California State University, San Marcos

- Authorization To Offer Non-Degree Extension Credit Course Through Extended Learning

1. Desired Term: Spring Semester     Year of implementation: 2009-2010

2a. Course abbreviation and Number:     2b. Abbreviated Title: (No more than 25 characters, including spaces)
  BUS 1003     Lean Six Sigma, BB Part2

3. College: Business

4. Number of Units:
   Part1: 4-5 units; Part2: 4-5 units

5. Billing Units: 6

6. Allowed Student Levels: UG X GR X EE X  (Default is to check all three levels)

7. Grading Method:  
   - N  Normal (N) (Default is Letter Grade +/-, Students may request Credit/No Credit)  
   - Normal Plus Report-in-Progress (NP) (As for Normal; also allows Report-in-Progress)  
   - Credit/No Credit Only (C)  
   - Credit/No Credit or Report-in-Progress Only (CP)  
   OR: Pass/Fail

8. Mode of Instruction: 
   (See pages 17-23 at http://www.csusm.edu/academic_programs/Curriculum_Forms/index.html for definitions of the Course Classification Numbers)

<table>
<thead>
<tr>
<th>Type of Instruction</th>
<th>Number of Credit Units</th>
<th>Instructional Mode (Course Classification Number)</th>
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<tbody>
<tr>
<td>Lecture</td>
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<td>C-02</td>
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<tr>
<td>Activity</td>
<td>1</td>
<td>N-13</td>
</tr>
<tr>
<td>Lab</td>
<td></td>
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</table>

9. Attributes: Course Requires Consent for Enrollment?  X Yes  N No
   - X Faculty Credential Analyst  Dean Program/Department Director/Chair

Prerequisites: BUS: Lean Six Sigma Part1

Co-requisites: Math: Algebra, Pre-Cal.

10. Does this course impact other discipline(s)? (If there is any uncertainty as to whether a particular discipline is affected, check "yes" and obtain signature.)
   Yes  N No
   If yes, obtain signature(s). Any objections should be stated in writing and attached to this form.
   
   Discipline
   Signature
   Date
   Support  Oppose
   
   Discipline
   Signature
   Date
   Support  Oppose

Important: Please Complete

1. Instructor  Salman Taghizadegan

2. Please complete the Extension Course Proposal Form
   http://www.csusm.edu/academic_programs/Curriculum_Forms/index.html

SIGNATURES: (COLLEGE LEVEL)

1. Program Director/Chair  8/6/09
   Signature  7/31/09

2. College Dean (or Designee) Date

SIGNATURES: (UNIVERSITY LEVEL)

3. Dean of Extended Learning (or Designee)  8/6/09
   Signature  8/24/09

   President for Academic Affairs (or Designee)  Date

(Handwritten annotations: 8/12/09)
Part II: Lean Six Sigma-A Black Belt Program (BUS-TBA)
Spring 2009-2010

INSTRUCTOR: Dr. Salman Taghizadegan
OFFICE: Craven Hall
PHONE: (760) 304-7208
OFFICE HOURS: Mon.-Thu. 5:00 – 6:00 PM and by appointments
EMAIL: df16s@yahoo.com
staghiza@csusm.edu

TEXT: Essentials of Lean Six Sigma: by Salman Taghizadegan; Publisher: Elsevier
Statistical Software: Minitab

COURSE OBJECTIVES:
Lean Six Sigma is a disciplined, data-driven approach to process improvement aimed at the near-
elimination of defects (driving towards six standard deviations between the mean and the nearest
specification limit) in any process -- from manufacturing/product to transactional/service, and increased
customer satisfaction, increased capacity and output, quality, service reliability, financial results through
process improvement, and direct cost reduction per project. This is accomplished through the use of
sub-methodology: Part I (Define, Measure, and Analyze-part1), and Part II (Analyze-part2, Improve,
and Control). Course emphasizes in topics from Lean, descriptive techniques to multiple regression
models and applications relevant to business problems. Use of computer and statistical software will be
integrated.

PREREQUISITES: Lower division core/Successful completion of the University Computer
Competency. Mathematical skills equivalent to college algebra is required. Lean Six Sigma part I.

GRADING POLICY:
<table>
<thead>
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<th>Component</th>
<th>Percentage</th>
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<tr>
<td>Term Project</td>
<td>30%</td>
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<tr>
<td>Mid-term</td>
<td>25%</td>
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<tr>
<td>Final Exam</td>
<td>30%</td>
</tr>
<tr>
<td>Lab/Class participation</td>
<td>10%</td>
</tr>
<tr>
<td>Assignments/Quizzes</td>
<td>5%</td>
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</tbody>
</table>

No make-up exams will be given. Assignments should be completed and submitted on their due
date. No late assignments are accepted. Working problems are important to learning how to apply the
concepts. Missing a class is not an acceptable excuse for late assignments, and it is the student’s
responsibility to find out about the homework assignments.

GROUP PROJECT:
A group project requires application of concepts learned through course work, discussion of
techniques, and assigned reading and problems are requirement for this course. Each group will
comprise 2/3 students. Students are strongly advised to form their own groups immediately. Each team
member must evaluate the other peers in the group on their participation and contribution to the project.
A written report (10-15 pages) is due on the day of the final. All group members should participate in
writing of the report. The objective of the group project is to come out with a first-class cooperative
effort. Each team will be required to make a 20-minute presentation of the major findings during the last
two class meetings.
Phase II-part2: Process Data Analysis Tools/ Techniques Chapters 2.0, 3.0, 7.0, 8.0, Handouts

Week 1:

1. Statistical Inference and Sampling
   1.1 Confidence Intervals for the Mean of a Normal Population (σ Known)
   1.2 Confidence Intervals for the Mean of a Normal Population (σ Unknown)
   1.3 Selecting the Sample Size/ Standard Errors
   1.4 Bootstrap Confidence Intervals
   1.5 Other Sampling Procedures

Week 2:

2. Hypothesis Testing for the Mean and Variance of a Population
   2.1 Hypothesis Testing on the Mean of a Population: Large Sample
   2.2 One-Tailed Test for the Mean of a Population: Large Sample
   2.3 Reporting Testing Results using a p-Value
   2.4 Hypothesis Testing on the Mean of a Normal Population: Small Sample

Week 3

3. Inference Procedures for Two Populations
   3.1 Independent versus Dependent Samples
   3.2 Comparing Two Means Using Two Large, Independent Samples
   3.3 Comparing Two Population Means Using Two Small, Independent Samples
   3.4 Comparing the Means of Two Normal Populations Using, Paired Samples
   3.5 Non-normal Data: Tests for Medians and Equal Variance

Week 4:

4. Estimation and Testing for Population Proportion
   4.1 Estimation and Confidence Interval for a Population Proportion
   4.2 Hypothesis Testing for a Population Proportion
   4.3 Comparing Two Population Proportion: Large, Independent Samples

Week 5:

5. ANOVA: Analysis of Variance
   5.1 One Way: Hypothesis testing
   5.2 Two Way: Hypothecis Testing

Week 6/7:

6. Multi-Vari Studies
   6.1 Analysis, Interpretation, and Application
7. Scatter/ Correlation Analysis
8. Reliability Engineering and Estimation/ Quality Cost

Week 8/9:

9. Regression and Correlation Analysis

Simple Linear Regression and Correlation
9.1 Bivariate Data and Correlation
9.2 The Simple Linear Regression Model
9.3 Inference on the Slope, $\beta_1$
9.4 Measuring the Strength of the Model
9.5 Estimation and Prediction using the Simple Linear Model
9.6 Examining the Residuals

**Week 10:**  
**Multiple Linear Regressions**
9.7 The Multiple Linear Regression Model
9.8 Hypothesis Testing and Confidence Intervals for $\beta$ parameters
9.9 Polynomial Regression
9.10 Stepwise Regression

*Midterm Exam-Presentation Part I*

**Week 11:**  
*Spring Break*

**II: Process Optimization**

**Week 12-14:**  
**Phase III: Process Improvement and Optimization**  
Chapters 3.0, 6.0, 8.0-10.0 Handouts

10. FMEA (Failure Mode Effects Analysis)
12. Design Of Experiments (DOE)
   12.1 Fractional Factorial Design
   12.2 Full Factorial (balanced & Orthogonal) Design
   12.3 Model with aliased interactions
   12.4 Composite Design (2-Factors)
13. Non-Linear and Multiple Linear Regression Analysis (MLR)
14. Response Surface Methodology/ Composite Designs  
   (Multiple factors)
15. Improvement Tools and Techniques
16. Mistake Proofing, 5S, Set-up Reduction

*Presentation Part II*

**Week 15/16:**  
**Phase IV: Process Control and Maintain**  
Chapters 6.0, 8.0-10.0, Handouts

17. Process Control Objectives/ Standardization
18. Control Tools and Techniques/ Training/ Documentation
19. Statistical Process Control-SPC
   19.1 SPC Methodology Selection and Analysis of Control Charts
20. Process Control Planning and Management
21. Lean Controls: Lean Tools/ Project Sustainability
22. Supply Chain Process Improvement
   22.1 Supply-Chain Operations Reference-model (SCOR)

**Week 17:**  
*Report out*
23. Review, Presentations
24. Final Exam (Comprehensive)

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Part I & II: Lean Six Sigma – Black Belt Program (BUS ***)
GROUP PROJECT

GROUP SIZE:
Groups should consist of 1-3 students.

TEAMWORK:
All members of the group must equally participate on all aspects of the project. Do not assign a task to a single member of the group. Each student must evaluate the other peers in their group on their participation and contribution to the project. This evaluation must be placed in a sealed envelope and attached to the final project.

PRESENTATION:
The presentation should be via an electronic medium, about 10 minutes, and all group members must participate.
- Outline.
- Introduction, definition of the project and the objective.
- A copy of your questionnaire.
- Data collection procedures. Describe difficulties and observations.
- Charts and graphs to show trends and categories in data.
- Statistical tests and the outcomes. Do not explain details.
- Conclusion and what you would have done differently.

EVALUATION:

<table>
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<tr>
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</tr>
<tr>
<td>Presentation</td>
<td>40%</td>
</tr>
<tr>
<td>Illustrations/ graphs</td>
<td>10%</td>
</tr>
<tr>
<td>Total</td>
<td>100%</td>
</tr>
</tbody>
</table>
REPORT FORMAT

ABSTRACT: (1-2 pages)
- The introduction should include a brief but precise definition of the objectives of the study. This also should include of a population definition and the specific characteristic of the population under study.

OBJECTIVES AND FOCUS OF STUDY: (1-2 pages)
- Objectives
- Data Sources
- Survey Questions

HOW STUDY WAS DONE: (8-9 pages)
- Design Choice
- Describe how the data was collected or the survey was concluded.
- Data analysis should consist of two parts:
  1. Descriptive Statistics: Charts, bar graphs, frequency distributions, etc.
  2. Inferential Statistics: Statistical procedures and techniques used to accomplish the objective of the project.

CONCLUSION AND SUMMARY
- State the result of your analysis and critique it. Discuss the possible sources of error.

Note: The UNIVERSITY WRITING REQUIREMENT:
The University writing requirement will be met by the write-ups and the final project.
OFFICE OF EXTENDED LEARNING
EXTENSION COURSE PROPOSAL FORM

In planning the components of our Extended Learning program at Cal State San Marcos, this office consults closely with the academic colleges and departments to determine the suitability of course content, teaching methods and instructor qualifications. To assist us in evaluating your proposed course for credit, please submit this completed form—along with Form X: New Course Non-degree Credit—to our office as soon as possible. Questions before you submit? Call (760) 750-4020.

- **Course Title:**
  
  Process Improvement: Lean and Six Sigma Black Belt Certification

- **Course Description:** (*Please provide a short paragraph describing the purpose, topics and audience for your course. Be sure to include the benefits for students who take your course. An edited version of this description will be used for promotional copy.*)

  Six Sigma is a disciplined, data-driven approach to process improvement aimed at the near-elimination of defects (driving towards six standard deviations between the mean and the nearest specification limit) in any process -- from manufacturing to transactional and from product to service. Unlike previous quality improvement efforts, Six Sigma is designed to provide tangible business results, cost savings that are directly traceable to the bottom line.

- **Course Objectives:** (*Provide specific student learning outcomes and how they will be achieved.*)

  The fundamental objective of the Lean Six Sigma methodology is reduction in total defects, increased customer satisfaction, increased capacity and output, better product, service reliability, financial results through process improvement, $100,000 to $200,000 direct cost reduction per project. This is accomplished through the use of sub-methodology: Define, Measure, Analyze, Improve, and Control (DMAIC)

  1) **Define** (understand the process and value-stream as related to the customer):
  Identify business drivers, select customer critical processes, define projects, and develop implementation plan.

  2) **Measure** (understand customer requirement, measure what factors effects your process, know your measure is good):
  Develop key process measures, collect and analyze data, identify the vital few that have the highest impact, estimate process capability, measurement systems analysis, and Teakt-time analysis.

  3) **Analyze** (create flow, statistically define improvement, look for root causes):
  Understand cause and effects, create Multi-vari analysis, determine variance components, assess correlation, and 5-S to facilitate improvement.

  4) **Improve** (improve specific root cause, implement cellular concepts, standardize process):
  Develop and evaluate solutions, implement variation reduction, standardize process, and assess risk factors.

  5) **Control** (ensure process improvements are sustained):
  Implement process control, implement control charts for key variables, mistake proof processes, evaluate results, and Leverage opportunities for future improvements.

- **Evaluation:** (*What will be the basis for grades? How will you know that the students have achieved the course objectives?*)

  1) Project completion
  2) Four presentations
  3) Short tests and final exam
Course Length: (How many actual contact hours in class? Note: Credit courses must contain a minimum of fifteen 50-minute contact hours for each semester unit of credit, and outside of class work by students is required.

Students who wish to earn Black Belt Certification with no Green Belt certification: 192 hrs

Proposed Date(s):
Fall Semester, 2009

Location: (Indicate if you are proposing this course to be scheduled and offered in our facilities, or if this course is to be held at an off-campus location, such as a school, district or county office, company, etc.)

Location:
Hunter Industries, Inc.
1943 Diamond St.
San Marcos, CA 92078
760-744-5240

Support Needs: (Please indicate any special services you will need, such as audio-visual equipment, photocopying, room set-up, etc.)

Audio-visual equipment with computer [PowerPoint Presentation], photocopying

Comments: (Please add any other relevant information, such as whether or not the course has been taught elsewhere successfully, why the course is needed in our area, marketing suggestions, etc.)

This course is taught at UCSD Extension, and USD due to high demand from healthcare and industries.
UCSD: Six Sigma Black Belt 9.0 Units ; Course number 40132. On campus.
UCSD: Lean Six Sigma Black Belt 9.0 Units ; Course number 40004. On campus.

When completed, please return this form, along with an up-to-date resume (with teaching references) to:
Eric Bullard, Office of Extended Learning, Cal State San Marcos, 333 S. Twin Oaks Valley Rd., San Marcos, CA 92096; FAX: (760)750-3138; E-mail: ebullard@csusm.edu