COURSE DESCRIPTION

This course is designed to familiarize students with the Lean Six Sigma process improvement methodology and to provide them an opportunity to practice using Six Sigma Black Belt tools. It is also the first step in the Cal Poly Lean Six Sigma Black Belt Certification process. A Lean Six Sigma Black Belt is an individual who is skilled in applying basic and advanced process improvement and project management methods in order to complete projects that will result in significant, sustainable improvements within an organization.

Originally developed by Motorola to improve quality in their manufacturing processes, Six Sigma has been adopted by companies throughout the world to improve all types of processes. When applied in business environments, Six Sigma programs have been used to dramatically increase an organization’s ability to improve quality and customer satisfaction while reducing overall costs. Companies such as AlliedSignal and General Electric have used Six Sigma to significantly increase productivity, operating income and cash flow.

In this course, students will gain an understanding of the strategy and deployment of Six Sigma Black Belt methods. After completing this course, you should be able to DO the following:

1. Communicate using Lean Six Sigma concepts.
2. Think about an organization as a collection of processes, with inputs that determine the output.
3. Relate Lean Six Sigma concepts to the overall business mission and objectives.
4. Use the concept of a Sigma Level to evaluate the capability of a process or organization.
5. Understand and apply the five-step D-M-A-I-C model as a framework to organize process improvement activity.
6. Employ a wide range of process improvement techniques, including Design of Experiments, within the D-M-A-I-C model.
7. Recognize the organizational factors that are necessary groundwork for a successful Lean Six Sigma effort.
8. Employ your Lean Six Sigma skills to lead a successful process improvement project delivering meaningful results to the organization.

Please read: This course requires ADDITIONAL COST companion software from MoreSteam.com at https://www.moresteam.com/university/calpoly.cfm
Note that to get access to the companion software as listed below you will need a discount code from the course instructor (Eric Olsen eolsen@calpoly.edu) AFTER you complete a contract and pay $499 to Cal Poly for the course as a fee for service through Central Coast Lean.

CSU Student Black Belt Training and Exam - $500  
CSU Student Black Belt Training and Exam (already completed or paid $300 GB in IT303) - $325  
Professional (non-CSU student) Black Belt Training and Exam - $3,100

For example, the out of pocket cost for a current CSU student is $499 to Cal Poly and $500 to MoreSteam.com or $999 TOTAL during early registration. If you register after the early registration deadline the Cal Poly portion of the cost rises to $600. The Cal Poly portion of the cost is always the same ($499 or $600). The MoreSteam.com portion adjusts per the category of student per the price schedule above.

This course consists of the following elements:

1. Complete the 140 hour Lean Six Sigma Black Belt – EngineRoom version online training provided by Moresteam.com. Access is provided for 365 days with permission. A course overview is provided at [http://www.moresteam.com/lean-six-sigma/black-belt.cfm](http://www.moresteam.com/lean-six-sigma/black-belt.cfm)
2. Complete the online quizzes from each session with at least an 80% average – 20% of grade.
3. Meet bi-weekly with the course instructor online and on-time completion of course homework. Attending a minimum of 4 of 8 live sessions is required – 10% of grade.
4. Practice Test in preparation for the final exam – 5% of grade.
5. Complete the open book, open note 5-hour final exam with at least a 70%. The score on this exam determines 50% of your final grade. Students not hitting the 70% mark will be required to retake the exam or take an incomplete or F for the class. Note that 80% or better is required to proceed with certification (separate course).
6. Complete a “Lean Six Sigma Mini-Project” as described below with a minimum of 70%. The grade on this project determines 15% of your class grade.
**COURSE OUTLINE**

**Summer Black Belt - Block Plan**  

<table>
<thead>
<tr>
<th>Wk</th>
<th>Online Session: Title</th>
<th>Online Hours</th>
<th>Target Complete*</th>
<th>Meeting Total</th>
<th>Online Class Meeting (hrs)</th>
<th>Online Meeting**</th>
<th>Meeting Number</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>Session 1: Introduction To Lean Six Sigma</td>
<td>4.8</td>
<td>6/23/15</td>
<td></td>
<td>2</td>
<td>6/17/15</td>
<td>Kickoff</td>
</tr>
<tr>
<td></td>
<td>Session 2: Define 1 - Starting a Project and Leading Teams</td>
<td>8.3</td>
<td>6/30/15</td>
<td>13.1</td>
<td>2</td>
<td>7/1/15</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>Session 3: Define 2 - Voice of the Customer</td>
<td>8.1</td>
<td>7/7/15</td>
<td></td>
<td></td>
<td>7/15/15</td>
<td>2</td>
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<tr>
<td></td>
<td>Session 4: Define 3 - Mapping the Process</td>
<td>5.3</td>
<td>7/14/15</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td></td>
<td>Session 5: Measure 1 - Measurements and Basic Statistics</td>
<td>5.8</td>
<td>7/14/15</td>
<td>19.1</td>
<td>2</td>
<td>7/15/15</td>
<td>2</td>
</tr>
<tr>
<td>5</td>
<td>Session 6: Measure 2 - Measurement System Analysis</td>
<td>8.6</td>
<td>7/21/15</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td></td>
<td><strong>Mini-Project Draft Charter due</strong></td>
<td>7/21/15</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Session 7: Measure 3 - Charting Process Behavior</td>
<td>9.7</td>
<td>7/28/15</td>
<td>18.2</td>
<td>2</td>
<td>7/29/15</td>
<td>3</td>
</tr>
<tr>
<td>7, 8</td>
<td>Session 8: Analyze 1 - Identifying potential root causes</td>
<td>10.2</td>
<td>8/11/15</td>
<td>10.2</td>
<td>2</td>
<td>8/12/15</td>
<td>4</td>
</tr>
<tr>
<td>9, 10</td>
<td>Session 9: Analyze 2 - Hypothesis Testing</td>
<td>23.2</td>
<td>8/25/15</td>
<td>23.2</td>
<td>2</td>
<td>8/26/15</td>
<td>5</td>
</tr>
<tr>
<td>11, 12</td>
<td>Session 10: Analyze 3 - Design of Experiments</td>
<td>36.8</td>
<td>9/22/15</td>
<td>18.4</td>
<td>2</td>
<td>9/9/15</td>
<td>6</td>
</tr>
<tr>
<td>13, 14</td>
<td><strong>Session 11: Improve</strong></td>
<td>12.8</td>
<td>9/29/15</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>Session 12: Control</td>
<td>7.0</td>
<td>10/6/15</td>
<td>19.8</td>
<td>2</td>
<td>10/7/15</td>
<td>8</td>
</tr>
</tbody>
</table>

**Practice Test due**  

10/6/15  

**Final Mini-Project due**  

10/13/15  

**Online Exam**  

<table>
<thead>
<tr>
<th>Online Hours</th>
<th>Target Complete*</th>
<th>Meeting Total</th>
<th>Online Class Meeting (hrs)</th>
<th>Online Meeting**</th>
<th>Meeting Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.0</td>
<td>5.0</td>
<td>Complete by 10/23*</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Notes:**  

* Target complete by 5pm.  

** Online Class Meetings scheduled for 5-7pm PDST.  

** Required **  

1. This course does not have a text. We will be using the same online training material used by over 45% of Fortune 500 Companies. MoreSteam is a premiere supplier of online lean six sigma training material [https://www.moresteam.com/elearning/tour/lean-six-sigma-retail-tour.cfm](https://www.moresteam.com/elearning/tour/lean-six-sigma-retail-tour.cfm)? You need to purchase access for a year. Follow these steps:  

   a. Obtain a **Discount Code** from Professor Eric Olsen eolsen@calpoly.edu. This will allow you to pay the appropriate fee.  
   
   b. Go to the Cal Poly/MoreSteam.com Lean Six Sigma Training website at:  
      [https://www.moresteam.com/university/calpoly.cfm](https://www.moresteam.com/university/calpoly.cfm) Select **Cal Poly Lean Six Sigma Black Belt and Exam**. Note that current students you are receiving a significant discount from the list price of $3,100.  
   
   c. Click on **ENROLL** for the **Lean Six Sigma Black Belt and Exam**. The price will be adjusted based on your Discount Code at checkout.  
   
   d. Login or New Customers to MoreSteam **CREATE MY ACCOUNT**.  
   
   e. **Pay** as directed.
2. In line with its mission to "Build a Community of Lean Practice" Central Coast Lean has purchased a site license to Gemba Academy [http://www.gembaacademy.com/enterprise/CClean/](http://www.gembaacademy.com/enterprise/CClean/). This license allows any Cal Poly student, faculty, or staff free access to the site and its resources. The username is: CClean and the password is: HCL6gemba (case sensitive). The password will change every quarter. If you are still at Cal Poly in the future and want access to the site, just contact me eolsen@calpoly.edu. Please respect this as intellectual property and do not share this outside Cal Poly. If you do want to share this within Cal Poly, I would appreciate if you cc me or send folks to me for access. That way I can monitor the "community building."

**Recommended**

It is also recommended you are also required to get a free copy of Minitab from Cal Poly’s software download channel. This will supplement the statistics software provided free with the MoreSteam training. Minitab only runs on a PC (not Mac).

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**PERFORMANCE EVALUATION**

**Grading:** Following is a breakdown of the grade:

<table>
<thead>
<tr>
<th>Component</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Online quizzes</td>
<td>20%</td>
</tr>
<tr>
<td>Participation (including online meetings)</td>
<td>10%</td>
</tr>
<tr>
<td>Six Sigma Mini Project</td>
<td>15%</td>
</tr>
<tr>
<td>Practice Exam</td>
<td>5%</td>
</tr>
<tr>
<td>Comprehensive online exam*</td>
<td>50%</td>
</tr>
</tbody>
</table>

*Note: If students do not achieve the 80% minimum on the exam required to proceed with certification, the exam may be retaken after a 30-day “cooling off” period. The original test score still determines the course grade.*

Because the value of Lean Six Sigma capability is highly valued in the job market, students can list “Completed all courses required for Six Sigma Blackbelt certification” on their resumes upon successful completion of this course.

In addition, students are encouraged to pursue Cal Poly Lean Six Sigma Black Belt certification. Students successfully completing this class have all the training necessary to pass any reputable certification test in the Six Sigma body of knowledge. The American Society for Quality (ASQ) offers certification as a Blackbelt by taking an exam and completing two projects for less than $500. Only one project is required with three years of work experience: [http://www.asq.org/certification/six-sigma/index.html](http://www.asq.org/certification/six-sigma/index.html).

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**POLICIES AND PROCEDURES**

**Personal Integrity Policy**

Although I do not expect cheating in my classroom, the penalty for cheating is an **F for the course**. Cheating occurs when a student looks at other students' papers during an exam or obtains help of faculty or students outside their assigned group on assignments. Plagiarism occurs when students copy sections of another author’s material without referencing it. I am a strong believer in accessing resources and discussing class topics outside the class, but be sure to give credit where credit is due.
INSTRUCTOR CAREER HIGHLIGHTS - ERIC OLSEN

RESEARCH INTERESTS
Lean Thinking -- Strategy Deployment – Performance Measurement

EDUCATION
Ph.D. Operations Management – 2004 The Ohio State University
Master of Business Administration - 1987 Virginia Polytechnic Institute & State U
Bachelor of Science, Forest Engineering - 1979 University of Maine at Orono

INDUSTRY
Hewlett Packard / Agilent (Avago Tech) 1988 - 1999
Production Manager – Wireless Semiconductor Division Santa Clara, CA
Worldwide Manufacturing Education Manager - Components Group
Manager, Product Engineering - Optical Communication Div., Fiber Optic Mfg.
Manufacturing Development Engineer - Optical Communication Division, Fiber Optics
Litton - Poly-Scientific 1982 – 1988
Manager Fiber Optic Engineering Blacksburg, VA
Senior Engineer - Slip Ring Products
Caterpillar Tractor Company 1979 – 1981
Test Engineer – Product Development Center Peoria, Illinois

APPENDIX

Requirements for Lean Six Sigma Mini-Project

Objective and Overview
It is important to exercise your knowledge to own it. This is especially true in the world of lean six sigma. Therefore, one of the requirements of this course is that you apply the concepts and tools that you are learning from the MoreSteam online content to a real project. This is the “learn-by-doing” portion of the course.

You shall select a process to improve and apply the DMAIC steps to that process. In the real world, you would be working with a team and have a great deal of flexibility about which approach and tools you would use to solve a problem. This project is to be completed on your own or possibly with the assistance of people involved in the process that you have selected. To manage and grade the large number of students taking this course, the documentation for the project is standardized. The remainder of this document explains the basic project requirements. Questions will be addressed during the weekly sessions.

Step 1: Select a Process to Improve
I suggest you complete at least the first four online sessions before you select a process. The best process to select involves a real world problem that you have a vested interest in solving. This is especially true of work processes at an internship. Alternatively, you can propose any process that you are familiar with and have access to. Select a process that has an “outside” sponsor (not you) to work with. Consider whether the improvement of this process would look good on a resume. Would you be able to use this an example for how you have applied the DMAIC process in a job interview? Consider whether this process would help others beside you. Ultimately, you need to strike a balance between doing a significant project that may be big and complex, with a project that is simple enough to use as
an explanation of the DMAIC process. Once you have decided on a candidate process or two, be sure to review the rest of the project requirements to be sure you have an idea how the project will roll out and which specific tools you might use. **Note that you may have to expand the scope of your project to apply all 10 tools to the problem.** Also note that applying all 10 tools may not necessary solve the problem you have identified. This is okay. That is why we call it a “mini” project.

**Step 2: Draft a Project Charter and Get Instructor Approval**
One key tool in the Define stage of a project is the “Project Charter.” You are required to provide the instructor with a **rough draft Project Charter** of your proposed project **by the beginning of the 6th week** of the class. You will not necessarily be able to insert all the required fields in the online form (see MoreSteam) by the fifth week, but you should provide enough information to demonstrate to the instructor that you have a high likelihood of success. Submit your draft Project Chart as directed by the instructor.

**Step 3: Create a Project Plan**
Review the “Lean 6 Sigma DMAIC Map (SIX SIGMA PROCESS IMPROVEMENT FLOWCHART)” in the sidebar of the MoreSteam training. You are required to apply a minimum of **two tools to each DMAIC stage**. Fortunately, the **Project Charter** counts as one tool in the Define stage. **You are also required to apply at least one “statistical tool” in your project.** Examples of statistical tools include control charts, hypothesis tests, correlation, capability analysis, and regression analysis.

**Project Plan Outline**

<table>
<thead>
<tr>
<th>Executive Summary</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recommendation</td>
</tr>
<tr>
<td>Define</td>
</tr>
<tr>
<td>1. Tool – Project Charter</td>
</tr>
</tbody>
</table>
| 2. Tool - ???
| Measure           |
| 1. Tool – ???
| 2. Tool – ???
| Analyze           |
| 1. Tool – ???
| 2. Tool – ???
| Improve           |
| 1. Tool – ???
| 2. Tool – ???
| Control           |
| 1. Tool – ???
| 2. Tool – ???

Aside from executing each tool in your plan, you will also provide a brief, clear statement on:

1. **Why you applied that particular tool to your SPECIFIC project and**
2. **Your interpretation is of the result to your SPECIFIC project** *(see “Thought Process Map” Session 1, Lesson 15).*
The project you will submit will consist of a total of 10 tools, 10 “why” statements and 10 corresponding “interpretation” statements.

A good “lean” approach that reduces muda for your instructor is to have every new tool begin on a new page clearly indicating the DMAIC stage, the title of the tool and your “why”, and “interpretation” statements.

Step 4: Execute your Project
During the execution of the project, bring your observations and questions to the weekly sessions [For independent study projects you may contact the instructor as needed].

Step 5: Compile your results
Put all your tools and statements into one MSword.docx document. Make sure:

1. The tools and statements are all in DMAIC process order.
2. The Word file name includes your name.
3. All pages are numbered.
4. Include a footer with the file name and your name.
5. Include an executive summary and recommendation as the first page of your project.

Step 6: Submit your results
Submit your docx as specified by the instructor.

Mini-Project Grading Criteria – See the grading rubric on PolyLearn.

The following is a breakdown summary of the criteria that will be used in assessing your project:

<table>
<thead>
<tr>
<th>Points</th>
<th>Percent</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>4%</td>
<td>Project report submitted on time.</td>
</tr>
<tr>
<td>5</td>
<td>4%</td>
<td>Format and submission directions followed.</td>
</tr>
<tr>
<td>10</td>
<td>8%</td>
<td>Picture or organization logo included.</td>
</tr>
<tr>
<td>10</td>
<td>8%</td>
<td>Executive summary included, well executed, extra effort evident.</td>
</tr>
<tr>
<td>10</td>
<td>8%</td>
<td>Recommendations included, well executed, extra effort evident.</td>
</tr>
<tr>
<td>5</td>
<td>4%</td>
<td>Statistical analysis applied in one or more tools.</td>
</tr>
<tr>
<td>10</td>
<td>8%</td>
<td>All ten why statements included, well-executed, extra effort evident.</td>
</tr>
<tr>
<td>60</td>
<td>48%</td>
<td>All ten tools submitted, well executed, extra effort evident.</td>
</tr>
<tr>
<td>10</td>
<td>8%</td>
<td>All ten interpretation statements included, well executed, extra effort evident.</td>
</tr>
<tr>
<td><strong>125</strong></td>
<td><strong>100%</strong></td>
<td></td>
</tr>
</tbody>
</table>