



Course Syllabus

General Information

Course Number: InIn4078
Course Title: **Statistical Quality Control**
Credit-Hours: Three

Course Description

Statistical control of the quality of processes; statistical methods for quality improvement; univariate and multivariate control charts for variables; attribute control charts; process capability studies; gage and measurement studies; setting specification limits; analysis and design of sampling inspection plans; Mil. Std. 105E, rectifying inspection plans.

Prerequisites

InIn 4010- Probability and Statistics for Engineers

Textbook and References

- Montgomery, D. C., **Introduction to Statistical Quality Control**, 5th Edition, John Wiley and Sons., 2005
- Banks, J; 1989, Principles of Quality Control, 1st Edition, John Wiley and Sons.
- Duncan, A. J, 1986, Quality Control and Industrial Statistics, 5th Edition, Richard D. Irwin,
- Grant and Leavenworth, 1996, Statistical Quality Control, 7th Edition, McGraw Hill.
- Kolerik, W. J, 1999, Creating Quality: Process Design for Results, 1st Edition, McGraw-Hill.
- Montgomery, D. C., and Runger, G. C, 1999, Applied Statistics and Probability for Engineers, 2nd Edition, John Wiley and Sons.
- Ryan, T. P, 2000, Statistical Methods for Quality Improvement, 2nd Edition, John Wiley and Sons.
- Vardeman, S. B., and Jobe, J. M., 1999, Statistical Quality Assurance Methods for Engineers, 1st Edition, John Wiley and Sons.
- Wadsworth, H. M, Stephens K. S, and Godfrey, A. B, 1986, Modern Methods for Quality Control and Improvement, John Wiley and Sons.

Purpose

This is a course primarily designed for majors in Industrial Engineering; however, it is appropriate for engineering students with a basic background in probability and statistics and interested in the production of quality good and services. The purpose of the course is to prepare technically competent engineers in the areas of statistical process control, process capability analysis, statistical tolerance setting, and basic acceptance sampling procedures. This course is a requirement in the B.S. in IE curriculum.

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Course Goals

After completing the course, the student should:

- Understand the strategic importance of quality.
- Developed abilities to identify, formulate, analyze, and solve quality control problems.
- Be able to select and apply appropriate statistical models to process control situations.
- Understand the statistical basis of control charts, process capability analysis, and acceptance sampling.
- Understand the concepts of process capability and measurement system capability.
- Know the different types of sampling procedures, their statistical basis, their properties, and their limitations and pitfalls.
- Enhanced his/her abilities to work on teams and present results in effective oral presentations and written reports.
- Use Minitab, Excel and MathCad to perform statistical analysis and mathematical calculations, and interpret the results.
- Be aware of the ethical and legal consequences of quality control problems on him, the company, and the public welfare.

Requirements

All students are expected to come to class and to the labs all the time, on time, and prepared; do all assigned readings and related homework; actively participate in class discussions and lab activities; and satisfy all assessment criteria to receive credit for the course.

Laboratory Work:

Laboratory practices, exercises, and drills have been designed to enhance the student=s learning experience and, consequently, they are considered a major part of the class. All students are expected to participate. All labs require a written report; some of them will be completed during the labs, but most of them will be turned in at the beginning of the next lab session (usually a week later). Most lab reports are done in teams (usually, three students per team), however, your name cannot appear in a report if you were not present during the corresponding lab practice.

Department and Campus Policies

Class attendance: Class attendance is compulsory. The University of Puerto Rico, Mayagüez Campus, reserves the right to deal at any time with individual cases of non-attendance. Professors are expected to record the absences of their students. Frequent absences affect the final grade, and may even result in total loss of credits. Arranging to make up work missed because of legitimate class absence is the responsibility of the student. (Bulletin of Information Undergraduate Studies)

Absence from examinations: Students are required to attend all examinations. If a student is absent from an examination for a justifiable reason acceptable to the professor, he or she will be given a special examination. Otherwise, he or she will receive a grade of zero or "F" in the examination missed. (Bulletin of Information Undergraduate Studies)

Final examinations: Final written examinations must be given in all courses unless, in the judgment of the Dean, the nature of the subject makes it impracticable. Final examinations scheduled by arrangements must be given during the examination period prescribed in the Academic Calendar, including Saturdays. (see Bulletin of Information Undergraduate Studies).

Partial withdrawals: A student may withdraw from individual courses at any time during the term, but before the deadline established in the University Academic Calendar. (see Bulletin of Information Undergraduate Studies).

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Complete withdrawals: A student may completely withdraw from the University of Puerto Rico, Mayagüez Campus, at any time up to the last day of classes. (see Bulletin of Information Undergraduate Studies).

Disabilities: After been identified with the professor and the institution, the students with disabilities will receive reasonable accommodations in their courses and evaluations. For more information, please contact *Student Services with Disabilities* at the Student Dean's Office at (Q-019), 787-265-3862 ó 787-832-4040 x-3250 ó 3258.

Ethics: Any academic fraud is subject to the disciplinary sanctions described in article 14 and 16 of the revised General Student Bylaws of the University of Puerto Rico contained in Certification 018-1997-98 of the Board of Trustees. The professor will follow the norms established in articles 1-5 of the Bylaws.

General Topics

Session	Topic	Reference
Part I: PROCESS CONTROL		
1	Introduction to control charts. Chance and assignable causes of quality variation	Secs. 4.1 and 4.2.
2-3	Statistical aspects of control charts. Rational Subgrouping. Detection and interpretation of patterns on control charts	Secs. 4.3 to 4.7.
4-6	Control charts for variables. X-Bar and R charts (statistical basis, charts based on standard values, development and use of these charts).	Secs. 5.1 and 5.2.
7-9	Control charts for variables. X-Bar and S charts (statistical basis, charts based on standard values, development and use of these charts).	Secs. 5.3 to 5.6.
10-13	Control charts for attributes. The p chart (statistical basis, charts based on standard values, development and use of these charts, variable sample size, OC Curve)	Secs. 6.1 and 6.2.
14-15	The C and U charts. (statistical basis, charts based on standard values, development and use of these charts, variable sample size, OC Curve)	Sec. 6.3 to 6.5.
16	Exponentially Weighted Moving Average	Sec. 8.2.
17-19	Multivariate Quality Control	Sec. 10.1 to 10.3
Part II: Process Capability Studies		
20-22	Process Capabilities Studies	Secs. 7.1 to 7.5
23-24	Gage and Measurement Capabilities	Sec 7.6
25-26	Setting Specification Limits on Discrete Components	7.7 and 7.8
Part III: Acceptance Sampling for Attributes		
27	Introduction to Acceptance Sampling. Advantages and disadvantages of acceptance sampling. Types of sampling plans.	Sec. 14.1.
28	Single sampling plans for attributes. Introduction and definitions. The OC Curve. Design of a single sampling plan.	Sec. 14.2.
29-30	Military Standard 105E	Sec. 14.4.