

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

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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 training course introduces students to the Six Sigma DMAIC methodology and provides tools and data analysis techniques to reduce process variation and improve performance of manufacturing and business processes.

- **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 1st Day (Exercise #01E)
- **(Optional) Case Studies (Background Reading for In-Class Exercises)**
 - Loan Process, Working Capital

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.

Useful Web Sites:

Statistics Material: <http://www.itl.nist.gov/div898/handbook/>
<http://davidmlane.com/hyperstat/index.html>

QETools Software: This course is Excel-Based. In addition, an Excel Add-In Tool, QETools (qetools.com), is available for 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
Session 1 (Tue) - Continuous Improvement Overview and Process Mapping		
8:30 – 9:00		Welcome, introductions, and course overview
9:00 – 10:00	01	Continuous Improvement Overview – 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 Define Phase
11:30 – 1:30		Lunch
1:30 – 2:00	02E	<i>In-Class Exercise: DMAIC Process</i>
2:00 – 3:15	03	Process Maps: SIPOC, Swim lane, Process Mapping Diagrams
3:15 – 4:00	03E	<i>In-Class Exercise: SIPOC and Swim Lane Process Maps (Non-Graded)</i>

Time	Module	Module Name
Session 2 (Wed) – Quantifying Current State		
8:30 – 10:00	04	Exploring Data Patterns - Graphical Analysis Tools (Run Chart, Dot Plot, Histogram, Box Plot)
10:00 – 10:15	4E	<i>QETools Tutorial</i>
10:15 – 11:15	05	Descriptive Statistics – Data Collection, Sampling, Descriptive Statistics
11:15 – 11:30	05E	<i>In-Class Exercise: Graphical Analysis Tools and Descriptive Statistics</i>
11:30 – 1:30		Lunch
1:30 – 3:00	06	MEASURE: Measuring Current State (Yield, PPM Defective, DPMO)
3:00 – 3:30	07	Rolled Yield Analysis (Types of Yield, Rolled Yield, Normalized Yield, % Value-Add versus Rolled Yield)
3:30 – 4:00	07E	<i>In-Class Exercise: Rolled Yield Card Simulation</i>
		Take Home Graded Exercise 1: Measure Current State

Time	Module	Module Name
Session 3 (Thu) – Value Stream Mapping		
8:30 – 10:30	08	Value Stream Mapping (VSM) (Current State VSM, Takt, Process Time Decomposition, Value Add Timeline)
10:30 – 11:30	08E	<i>In-Class Exercise: Current State VSM (Non-Graded)</i>
11:30 – 1:30		Lunch
1:30 – 2:30	09	Productivity Analysis: Capacity and Utilization (Detractors, Nominal vs. Effective Capacity, Utilization, Operator Bar Charts, Staff Planning)
2:30 – 3:30	10	Future State VSM (Operator Bar Charts/Load Balancing, Demand Leveling Strategies, Triage, Pitch Interval/Takt Board)
3:30 – 4:00	10E	Graded Exercise 2: Future State VSM- Part II (Take Home Homework)

Time	Module	Module Name
Session 4 (Fri) – Assessing Process Stability and Statistical Process Control (SPC)		
8:30 – 12:00		Plant Tour
		<i>Begin Graded Take Home Case Study: Puddy Computer</i>

Time	Module	Module Name
Session 5 (Mon) – Analyze Phase		
8:30 – 9:30	11	ANALYZE: Qualitative Analysis (Cause-Effect Diagram, 5 Whys)
9:30 – 11:30	12	Stratification Analysis: Graphical Tools (Bar/Pie Charts), Scatter Plot/Regression, Check Sheet, Pareto Analysis, Pareto Drill Down
11:30 – 1:30		Lunch
1:30 – 2:00	12E	<i>In-Class Exercise: Stratification Analysis</i>
2:00 – 3:30	13	Hypothesis Testing (t-test, F-test, Two Proportion Tests)
3:30 – 4:00	13E	<i>In-Class Exercise: Hypothesis Testing</i>
		<i>Graded Take Home Exercise 3: Analyze Phase</i>

Time	Module	Module Name
Session 6 (Tue) - Lean-Six Sigma IMPROVE Phase		
8:30 – 9:15	<i>Round 1</i>	<i>Paper House Simulation – Current State</i>
9:15 – 10:15	14	IMPROVE Phase and Rapid Improvement/Workplace Organization – ‘5S’ Process
10:15 – 10:30	14E	<i>In-Class Exercise: 5S Process</i>
10:30 – 11:30	15	Standardized Work Analysis (Time Observation Form, Capacity Sheets, Detail Job Instructions)
11:30 – 1:30		Lunch
1:30 – 2:00		Standardized Work Analysis (Continued)
2:00 – 3:00	16	Quick Win Improvements (Waste Walk, Improved Training, Error Proofing, Visual Aids, Process Monitoring)
3:00 – 4:00	<i>Round 2</i>	<i>Paper House Simulation – Standard Work/Quick Win Improvements</i>

Time	Module	Module Name
Session 7 (Wed) – Improve and Control		
8:30 – 9:30	17	Flow Improvements (Little's Law, Inventory Waste, Batch Size Reduction – One-Piece Flow, Pull Signals Workplace Layout, Setup)
9:30 – 11:00	18	CONTROL: Methods of Control, Visual Controls and Daily Visual Management, Control Plans
11:00 – 11:30	19	DMAIC Gate Review Process
11:30 – 1:30		Lunch
1:30 – 4:00	19E	DMAIC Team Case Study Exercise – Puddy Computer
		Graded Team Reports (PPT) – Puddy Computer

Time	Module	Module Name
Session 8 (Thu) – Course Review and Final Exam		
8:30 – 9:30	20	Conducting a Kaizen Event
9:30 – 10:00	21	Course summary (Optional certification requirements)
10:00 – 11:30		Final Exam (Open Book/Open Note)

About the Final Exam:

Open Book/Open Note/Software

20 Multiple Choice (3 pts each)

10 True-False (2 pts each)

4 Short Answer/Interpretation (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%
Total	200	100%

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 attached CD) within 180 days of course completion.
 - Participants may select a project from their workplace or if unable to find a project, participants may use a University of Michigan Case Study for Green Belt.
 - 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). 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) 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, and to seek assistance from the CIMBA Director, Brandelle Unkrich, at 319-335-1041 or brandelle-unkrich@uiowa.edu.