

**MSCI: 7900 Special Topics in Management Sciences:  
Lean-Six Sigma Green Belt  
CIMBA Course – Summer 2017**

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**Course Description:**

Numerous organizations have successfully applied Lean-Six Sigma continuous improvement methods to increase customer satisfaction, minimize lead-time/process time, and reduce costs of poor quality. This Green Belt level training course introduces students to the Six Sigma DMAIC methodology and provides tools and data analysis techniques to reduce process variation and improve performance for either manufacturing or office business processes.

**Lean Six Sigma Green Belt Learning Objectives:**

- Understand variability through the graphical representation of data.
  - Describe a process visually through process mapping techniques.
  - Apply DMAIC problem solving process toward process improvement at the Green Belt level.
  - Interpret test results and draw conclusions based on data.
  - Develop recommendations and control plans to improve processes.
  - Complete a process improvement project outside of class that demonstrates the application of the full DMAIC methodology.
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- **Pre-reading: Continuous Improvement Overview**
    - What is Six Sigma, D. Lynch
    - The Lean Service Machine (Jefferson Pilot), Cynthia Swank, Harvard Business Review
    - Note: Case Study is discussed during class on 1<sup>st</sup> Day (Exercise #1)
  
  - **(Optional) Case Studies (Background Reading for In-Class Exercises)**
    - Loan Process

**Course Text Book:**

The course lecture notes have been developed from a variety of sources and created such that a textbook is **NOT** required. Still, many of the tools and concepts covered are available through numerous web resources or a reference book. (See below for recommendations or refer to course list of Lean Six Sigma References).

George, Rowlands, Price, and Maxey (2005). The Lean Six Sigma Pocket Toolbook.

**QETools Software:** This course requires a laptop with Microsoft Excel for data analysis exercises. In addition, an Excel Add-In Tool, QETools ([qetools.com](http://qetools.com)), is required to download to all students. See separate instructions for downloading QETools Excel Add-In.

**Assignments:** This course contains a mix of non-graded and graded assignments. For Graded Assignments, students may complete after class and hand-in prior to the start of next class (or submit electronically). See section below for breakdown of assignment points for course grading.

**Course Grades:** Based on past performances, final grades will *likely* be based on a straight scale. However, adjustments may be made based on overall class performance. Expected Grading Scale: A+  $\geq$  97, A  $\geq$  93, A-  $\geq$  90; B+  $\geq$  87, B  $\geq$  83, B-  $\geq$  80; C+  $\geq$  77, C  $\geq$  73, C-  $\geq$  70, etc. (Fail < 60%)

#### Daily Schedule of Topics

Time	Module	Module Name
<b>Session 1 (Tue) - Continuous Improvement Overview, Process Mapping, DEFINE Phase</b>		
8:30 – 9:00		Welcome, introductions, and course overview
9:00 – 10:00	01	<b>Continuous Improvement Overview</b> – Integrating Lean and Six Sigma, Classic Forms of Waste, Kaizen and Saw Tooth Effect
10:00 – 10:30	01E	<i>Small Group Discussion</i>
10:30 – 11:30	02	DMAIC Problem Solving Process and <b>Define Phase</b>
11:30 – 1:00		<b>Lunch</b>
1:00 – 1:30	02E	<i>In-Class Exercise: DMAIC Process</i>
1:30 – 3:00	03	Process Maps: SIPOC, Swim lane, Process Mapping Diagrams
3:00 – 3:30	03E	<i>In-Class Exercise: SIPOC and Swim Lane Process Maps (Non-Graded)</i>

Time	Module	Module Name
<b>Session 2 (Wed) – Value Stream Mapping</b>		
8:30 – 10:30	04	Value Stream Mapping (VSM) (Value Stream Process Redesign, Current State VSM, Value Add Timeline, Future State VSM)
10:30 – 11:30	04E	<i>In-Class Exercise: Current State VSM (Non-Graded)</i>
11:30 – 1:00		<b>Lunch</b>
1:00 – 3:00	05	Productivity Analysis and Lean Levers (Effective Process Time, Operator Bar Charts. Lean Levers: Volume/Mix Leveling, Pitch Interval/Takt)
3:00 – 3:30	Cont. 4E	<i>In-Class Exercise: Future State VSM (Non-Graded)</i>
		<b>Take Home Graded Exercise: Productivity Analysis</b>

Time	Module	Module Name
<b>Session 3 (Thu) – Graphical Analysis Tools and MEASURE Phase</b>		
8:30 – 10:30	06	Exploring Data Patterns and Descriptive Statistics - Graphical Analysis Tools (Run Chart, Dot Plot, Histogram, Box Plot)
10:30 – 11:30	06E	<i>QETools Tutorial and Exercise</i>
11:30 – 1:00		<b>Lunch</b>
1:00 – 3:00	07	<b>Measure Phase:</b> Measurement Systems and Measuring Current State Capability (Yield, PPM Defective, DPMO, Rolled Yield)
3:00 – 3:30	07E	<i>In-Class Exercise: Measure Phase</i>

Time	Module	Module Name
<b>Take Home Graded Exercise: Measure Current State (Due Monday)</b>		
<b>Session 4 (Fri) – ANALYZE Phase</b>		
8:30 – 9:30	08	<b>ANALYZE:</b> Qualitative Analysis (Cause-Effect Diagram, 5 Whys)
9:30 – 10:30	09	Stratification Tools: Graphical Tools (Bar/Pie Charts), Multiple Box Plot, Scatter Plot
10:30 – 11:30	09E	<i>In-Class Exercise: Stratification Analysis</i>
		<b>Begin Graded Take Home Case Study: Puddy Computer (Work on Define/Measure Phase)</b>

Time	Module	Module Name
<b>Session 5 (Mon) – ANALYZE/IMPROVE Phase</b>		
8:30 – 9:30	10	Check Sheets and Pareto Analysis (Pareto Drill Down)
9:30 – 10:00	10E	<i>Exercise: Check Sheets and Pareto Analysis</i>
10:00 – 11:30	11	Hypothesis Testing: Two Group Tests (Means and Proportions)
11:30 – 1:00		<b>Lunch</b>
1:00 – 1:30	11E	<i>Exercise: Hypothesis Testing</i>
1:30 – 2:15	12	IMPROVE Phase and Rapid Improvement/Workplace Organization – ‘5S’ Process
2:15 – 2:30	12E	<i>In-Class Exercise: 5S Process</i>
2:30 – 3:30	13	Quick Win Improvements (Waste Walk, Improved Training, Error Proofing, Visual Aids, Process Monitoring)
		<b>Graded Take Home Exercise: Analyze Phase</b>

Time	Module	Module Name
<b>Session 6 (Tue) - Lean-Six Sigma IMPROVE Phase</b>		
8:30 – 9:30	<i>Round 1</i>	<i>Paper House Simulation – Current State</i>
9:30 – 10:30	14	Standardized Work Analysis (Time Observation Form, Capacity Sheets, Detail Job Instructions)
10:30 – 11:30		<i>Paper House Simulation – Standard Work/Quick Win Improvements</i>
11:30 – 12:30		<b>Lunch</b>
12:30 – 2:00	<i>Round 2</i>	<i>Paper House Simulation – Future State</i>
2:00		<b>Leave for PLANT TOUR</b>

Time	Module	Module Name
<b>Session 7 (Wed) – CONTROL Phase and DMAIC Review</b>		
8:30 – 10:00	15	<b>CONTROL:</b> Methods of Control, Visual Controls and Daily Visual Management, Control Plans
10:00 – 11:00	16	Conducting a Kaizen Event
11:00 – 11:30	17	DMAIC Gate Review Process
11:30 – 1:00		<b>Lunch</b>
1:00 – 3:00	17E	DMAIC Team Case Study Exercise – Puddy Computer
3:00 – 3:30	18	Course Summary
		<b>Graded Team Reports (PPT) – Puddy Computer</b>

Time	Module	Module Name
<b>Session 8 (Thu) –Final Exam</b>		
8:30 – 10:30		<b>Final Exam (Open Book/Open Note)</b>

**About the Final Exam:**

Open Book/Open Note/Software

40 Multiple Choice (2.5 pts each)

See Practice Test for Sample Questions

## Course Grading

Assignment	Points	% of Grade
Exercises (3)	50	25%
Case Studies (1)	30	15%
Participation	20	10%
Final Exam	100	50%
<b>Total</b>	<b>200</b>	<b>100%</b>

### **Additional Course Information:**

*See Online References for Additional Topics and Supplemental Information*

### **Supplemental Information Provided on Course Website:**

Tollgate review process

Glossary (lean and Six Sigma)

Lean-Six Sigma Reference list

Basic Statistics Review Guide

GB Certification Project Guidelines and Report Templates

Champion effectiveness and Gate Review questions

### **University of Michigan Lean-Six Sigma Green Belt Certification OPTION**

After successfully completing this course, participants may seek to obtain their Lean-Six Sigma Green Belt Certification through the University of Michigan. Certification requires:

- Completion of this course with a grade of B- or higher
- Completion of Certification Project
  - Participants should complete an industry certification project per University of Michigan guidelines (see requirements) within 180 days of course start (max. year)
  - Participants should select a project from their workplace (if unable to find a work project, participants may use a University of Michigan Green Belt Case Study)
  - See instructor for registration information link.

### **Attendance and Preparation**

Attendance at all classes and CIMBA sanctioned activities is mandatory. All unexcused absences will have the following consequences:

- a. 1st absence will result in a loss of a 1/2 of a letter grade in that class
- b. 2nd (cumulative) absence will result in a loss of an entire letter grade in that class
- c. 3rd (cumulative) absence will result in a dismissal from the program

Absences due to illness require a note from the CIMBA Staff. If a student is sick and cannot attend class, he/she must inform the CIMBA Staff immediately. Failure to do so will result in an unexcused absence.

### **Academic Honesty**

Students will be held to the highest standards of integrity in completing exams and assignments. If I determine that any assignment was not written solely by the student whose name is on the project, the student will receive a zero (0) for the assignment and may receive an "F" for the class. All incidents of cheating will be reported to the Senior Associate Dean and the student may be placed on disciplinary probation for the remainder of his or her enrollment at the University of Iowa. Honor Code for the Tippie College of Business will determine the appropriate appeal process.

### **Student Grievances**

Student concerns regarding this course should first be discussed with me, the faculty member teaching this course. If we can't resolve the complaint, you may contact the CIMBA Director, Brandelle Unkrich (319-335-1041, [brandelle-unkrich@uiowa.edu](mailto:brandelle-unkrich@uiowa.edu)). The Director will review the details of the complaint and involve the Associate Dean of the Graduate Programs, as needed.

### **Accommodations for disabilities**

A student seeking academic accommodations such as a modification of seating, testing, timing, etc. should first register with Student Disability Services, then contact Shannon Lizakowski ([shannon-lizakowski@uiowa.edu](mailto:shannon-lizakowski@uiowa.edu)) in the CIMBA Office to make further arrangements. See <http://sds.studentlife.uiowa.edu> for more information.

### **Policy on Sexual Harassment**

Sexual harassment subverts the mission of the University and threatens the well-being of students, faculty, and staff. All members of the UI community have a responsibility to uphold this mission and to contribute to a safe environment that enhances learning. Incidents of sexual harassment should be reported immediately. If you feel that you are being or have been harassed or you are not sure what constitutes sexual harassment, we encourage you to visit the University website, [www.sexualharassment.uiowa.edu/index.php](http://www.sexualharassment.uiowa.edu/index.php), and to seek assistance from the CIMBA Director, Brandelle Unkrich, at 319-335-1041 or [brandelle-unkrich@uiowa.edu](mailto:brandelle-unkrich@uiowa.edu).