IENG 551 - Quality and Reliability Engineering

CRN: 82715 **Semester:** Fall 2011 **Room:** 243 MRB **Time:** 11:00 - 12:15 **Credit Hours:** 3

Course Description: This course will provide an introduction to quality and reliability engineering. Special emphasis will be placed on the use of orthogonal arrays for design of experiments and the use of Markov models to represent state dependent systems.

Prerequisite: Graduate Standing

Textbook: Course notes will be available on eCampus (https://ecampus.wvu.edu). You can access eCampus by using your mix ID and password. You should check eCampus on a regular basis for due dates and other course related information. There is no required text book for the course. However, the following texts are recommended as references:

1. Quality Engineering Using Robust Design, Madhav Phadke, Prentice Hall, 1989.
2. Introduction to Reliability and Maintainability Engineering, Charles Ebeling, Waveland Press, 2010.
3. Reliability Engineering, Elsayed Elsayed, Addison Wesley, 1996.
4. Software Reliability, Musa, Iannino, Okumoto, McGraw-Hill, 1987.
5. Probability and Statistics for Engineers and Scientists, Walpole, Myers, Prentice Hall, 2007.
6. Design and Analysis of Experiments, Douglas Montgomery, 6th edition, Wiley, 2005.
7. Certified Quality Engineer (CQE) Primer, Quality Council of Indiana, 1999.

Instructor: Rashpal S, Ahluwalia, Ph.D., PE, CSQE
Professor, IMSE Department, Room 353E MRB
Email: rashpal.ahluwalia@mail.wvu.edu
Phone: 304-293-9430
Office Hours: T-Th.: 1:00 – 3:00 PM or by appointment

Statement on Attendance: Student attendance is mandatory unless excused by the instructor. The basis for an excused absence will follow the university policy. No credit will be given for attendance. However, class participation can affect the final grade in borderline cases.

Statement on Social Justice: *West Virginia University (WVU) is committed to social justice. I concur with that commitment. I expect to foster a nurturing learning environment that is based upon open communication, mutual respect, and non-discrimination. WVU does not discriminate on the basis of race, sex, age, disability, veteran status, religion, sexual orientation, color or national origin. Any suggestions as to how to further such a positive and open environment in this class will be appreciated and given serious consideration. If you are a person with a disability and anticipate needing any type of accommodation in order to participate in this class, you must make appropriate arrangements through Disability Services (293-6700). They will identify the nature of the accommodation your disability requires.*

Course Goals: To provide industrial engineering students fundamental knowledge of quality and reliability engineering.

Key Abilities: Upon completion of the course the student will have an understanding of:

1.0 Probability and Statistics
2.0 Quality Control
3.0 Quality Management
4.0 Reliability

Key Abilities	H1	P1	T1	H2	P2	T2	H3	P3	T3	H4	P4	T4
Key Ability #1	X	X	X									
Key Ability #2				X	X	X						
Key Ability #3							X	X	X			
Key Ability #4										X	X	X

Course Contribution to Professional Component:
Engineering Science - 33%, Engineering Design - 67%

Grading: No make-up tests, projects, or homework will be given. Tentative grading scheme is:
Homework (H): 4 x 4% = 16%
Projects (P): 4 x 6% = 24%
Tests (T): 4 x 15% = 60%

A =>90, B =>80, C=>70, D=>60, F<60

Academic Dishonesty: Acts of academic dishonesty such as cheating or plagiarism will result in a failing grade (F), and will be reported to the university administration.

All work (project reports and home work) will be due at the start of the class on the assigned due date. Ten percent/class period will be taken off for late work. The reports should be neatly typed in MS Word. Each report should include: a) Abstract/Summary, b) Background/Introduction, c) Problem Statement, d) Solution Description, e) Results/Conclusion/Recommendations (if any), f) References, and g) Appendix (if needed). All equations must be typed. Left, right, top, and bottom margins should be 1". Use 12 pt. Times New Roman Font. Section headings should by in bold.

Tentative Course Syllabus

1.0 Probability and Statistics
- 1.1 Introduction
- 1.2 Probability
- 1.3 Random Variables and Probability Distributions
- 1.4 Discrete Probability Distributions
- 1.5 Continuous Probability Distributions
- 1.6 Fundamental Sampling Distribution
- 1.7 One and Two Sample Estimation Problems
- 1.8 One and Two Sample Tests of Hypotheses
- 1.9 Simple Regression

Home Work #1, Project #1, Test #1

2.0 Quality Control
- 2.1 Quality Control Tools
- 2.2 Statistical Process Control
- 2.3 Control Charts for Variable Data
- 2.4 Control Charts for Attribute Data
- 2.5 Process Capability Analysis

Home Work #2, Project #2, Test #2

3.0 Quality Management
- 3.1 Quality Loss Function
- 3.2 Orthogonal Arrays
- 3.3 Quality Function Deployment
- 3.4 Total Quality Management
- 3.5 ISO 9000
- 3.6 Malcolm Baldrige National Quality Award

Home Work #3, Project #3, Test #3

4.0 Reliability
- 4.1 Introduction
- 4.2 Reliability of Hardware Components
- 4.3 Reliability of Software Components
- 4.4 Reliability of State Independent Systems
- 4.5 Reliability of State Dependent Systems

Home Work #4, Project #4, Test #4

Prepared By: Dr. Rashpal S. Ahluwalia **Date:** August 22, 2011