

Program Cover Document

STA 314: Statistical Quality Control

I. Basic Course Information

STA 314: Statistical Quality Control is an upper-level statistics option both for Data Science and Statistics majors and Statistics minors. The course meets twice weekly for 80-minute periods. Prerequisites: STA 215 or STA 216 or (ECO 105 and (MAT 125 or MAT 127)) or (STA145 and MAT 127).

II. Learning Goals

The primary goal of STA 314 is to give students an introduction to the theory and applications of statistical quality control. This is a set of techniques that have been developed to improve the quality of output of both manufacturing and service industries as well as other applications by identifying different sources of variability, eliminating those which can be controlled, and then monitoring the processes to identify when new problems occur.

The major focus of the course will be learning how to design, implement and monitor various types of control charts for different situations. This will include Shewhart type charts, including variables charts such as \bar{X} , R, and s charts; and attributes charts such as the p, np, c, and u charts. Non-Shewhart type charts will also be explored, including CUSUM, Moving Average, and Exponentially Weighted Moving Average charts. For each of these students will see the derivation of the associated formulae, as well as learn the concepts behind determining the best way to design the parameters of the charts to deal with different types of anticipated problems. Examples of these anticipated problems include shifts in the mean or variability, which may be large or small; may be either gradual or all at once, and which may or may not be sustained. Designing control charts to detect specific types of occurrences will include concepts of rational subgrouping (i.e., whether to take observations for each subgroup close together in time or randomly spread about the entire time interval) and determining subgroup sizes and frequencies to extract the maximum amount of information from the smallest number of observations.

This course is computer intensive. There are software packages available which do statistical quality control, or the instructor may choose to have the students program the techniques themselves using a spreadsheet such as Excel.

Additional topics can be tailored to fit the needs of the students in the class. For example, if there are engineering majors in the class, the instructor may want to include topics such as acceptance sampling, Taguchi methods, and reliability/risk analysis because these are on the Certified Quality Engineer exam.

On completion of this course, students will have achieved the following learning goals:

- i) Comprehend the development of statistical quality control techniques.

- ii) Select appropriate statistical quality control techniques in given contexts.
- iii) Apply quality control techniques to a variety of real-life problems.
- iv) Assess the applicability and reasonableness of using the techniques.
- v) Provide correct interpretations of results.
- vi) Recommend appropriate decisions.
- vii) Use computer software to support problem solving.

III. Student Assessment

Students will receive regular feedback on their work through some combination of homework, quizzes, projects, and tests throughout the course. The specific choice of these will depend on the individual instructor. These will provide valuable information both for the instructor and the individual students.

IV. Learning Activities

The specific choices of learning activities will depend upon the instructor, but it is expected that they will consist of some combination of lectures, group work, student presentations, individual homework, data analysis projects, quizzes, tests and a final exam.

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