERY MODE:

The course will be synchronous remote (SR), where all students are expected to join the online class through Zoom on the specified days/times.

COURSE MATERIALS

▪ **Optional TEXTBOOKS**

1) Title: Learning to See: Value Stream Mapping to Add Value and Eliminate MUDA. Lean Enterprise Institute, 1999. (Abbreviated as Learning to See)

Authors: Mike Rother and John Shook

ISBN-13: 978-0966784305 ISBN-10: 0966784308

Publisher: Lean Enterprise Institute

2) Title: A Guide to Six Sigma and Process Improvement for Practitioners and Students (Second Edition)

Authors: Howard S. Gitlow, Richard J. Melnyck and David M. Levine

ISBN-13: 978-0-13-392536-4 ISBN-10: 0-13-392536-6

Publisher: Pearson

▪ **Required Software**

Minitab 16 (<https://labgateway.rutgers.edu>)

▪ **SLIDE DECKS & OTHER COURSE MATERIALS**

- Slide decks covering topics in the textbook will be reviewed and discussed in class and will also be provided to students through Canvas.
- Other course materials will also be provided to students through Canvas.
- Check **Canvas** (canvas.rutgers.edu) and your **official Rutgers email account** regularly for updates and announcements.

LEARNING GOALS AND OBJECTIVES

This course is designed to help students develop skills and knowledge in the following areas:

1. Knowledge: Students will have broad understanding of basic business theory and practice and deep understanding of theory and practice within supply chain management. Students who complete this course will demonstrate the following:
 - a. Knowledge of current advanced concepts within supply chain management and an ability to integrate and apply these concepts to practical business problems.
 - Successful students will demonstrate their knowledge of manufacturing and operations planning concepts to ensure efficient and effective operations in business.
 - b. Proficiency at using current software tools and information systems to manage business data and address practical business problems.
 - c. Ability to apply appropriate quantitative methods to analyze business data, and to apply quantitative modeling techniques to analyze business plans and decisions.
2. Effective Communication: Students will be effective communicators. Students who complete this course will demonstrate the following:
 - a. Ability to construct clear, concise, and convincing written business communication.
 - b. Ability to construct and deliver clear, concise, and convincing oral communication.

Students develop these skills and knowledge through the following course activities and assignments:

- **Lectures.** Lectures provide core knowledge of lean six sigma and how improvement strategies apply in a complex business environment, especially in supply chain operations, manufacturing, and service management. Students will establish an appreciation of operational excellence through the linkage between business improvement strategies and business performance. Lean six sigma principles are grounded on data-oriented decision-making, and therefore students will learn to use quantitative data analysis tools to quantify characteristics of business problems, derive cause-and-effect relationships, brainstorm and prioritize solutions, and report to stakeholders.
- **Class Participation.** Students should be able to communicate their ideas to the class and create a positive learning environment.
- **Homework & Term Project:** The homework assignments and the term project enhance learning in real-life business scenarios. In the term project, students will produce and deliver a presentation in a team setting. It is geared to enhance student skills to engage an audience and present ideas effectively and efficiently, both in oral and written formats.
- **Exams.** The course includes two exams to formally assess students' knowledge and comprehension.

PREREQUISITES

None. However, basic knowledge of statistics is very helpful.

ACADEMIC INTEGRITY

Cheating will not be tolerated. Students are responsible for understanding the RU Academic Integrity Policy (<http://academicintegrity.rutgers.edu/>). I will strongly enforce this Policy and pursue *all* violations. On all examinations and assignments, students must sign the RU Honor Pledge, which states, "On my honor, I have neither received nor given any unauthorized assistance on this examination or assignment." I reserve the right to screen all written assignments through plagiarism detection services that compare the work against a large database of past work. Don't let cheating destroy your hard-earned opportunity to learn. See business.rutgers.edu/ai for more details.

COURSE REQUIREMENTS AND GRADES

Grading Scheme

The weights given to different activities in determining the final course grade follow:

Class participation	10%
Homework	20%
Exam 1	20%
Exam 2	25%
Term Project:	
Peer Evaluation	5%
Instructor Evaluation	20%

Class participation

This being a course requiring careful thinking, the entire class’s learning experience will be enhanced by class participation. Through class participation, you will get an opportunity to listen to the perspectives of peers and to inform them of your own views/opinions:

Your class participation will be evaluated primarily through the following three mechanisms:

- a. **Students are expected to attend all online class sessions, arrive on time, and stay for the entire class session.** If a student is to be absent, the student should notify the instructor in advance and get approved. If the absence is due to religious observance, a Rutgers-approved activity, illness, or family emergency/death, also send the instructor full details and supporting documentation within one week of your absence. Since class attendance is expected, students are responsible for all announcements made or material handed out in class, regardless of their attendance.
- b. **Each team’s project presentation video will be made available to the entire class for review** under the assignments section of Canvas. **You will be required to watch term project presentation videos** and provide your detailed online peer evaluation. Your activity of watching the presentation video will be monitored. You are also required to click the “Mark as Done” button on top of the video page.
- c. **Through the discussion section of Canvas,** share with everybody web-links/copies of newspaper/magazine articles informing us of topical issues and events in the world of Lean and Six Sigma. This will also be useful for you to keep abreast of important issues and events by reading popular business periodicals. **You can post by hitting the reply button within the discussion forum.** Your activity in this discussion forum will be monitored closely as it will count towards your class participation grade.

Homework

Homework problems will be assigned regularly, relating to the material covered in the class. Since these homework assignments will depend heavily on the class lecture, not attending class will put you at a disadvantage in doing your homework assignments accurately. Homework assignments

will be posted on Canvas in the assignments section. **The submissions will have to be made via the assignment section of Canvas by the specified due date.**

The following policies will apply:

- Late submissions will **not be accepted** unless approved in advance for a valid reason (e.g., illness, family emergency, work emergency, etc.)
- Students should feel free to communicate with the instructor to ask for clarifications of the homework assignment questions. However, pre-grading will not be practiced.
- Homework grades may be adjudicated at the discretion of the instructor, but not later than 2 weeks after being assigned.

Exams

There will be two online synchronous exams where you will have to join the class on **Zoom at the specified time with your webcam ON throughout the duration of the exam.** Please refer to the exam schedule in the course outline. In case you have a **conflict** with that timing, please **let the Instructor know** as soon as possible. The exam will test your ability to analyze and model to make decisions. The exams can serve as a tool for self-evaluation, provide feedback, and deepen the learning. The exams **will not** be open book, open notes. Use of phone and internet to communicate with anyone except the instructor will not be allowed, and any deviance from this policy will be reported to the school administration for disciplinary action (please note the academic integrity policy mentioned earlier in the document).

There will be no make-up exams unless a special event out of your control (e.g., a medical emergency) happens and prevents you from attending the scheduled exams. In such cases, you must notify the instructor as soon as you can and provide necessary documentation (e.g., a doctor's note).

Exams will not be returned after grading. Students who would like to review their graded exams can come to office hours or make an appointment.

Term Project

The objective of the term project is to identify a process of your choice and develop an improvement strategy using lean six sigma concepts and tools. Students will team up into groups for this project. The final deliverables include a presentation deck and a video (to be submitted electronically). Each team will prepare a recorded video presentation which will be published on Canvas.

The following guidelines will apply:

- Each student has been assigned to a team.
- Each team needs to choose a real-world problem/process, not theoretical or fictional.

- The topic can be in any domain like Healthcare, Finance, Logistic and Supply Chain, etc.
- The final deliverable is a voice-embedded presentation to be uploaded on Canvas by one of the team members.
- The project grade is judged by both the quality of work (importance, comprehensiveness, workload, etc.) and the effectiveness of presentation (clarity, time control, engagement, teamwork, etc.).
- Part of the project grade will be determined by the peer evaluations of your fellow classmates.
- Each team is required to consult and get the instructor’s approval for their chosen project.
- The term project is due on **Friday, June 30 by 11:59pm**

TENTATIVE COURSE OUTLINE

(Note: This is only a tentative outline. Actual schedule may not exactly follow this tentative outline.)

Lecture #	Topic	Key Concepts	Recommended Reading
1-3	Course Overview; Lean Six Sigma Introduction Lean Concepts; Value Stream Mapping; Lean Culture and Tools; Toyota Production System	<ul style="list-style-type: none"> ▪ Course introduction and administration ▪ Lean and Six Sigma history ▪ Strategic business benefits ▪ Value added and non-value added ▪ Eight wastes of lean ▪ Value stream mapping ▪ Lean thinking and culture ▪ Lean tools ▪ Toyota Production System 	<i>Learning to See</i>
4-5	Six Sigma Overview; Minitab Introduction; Six Sigma: Define; Six Sigma: Measure	<ul style="list-style-type: none"> ▪ Six Sigma overview ▪ DMAIC introduction ▪ Minitab introduction ▪ VOC ▪ CTQ ▪ SIPOC ▪ Team charter ▪ Process flowchart ▪ Process yield ▪ Specification limit ▪ Measurement system analysis ▪ Data collection ▪ Basic statistics ▪ Process sigma 	<i>Six Sigma</i> (Ch. 9) <i>Six Sigma</i> (Ch. 10) <i>Six Sigma</i> (Ch. 11)

6	Exam 1	Thursday, June 15: Exam 1 (Online Synchronous) (6:00 PM – 7:30 PM)	
6-8	Six Sigma: Analyze	<ul style="list-style-type: none"> ▪ 5-Whys ▪ Fishbone diagram ▪ Control chart ▪ Pareto chart ▪ Hypothesis testing ▪ Regression analysis ▪ Design of Experiments (DOE) 	<i>Six Sigma</i> (Ch. 12)
8-9	Six Sigma: Improve; Six Sigma: Control	<ul style="list-style-type: none"> ▪ Brainstorming ▪ Solution prioritization matrix ▪ Implementation ▪ Risk assessment (FMEA) ▪ Sustaining the gains ▪ Statistical process control ▪ Documentation (SOP) ▪ Control plans (PDCA) 	<i>Six Sigma</i> (Ch. 13) <i>Six Sigma</i> (Ch. 14)
10	DMAIC Class Exercise; Design for Six Sigma	<ul style="list-style-type: none"> ▪ DMAIC practice ▪ DFSS introduction 	
Term Project		Term Project due: Friday, June 30 by 11:59pm	
11	4th of July Holiday – NO CLASS		
12	Exam 2	Thursday, July 6: Exam 2 (Online Synchronous) (6:00 PM – 7:30 PM)	
12	Change management	<ul style="list-style-type: none"> ▪ Change management concepts 	<i>Six Sigma</i> (Ch. 16)

ACCOMMODATION AND SUPPORT STATEMENT

Rutgers University Newark (RU-N) is committed to the creation of an inclusive and safe learning environment for all students and the university as a whole. RU-N has identified the following resources to further the mission of access and support:

For Individuals with Disabilities: The Office of Disability Services (ODS) is responsible for the determination of appropriate accommodations for students who encounter barriers due to disability. Once a student has completed the ODS process (registration, initial appointment, and

submitted documentation) and reasonable accommodations are determined to be necessary and appropriate, a Letter of Accommodation (LOA) will be provided. 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 ods.rutgers.edu. Contact ODS at (973)353-5375 or via email at ods@newark.rutgers.edu.

For Individuals who are Pregnant: The Office of Title IX and ADA Compliance is available to assist with any concerns or potential accommodations related to pregnancy. You may contact the Office of Title IX and ADA Compliance at (973)353-1906 or via email at TitleIX@newark.rutgers.edu.

For Individuals seeking Religious Accommodations: The Office of the Dean of Students is available to verify absences for religious observance, as needed. Contact the Dean of Students at (973)353-5063 or via email at DeanofStudents@newark.rutgers.edu.

For Individuals with temporary conditions/injuries: Students who have experienced a temporary condition or injury that is adversely affecting their ability to fully participate should submit a request via <https://temporaryconditions.rutgers.edu>.

Absences: Per University Policy 10.2.7, you are responsible for communicating with your instructors regarding absences. The Office of the Dean of Students is available to verify extended absences. Contact the Dean of Students at (973)353-5063 or via email at DeanofStudents@newark.rutgers.edu.

For English as a second language (ESL): Students experiencing difficulty in courses due to English as a second language (ESL) should contact the Program in American Language Studies via email at PALS@newark.rutgers.edu to discuss potential supports.

For Gender or Sex-Based Discrimination or Harassment: If you have experienced any form of gender or sex-based discrimination or harassment, including sexual assault, sexual harassment, relationship violence, or stalking, know that help and support are available. If you wish to report an incident, you may contact the Office of Title IX and ADA Compliance at (973)353-1906 or via email at TitleIX@newark.rutgers.edu. You may also submit an incident report using the following link: tinyurl.com/RUNReportingForm. If you wish to speak with a staff member who is confidential and does **not** have a reporting responsibility, you may contact the Office for Violence Prevention and Victim Assistance at (973)353-1918 or via email at run.vpva@rutgers.edu.