

THE UNIVERSITY OF MICHIGAN
Industrial & Operations Engineering - IOE 591
Lean Thinking in Manufacturing & Services

3 Credit Hours

Time and Place: Friday, 9:00am-12:00pm, 1610 IOE

Instructor: Dr. Jeffrey K. Liker, 2863 IOE Building Email: liker@umich.edu
Office Hours: most Fridays & appointment Office Phone: 763-0166

Required Material: IOE 591 on Ctools (readings, assignments)

Web Page: <http://ctools.umich.edu>

Course Description:

Companies are finding the traditional command-and-control management model ineffective in today's rapidly changing environment. We need flexible, adaptive organizations that learn over time.

Over decades a new model of organizing, often referred to as "Lean" or "Agile," has become a global movement. It embodies the ideal image of industrial and operations engineering as captured in the four M's—Integrating Man, Machine, Material, and Method. The human was historically ubiquitously missing from IE, except as another type of machine with unique cognitive and physical characteristics. Lean puts the human at the center—thinking creatively to continuously improve the use of machines, materials, and methods.

In the early days Toyota, the original model for Lean, was mindlessly copied, leading to a set of tools for Lean. As Lean has evolved we have discovered it is a way of thinking about how to develop a culture of people continuously learning through experiments in work. The tools are designed to support that exploration and continuous improvement. This course will focus on Lean as a way of managing in order to build a learning organization that applies to professional, technical, manufacturing, or service work. The Toyota Kata approach will be utilized and featured.

Class Format: *A participative, involving seminar with an outside team project*

Prerequisites: *Instructor's Permission.* It is highly desirable that you have some background in Lean, preferably IOE 425, prior to taking this course. IOE 421 also provides great background. Direct experience can help substitute for formal coursework in the area, but be prepared for the course to challenge your assumptions of what Lean is.

Reading Assignments: All reading assignments are at the CTOOLS site or on the internet. I suggest you purchase the ***Toyota Kata Practice Guide*** as there are a number of assignments from this guidebook:

<http://www.amazon.com/Toyota-Kata-Practice-Guide-Results/dp/1259861023/>

Assignments and Exams: Grades will be based on a combination of individual and group assignments as well as participation. Students are encouraged to discuss their performance with the instructor at any time during the semester. The course grade will be based on four components:

- **Individual Assignments**
 - **Individual Journal Entries:** Every week you will write a journal entry (individual essay of max 2 pages) that summarizes key insights from the readings and the class session that will be due the end of the day Tuesday after the class. The first journal entry will summarize the content of week 2. You will answer two questions: What are the key points I got from the readings? What are the key points I got from class? These can be in bullet form—complete essays not needed.
 - **Grading Journal Entries-**Your papers are to be uploaded into CTools by 5pm on the Tuesday after the class the topic is covered. For grading purposes, use your UMID # as your identification for the essay. Do not put your name or unique name on the essay. These journal entries will be graded as:
0 (not turned in or unacceptable), *B (okay, some weakness)*, *A (good job)*.
 - **Late papers** will be not be accepted; you will receive a zero unless there is a bona fide emergency or you get advance permission (at least night before class one) to hand in the assignment late.
- **Class Participation** - You will be rewarded for participating in class. We will emphasize quality, not quantity. This will include on-time class attendance, and how active you are in listening and participating. A quiet student who listens intently and participates actively can get a good grade.
- **Group Project Proposal and Status Reports** – These are group assignments. You will work in a group you select of 2-3 students and do an improvement project in a real organization. You will follow the pattern of Toyota Kata. I have opportunities in Ann Arbor for those who need them, or some of you may have your own organization you wish to work with. The due dates of reports and a sample schedule are at the end of this document.
- **Group Final Paper** –Final report summarizing the group project.

Grade Breakdown

Individual Weekly Journals	25%
Intermediate Group reports	15%
Final Group Paper	40%
Class Participation	20%
	<hr style="width: 50%; margin: 0 auto;"/>
	<u>100%</u>

Policy on Written Assignments: All individual written assignments in this course are to be completed on your own. You are allowed to consult with other students in the current class during the conceptualization of a problem but all written work, whether in scrap or final form, is to be generated by you working alone. Similarly, all group assignments should be worked on only by members of your group. You are not allowed to possess, look at, use, or in anyway derive advantage from the existence of papers prepared by students in prior years. Violation of this policy is grounds for me to initiate an action that would be filed with the Dean’s office and would come before the College of Engineering’s Honor Council.

Overview of Agenda:

Part I: Tools and Methods of Lean Thinking

- 1 1/8 What is Lean, Toyota Way, and Toyota Kata? *Kata in the Classroom* exercise.
2. 1/15 The Toyota Way and Toyota Kata: The **Strategic Direction and Challenge**
--Hand out Toyota Kata Course Project Assignment
1/19 First Journal entry due, then due every week after.
3. 1/22 Value Stream Mapping to **Set Direction**
1/28 - 1 page project charter: Client, project, student team, initial problem definition, POC
- 4 1/29 **Grasping the Current Condition** and **Setting Target Conditions** (Paper Car exercise)
- 5 2/5 **Experiment Toward the Target Condition** and the **Coaching Kata** (coaching exercise & Paper Car exercise continue)
2/11 - Interim Report 1: Progress to date with photographs of process and storyboard
- 6 2/12 Problem Solving, Toyota Kata, and the learner's storyboard
- 7 2/19 Exceptional Processes: Standard Work and Job Instruction Training

Part II: The Social System of Lean Thinking

- 8 2/26 Work Groups and Daily Kaizen
Week 9 ~~~ WINTER BREAK ~~~

Part III: Transforming to Lean Thinking

- 3/10 - Interim Report 2: Overview of challenge, current condition, obstacles, coaching and PDCA cycles with photos and initial results**
- 10 3/11 Lean in Services—Menlo Innovations Case
- 11 3/18 Lean Culture
- 12 3/25 Lean Site Visit – Zingerman’s Mail Order, Ann Arbor
3/31 - Interim Report 3: Overview of challenge, current condition, obstacles, coaching and PDCA cycles with photos and initial results
- 13 4/1 How can we effectively manage change?
- 14 4/8 Lean leadership
- 15 4/15 Group Project Presentations and Feedback
4/22 Final Group Paper Due

Weekly Reading Assignments:

1/8, Week 1 What is Lean, Toyota Way, and Toyota Kata?

1. Collins, J. Great by Choice, Chapter 2 - "10Xers," Harper Business, 2011.
2. Rother, Mike, *Toyota Kata Practice Guide*, Introduction and pp. 1-54

1/15 , Week 2, The Toyota Way and Toyota Kata: The Strategic Direction and Challenge

1. Watch these videos in preparation for Friday's class (you will be tested!):
https://www.youtube.com/watch?v=es3hYCMmMc&ab_channel=MikeRother
2. <https://www.youtube.com/watch?v=qluiKUcSHOQ>
3. Rother, Mike, *Toyota Kata Practice Guide*, pp. 71-88 (Understand the Direction/Challenge)
4. Liker, J. and Meier, D., *The Toyota Way Fieldbook*, NY: McGraw Hill, 2006, Chapter 2.

1/22, Week 3, Value Stream Mapping to Set Direction

1. Liker, J. and Meier, D., *The Toyota Way Fieldbook*, NY: McGraw Hill, 2006, chapter 3.
2. <http://www.slideshare.net/mike734/value-stream-mapping-the-improvement-kata>
3. <http://theleanthinker.com/2013/11/10/learning-to-see-in-2013/comment-page-1/#comment-40172>
4. <http://www.slideshare.net/mike734/the-coaching-kata-chain-of-coaching>

1/29, Week 4, Understanding the Current Condition and Setting Target Conditions

5. Liker, J. and Meier, D., *The Toyota Way Fieldbook*, NY: McGraw Hill, 2006, Chapter 4.
6. Rother, Mike, *Toyota Kata Practice Guide*, pp. 89-149 (Grasp the Current Condition and Establish the Next Target Condition)

2/5, Week 5, Toyota Kata: Experiment Toward the Target Condition and the Coaching Kata

1. Rother, Mike, *Toyota Kata Practice Guide*, pp. 185-273 (Guidelines for Improvement Kata Coaches and How to do a Coaching Cycle)

2/12, Week 6, Problem Solving, Toyota Kata, and the Learner's Storyboard

1. Liker, J. and Meier, D., *The Toyota Way Fieldbook*, NY: McGraw Hill, 2006, chapter 18.
2. http://www.slideshare.net/mike734/a3-and-the-improvement-kata?qid=e608ac96-06f9-4caa-8e6a-36efa3f19360&v=qf1&b=&from_search=2

2/19, Week 7, Exceptional Processes: Standard Work and Job Instruction Training

1. Liker, J. and Meier, D., *The Toyota Way Fieldbook*, NY: McGraw Hill, 2006, chapter 6.
2. Liker, J. K., M. Hoseus., *Toyota culture: the heart and soul of the Toyota way*. New York, McGraw-Hill. 2008, Chapter 5.
3. O'Connell, V. (2008). Stores Count Seconds to Trim Labor Costs. *Wall Street Journal*. New York.

2/26, Week 8- Work Groups and Daily Kaizen

1. Liker, J. and Meier, D., *The Toyota Way Fieldbook*, NY: McGraw Hill, 2006, chapters 10 and 11.
2. Liker, J. K. (2004). *The Toyota way: 14 management principles from the world's greatest manufacturer*. New York, McGraw-Hill. Chapter 16

3/4, Week 9 **WINTER BREAK******

3/11, Week 10 –Lean in Services: Menlo Innovation Case

1. Richard Sheridan, *Joy Inc.*, Penguin Books, 2014, Chapters 1 --
2. http://www.leanpd.org/downloads/LPPD2_case_Menlo.pdf
3. Liker, J. K. (2004). *The Toyota way: 14 management principles from the world's greatest manufacturer*. New York, McGraw-Hill. Chapter 21.

3/18, Week 11- Lean Culture

1. Schein, E. H. (1984). "Coming to a New Awareness of Organizational Culture." *Sloan Management Review* 25(2).
2. Liker, J. K., M. Hoseus. *Toyota culture: the heart and soul of the Toyota way*. New York, McGraw-Hill. 2008.
3. Brelis, M. "Herb's Way: Chairman's Unconventional Business Strategy has made Southwest Airlines a Model for Success," *Boston Globe*, 11/5/2000.

3/25 Week 12 – Lean Site Visit (Zingerman's Mail Order)

4/1, Week 13 - How can we effectively manage change?

1. Liker, J. and Meier, D., *The Toyota Way Fieldbook*, NY: McGraw Hill, 2006, chapters 19 and 20.
2. Rock, D. and Schwartz, J., "The Neuroscience of Leadership," *Strategy and Business*, No. 43, 2006.
3. <http://www.slideshare.net/mike734/how-to-deploy-the-improvement-kata?related=1>

4/8, Week 14 - Lean Leadership

1. Liker, J. K. and Convis, G. (2012). *The Toyota way to Lean Leadership*. NY: McGraw-Hill., chapter 1.
2. Collins, Jim, *Good to Great*, 2001: Chapter 2, pp 17-40

--Take the abbreviated form of the Meyers-Briggs Personality Inventory and read results:

<http://www.16personalities.com/free-personality-test>

<http://media-cache-ak0.pinimg.com/originals/3b/d3/dc/3bd3dc21d6eeb1742976dc496e41d0ab.jpg>

4/15, Week 15 - Final Group Project Reports Due (Discuss in class)

4/22 Final Group Paper Due

Sample Group Project Schedule

(It probably will not be exactly like this)

Week of

1/18	Meet at project site with client and coach for initial overview and planning
1/25	Understand strategic direction, select focus area, define challenge 1/28 - 1 page proposal: Client, project, student team, initial problem definition, POC
2/1	Current situation analysis—set up kata storyboard and post information
2/8	1 st target condition, define obstacles, first experimenting cycles 2/11 - Interim Report 1: Progress to date with photographs of process and storyboard
2/15	1 st coaching cycle and 2 nd experimenting cycles
2/22	3 rd coaching cycle and experimenting cycles 2/25 - Interim Report 2: Overview of challenge, current condition, obstacles, coaching and experimenting cycles with photos and initial results
3/1	4 th coaching cycle and experimenting cycles
3/8	If reached 1 st target condition, current state analysis, and plan 2 nd target condition
3/15	5 th coaching cycle and experimenting cycles 3/19 - Interim Report 3: Overview of challenge, current condition, obstacles, coaching and experimenting cycles with photos and initial results
3/22	6 th coaching cycle and experimenting cycles
3/29	7 th coaching cycle and experimenting cycles
4/7	Planning session to sustain the improvement process

4/22 Final Group Paper Due