SOUTHERN ILLINOIS UNIVERSITY CARBONDALE

IT 480
Six Sigma Black Belt
Fall 2009

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1. **COURSE OBJECTIVE:** To develop a detailed understanding of advanced principles, methods, and tools of Six Sigma and their application in the business world. This course covers the material on the American Society of Quality (ASQ) Certified Six Sigma Black Belt (CSSBB) examination.

2. **REQUIRED RESOURCES:** The following resources are required for this course:

   a. CSSBB PRIMER, Quality Council of Indiana, www.qualitycouncil.com, 2006.

   b. Hand-held scientific calculator with statistical functions.

3. **OPTIONAL RESOURCES:** The following supplemental resources will be used throughout the class and are highly recommended:

   a. Black Belt Course Manual (CM-BB) from OpenSourceSixSigma.com

   b. Laptop computer with Minitab 15 from www.minitab.com

4. **EVALUATION:** A mid-term and a (non-comprehensive) final exam will be administered to assess student performance. Each exam will be worth 50% of the final grade.

5. **GRADING POLICY:** The following grading standards will be used for this course:

A 90 – 100%
B 80 – 89%
C 70 – 79%
D 60 – 69%
F < 60%

Each exam will be graded on a curve determined by the highest score in the class.

Students missing an exam will incur a 20% grading penalty unless an appropriate reason for absence is given to the instructor prior to the exam date. The missed exam must be completed on the make-up date set by the instructor.

6. **ACADEMIC CONDUCT:** Cheating on examinations, submitting work of other students as your own, or plagiarism in any form will result in penalties ranging from an F on the assignment to expulsion from the university, depending on the seriousness of the offense.

7. **MAJOR TOPICS:** This course will cover knowledge areas beyond Green Belt training including hypothesis testing for non-normal data, Design of Experiments (DOE), statistical process control, Design for Six Sigma (DFSS) and other methods and techniques.

8. **MINIMUM STUDENT COMPETENCIES:** At the completion of this course, students should be capable of performing the following:

   a. Describe the structure, approach, methods, and tools used in a Six Sigma project.

   b. Discuss the assumptions and constraints surrounding Six Sigma methods and select projects compatible with the DMAIC methodology.

   c. Perform calculations and graphical analysis of data using statistical methods including, but not limited to, the following:

(1) Identify statistical distributions and their practical uses with specific emphasis on the normal, binomial, and Poisson distributions.

(2) Calculate process capability using Cp, Cpk, Pp, Ppk, and Z.Bench metrics.

(3) Perform measurement systems analysis to determine the validity of baseline performance data.

(4) Conduct hypothesis testing to (1) determine critical process inputs (X's) for future improvements and (2) the quantitative impact of process changes.

(5) Create and interpret multi-vari studies to interpret the difference between positional, cyclical, and temporal variation.

(6) Apply sampling plans to investigate the largest sources of variation.

(7) Interpret the correlation coefficient and determine its statistical significance (p-value).

(8) Recognize the difference between correlation and causation.

(9) Interpret the linear regression equation and determine its statistical significance.

(10) Use regression models for estimation and prediction.

(11) Distinguish between statistical and practical significance.

(12) Apply tests for means, variances, and proportions, and determine significance level, power, Type I (alpha), and Type II (beta) errors.

(13) Determine appropriate sample size for various statistical tests.

(14) Define and describe paired-comparison parametric hypothesis tests.

(15) Define terms related to single-factor analysis of variance (ANOVA) and interpret their results and data plots.

(16) Define and interpret Chi Square and use it to determine statistical significance.

(17) Define and describe basic Design of Experiments (DOE) terminology such as independent and dependent variables, factors and levels, response, treatment, error, repetition, and replication.

(18) Interpret main effects and interaction plots.

(19) Describe the objectives and benefits of statistical process control (SPC).

(20) Define and describe how rational subgrouping is used in sampling and data analysis.

(21) Identify, select, construct, and apply the following types of control charts: X-bar and R, X-bar and S, individuals and moving range, median, p, np, c, and u.

(22) Interpret control charts and distinguish between common and special causes using rules for determining statistical control.

(23) Analyze non-normal data using nonparametric statistical methods.

(24) Design, analyze, and interpret Design of Experiments (DOE) models including two-level full and fractional factorials.

d. Describe the elements of robust product design, tolerance design, and statistical tolerancing.

e. Interpret Quality Function Deployment (QFD) matrices and their use in determining product performance criteria.

f. Develop control plans and methods to ensure that process improvements withstand the test of time.