ISyE 6382 – Quality and Six Sigma

Georgia Tech – Spring 2027

Instructor: Kamran Paynabar, Office: Groseclose 436, phone: (404)385-3141
Email: kamran.paynabar@isye.gatech.edu
Office hours: TBD

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Textbook

There is no required textbook for this course, but the following books will provide complementary information:

- "The Certified Six Sigma Black Belt Handbook," Second Edition, by T.M. Kubiak and Donald W. Benbow.
- "Introduction to Statistical Quality Control", 7th edition, Douglas C. Montgomery, Wiley, ISBN: 978-1-118-14681-1©2013.
- "Applied Statistics and Probability for Engineers", 6th Edition, Douglas C. Montgomery, George C. Runger, Wiley, ISBN 978-1118539712, © 2014, 836 pages.

Software: Minitab® 19
You can access the software through Vlab at http://mycloud.gatech.edu.

Catalog Course Description

This course covers various statistical and managerial methods for variation modeling and quality improvement. Specifically, it focuses on Six Sigma's DMAIC methodology, which includes a variety of tools and techniques including statistical process control, measurement system analysis, sampling, design of experiments, hypothesis testing, etc.

Course Outcomes

Students will

- Be able to join Six Sigma teams and work on quality improvement projects using DMAIC methodology;
- Learn managerial as well as analytical aspects of quality improvement methodologies and Six Sigma;
- Understand how, when and in what order to use statistical tools for effective implementation of Six Sigma;
- Understand how to validate and assess the capability of a measurement system;
- Develop skills in process monitoring as well as in design and analyze of factorial experiments.

Grading policy

Homework and Assignments 40%

Assignment 1 is released on January 11 and due on January 17
Assignment 2 is released on January 18 and due on January 24
Assignment 3 is released on January 25 and due on January 31
Assignment 4 is released on January 1 and due on February 7
Assignment 5 is released on February 8 and due on February 14
Assignment 6 is released on February 15 and due on February 21

Exam I 30%

It is a 2-hour exam that covers Probability and Statistics, Define, Measure, and Analyze up to and including ANOVA.
Exam I released on January 28 and must be completed by February 4

Exam II 30%

It is a 2-hour exam that covers Regression, Improve and Control.
Exam II released on February 16 and must be completed by February 22.

Course policy

- Homework must be submitted before *the due date*. Late submission up to 2 days after the due date is acceptable, but there will be 15 percent point deduction for late submissions. The lowest score will be dropped.
- No late submission is accepted for exams. Exams are open-book.
- Requests for re-grading HW and exams should be made within a week of returning them.
- You are encouraged to discuss homework problems with your fellow students. But your final answers should be based on your own understanding. Copying others' work is NOT acceptable and violates the **honor code**.

Academic Honor Code: It is your responsibility to get familiar with the Georgia Tech Honor Code and you are bound by its requirements.
Use of any previous semester course materials is allowed for this course; however, I remind you that while they may serve as examples for you, they are not guidelines for any tests, quizzes, homework, projects, or any other coursework that may be assigned during the semester. For any questions involving these or any other Academic Honor Code issues, please consult with me, the teaching assistant, or visit www.honor.gatech.edu.

Tentative Lectures Schedule:
The topics covered and the dates they are to be covered are subject to change.

Topics

1. Quality Improvement and Six Sigma
   - Quality definition and modeling
   - Quality improvement approaches
   - Define, Measure, Analyze, Improve, Control (DMAIC) methodology
2. Define
   - Project charter
   - Business case
   - SIPOC diagram
3. Measure
   - Type of data
   - Data collection plan
   - Measurement system analysis and Gage R&R

- Descriptive statistics and probability distributions
- Process capability analysis

4. Analyze
   - Correlation and regression analysis
   - Point and interval estimation
   - Hypothesis testing
     - Z-test, t-test, goodness of fit tests, nonparametric tests
     - Sample size determination
   - ANOVA
5. Improve
   - Design of experiments
     - Factorial design
   - Risk analysis
6. Control
   - Control charts
     - Variable control charts: Xbar-R, Xbar-S, X-MR
     - Attribute control charts: p, np, c, u
     - Advanced control charts: EWMA, CUSUM
   - Control charts interpretation and trend analysis
   - Process capability analysis