INSTRUCTOR:  Dr. Tomas Velasco, C.Q.E., C.S.S.B.B.
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TEXTBOOK:

Montgomery, D. INTRODUCTION TO STATISTICAL QUALITY CONTROL.

REFERENCES:  TEXTBOOKS

(FURTHER READING) Six Sigma Pocket Guide by Rath & Strong, Rath & Strong, Inc; Spiral edition (October 17, 2000).


AUDIVOVISUALS

- Against all Odds: Inside Statistics Series, 1988

CLASS:

Spring Semester 2014
9:35 am. – 10:50 am.
219 ENG-A

Objective:
The purpose of this course is to provide the student with a complete coverage of the statistical and analytical tools used and applied in the “Six Sigma” methodology at the green-belt level.
Requirements:
Major emphasis will be placed on reading and understanding the material from the class, suggested books and reference material prior to class, and in homework assigned. Class attendance is required.

Grading:
- 3 Examinations, each of which counts 25% towards your grade.
- Homework, Work in teams, and Quizzes, which count 25% towards your grade.

Standards:
Letter grades are assigned based on the total number of points accumulated.
- A : 90% and higher
- B : 80% - 89.99%
- C : 70% - 79.99%
- D : 60% - 69.99%
- F : Less than 60%

Grading Policy:
Missed examinations and assignments have a 10% penalty per day, imposed when turned in, unless an appropriate, prior excuse is provided to the instructor. The missed examination must be completed on the make-up date set by the instructor. Quizzes can not be made up, unless an appropriate excuse is provided to the instructor.

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.

Office Hours:
10:30 am to 12:00 m on Mondays, 11:00 am to 12:00 m. on Tuesdays, 10:00 am to 12:00 m. on Wednesdays, 2:00 pm to 3:30 pm on Thursdays; other hours by appointment.

Equipment and Software:
Hand-held calculator and any computer-based spreadsheet. Excel is available in all the P.C. laboratories in Engineering including Industrial Technology labs. and College of Engineering labs.
Major Topics

1. Quality Improvement in the Modern Business Environment – Chapter I
2. Important Discrete Distributions – Chapter II: 3.2
3. Important Continuous Distributions – Chapter II: 3.3 – 3.5
4. Methods and philosophy of Statistical Process Control – Chapter V
5. Control Charts for Variables – Chapter VI
6. Control Charts for Attributes for Fraction Non-conforming – Chapter VII: 7.1 – 7.2
7. Control Charts for Attributes for Non-conformities – Chapter VII: 7.3 – 7.5
8. Process Capability Analysis – Chapter VIII: 8.1 – 8.6
9. Gauge and Measurement Capability Studies – Chapter VIII: 8.7 – 8.9
10. Cumulative Sum Control Charts – Chapter IX: 9.1
11. Exponentially Weighted Moving Average Control Charts – Chapter IX: 9.2 – 9.3
12. Other Univariate Statistical Process-Monitoring and Control Techniques – Chapter X

SIU Policy on Incomplete Grades:
An INC is assigned when, for reasons beyond their control, students engaged in passing work are unable to complete all class assignments. An INC must be changed to a completed grade within a time period designated by the instructor but not to exceed one year from the close of the term in which the course was taken, or graduation, whichever occurs first. Should the student fail to complete the course within the time period designated, not to exceed one year, or graduation, whichever occurs first, the incomplete will be converted to a grade of F and the grade will be computed in the student’s grade point average. Students should not reregister for courses in which an INC has been assigned with the intent of changing the INC grade. Re-registration will not prevent the INC from being changed to an F.
Mobile Technology Policy:
Cell phones should be turned off during class-time (including during tests).

Inclusive Excellence:
SIU contains people from all walks of life, from many different cultures and sub-cultures, and representing all strata of society, nationalities, ethnicities, lifestyles, and affiliations. Learning from and working with people who differ from you is an important part of your education in this class, as well as an essential preparation for any career.

SIU Student Code of Conduct/Plagiarism:
Please consult the following sites for information on the SIU’s student code of conduct and Morris Library’s guide on plagiarism:

- SIU Student Code of Conduct:


Emergency Procedures:
Southern Illinois University Carbondale is committed to providing a safe and healthy environment for study and work. Because some health and safety circumstances are beyond our control, we ask that you become familiar with the S.I.U.C. Emergency Response Plan and Building Emergency Response Team (BERT) program. Emergency response information is available on posters in buildings on campus, available on the BERT’s website at www.bert.siu.edu, Department of Public Safety’s website www.dps.siu.edu (disaster drop down) and in the Emergency Response Guidelines pamphlet. Know how to respond to each type of emergency.

Instructors will provide guidance and direction to students in the classroom in the event of an emergency affecting your location. It is important that you follow these instructions and stay with your instructor during an evacuation or sheltering emergency. The Building Emergency Response Team will provide assistance to your instructor in evacuating the building or sheltering within the facility.

Resources for Academic Assistance:
- Learning Support Services: http://tutoring.siu.edu/
  • Provides academic assistance in courses/tutoring

- Disability Support Services: http://disabilityservices.siu.edu/
  • Provides the required academic and programmatic support services to students with permanent and temporary disabilities

- SIUC Writing Center: http://write.siu.edu/
  • Offers free tutoring services to all SIUC undergraduate and graduate students and faculty.

SIU Email Policy:
Official SIU Student Email Policy: http://policies.siu.edu/policies.email.htm

Saluki Cares:
The purpose of Saluki Cares is to develop, facilitate and coordinate a university-wide program of care and support for students in distress. By working closely with faculty, staff, students and their families, SIU Carbondale continues to display a culture of care by demonstrating to our students and their families that they are an important part of the community. To make a referral to Saluki Cares click, call, or send: http://salukicares.siu.edu/index.html, (618) 453-5714, or siucares@siu.edu.

**Student Learning Objectives**

At the end of the course, the student should be able to:

- Define and discuss quality and quality improvement
- Discuss the different dimensions of quality
- Discuss the evolution of modern quality improvement methods
- Discuss the role that variability and statistical methods play in controlling and improving quality
- Describe the quality management philosophies of W. Edwards Deming, Joseph M. Juran, and Armand V. Feigenbaum
- Discuss total quality management, the Malcolm Baldrige National Quality Award, Six Sigma, and quality systems and standards
- Explain the links between quality and productivity and between quality and cost
- Discuss product liability
- Discuss the three functions: quality planning, quality assurance, and quality control and improvement
- Explain the concepts of a random variable and a probability distribution
- Understand and interpret the mean, variance, and standard deviation of a probability distribution
- Determine probabilities from probability distributions
- Understand the assumptions for each of the discrete probability distributions presented
- Understand the assumptions for each of the continuous probability distributions presented
- Select an appropriate probability distribution for use in specific applications
- Use probability plots
- Use approximations for some hypergeometric and binomial distributions
- Understand chance and assignable causes of variability in a process
- Explain the statistical basis of the Shewhart control chart, including choice of sample size, control limits, and sampling interval
- Explain the rational subgroup concept
- Understand the basic tools of SPC: the histogram or stem-and-leaf plot, the check sheet, the Pareto chart, the cause-and-effect diagram, the defect concentration diagram, the scatter diagram, and the control chart
- Explain phase I and phase II use of control charts
- Explain how average run length is used as a performance measure for a control chart
- Explain how sensitizing rules and pattern recognition are used in conjunction with control charts
- Understand the statistical basis of Shewhart control charts for variables
- Know how to design variables control charts
- Know how to set up and use and R control charts
- Know how to estimate process capability from the control chart information
- Know how to interpret patterns on and R control charts
- Know how to set up and use and s or s2 control charts
- Know how to set up and use control charts for individual measurements
- Understand the importance of the normality assumption for individuals control charts and know how to check this assumption
- Understand the rational subgroup concept for variables control charts
- Determine the average run length for variables control charts
- Understand the statistical basis of attributes control charts
- Know how to design attributes control charts
- Know how to set up and use the p chart for fraction nonconforming
- Know how to set up and use the np control chart for the number of nonconforming items
- Know how to set up and use the c control chart for defects
- Know how to set up and use the u control chart for defects per unit
- Use attributes control charts with variable sample size
- Understand the advantages and disadvantages of attributes versus variables control charts
- Understand the rational subgroup concept for attributes control charts
- Determine the average run length for attributes control charts
- Investigate and analyze process capability using control charts, histograms, and probability plots
- Understand the difference between process capability and process potential
- Calculate and properly interpret process capability ratios
- Understand the role of the normal distribution in interpreting most process capability ratios
- Calculate confidence intervals on process capability ratios
- Conduct and analyze a measurement systems capability (or gauge R & R) experiment
- Estimate the components of variability in a measurement system
- Set specifications on components in a system involving interaction components to ensure that overall system requirements are met
- Estimate the natural limits of a process from a sample of data from that process
- Set up and use CUSUM control charts for monitoring the process mean
- Design a CUSUM control chart for the mean to obtain specific ARL performance
- Incorporate a fast initial response feature into the CUSUM control chart
- Use a combined Shewhart–CUSUM monitoring scheme
- Set up and use EWMA control charts for monitoring the process mean
- Design an EWMA control chart for the mean to obtain specific ARL performance
- Understand why the EWMA control chart is robust to the assumption of normality
- Understand the performance advantage of CUSUM and EWMA control charts relative to Shewhart control charts
- Set up and use a control chart based on an ordinary (unweighted) moving average
- Set up and use and R control charts for short production runs
- Know how to calculate modified limits for the Shewhart control chart
- Know how to set up and use an acceptance control chart
- Use group control charts for multiple-stream processes, and understand the alternative procedures that are available
- Understand the sources and effects of autocorrelation on standard control charts
- Know how to use model-based residuals control charts for auto-correlated data
- Know how to use the batch means control chart for auto-correlated data
- Know what the Cuscore control chart can be used for
- Know how change-point methods relate to statistical process monitoring techniques
- Understand the practical reason behind the use of adaptive control charts
- Understand the basis of economic principles of control chart design
- Know how control charts can be used for monitoring processes whose output is a profile
HAPPY SERVICE ANNIVERSARY, ALICE.

WE'RE OUT OF TWENTY YEAR PINS SO I GOT TWENTY OF THE ONE YEAR PINS.

YOU CAN PIN THESE BABIES ALL OVER YOUR BLOUSE... OR FISHING HAT IF YOU PREFER.

THE CARD SAYS, "TO KATHY" BUT IT WAS NEVER OPENED. FOR SOME REASON SHE QUIT THE DAY SHE GOT HER TWENTY PINS.

INCIDENTALLY, I HAVE TO CHARGE YOU BADA FOR THE PINS. THE COMPANY DOESN'T PAY FOR THEM.

FIRST OF ALL, I'VE ONLY WORKED HERE FOR ABOUT SIX YEARS...

WOW, YOU LOOK OLDER ANYWAY. JUST GIVE ME THE BAGS AND THROW AWAY EIGHT PINS AND WE'LL CALL IT GOOD.

WHY ARE YOU ROLLING UP YOUR SLEEVES? ARE YOU GOING TO PIN THEM TO YOUR ARM?