

MFE634: Quality Engineering.

General Information:

Course: Productivity and Quality Engineering (MFE634)

Instructor: Jorge Luis Romeu, Ph.D. Research Professor. Dept. of Mech. & Aerospace Eng.

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Required Textbook: Juran's Quality Planning & Analysis for Enterprise Quality (5th Ed.), by Frank Gryna, Richard Chua, Joseph DeFeo; McGrawHill, 2007. *In addition, below is a list of suggested extra materials:*

ASQ Certified Quality and Reliability Engineer Manuals. RIAC Quality and Reliability Toolkits.

Classes: Thursdays 6:30 to 9:10 PM. **Office Hours:** Wed. 10:30 am to 12:30 pm and 9 to 10 pm after class.

Instructor's Office: Link Hall Room 314. **Communications:** via Email or Blackboard (don't use phone).

The Instructor reserves the right to reschedule a class or topic, if necessary.

Course Objectives:

This course presents quality assurance (QA) methods, used by service and manufacturing organizations, to improve organization-wide effectiveness. Emphasis is placed on procedures that foster continuous quality improvement: simple & new QE tools, Lean & Six Sigma, Capability Analysis, MSA, SPC, Acceptance Sampling, Reliability Analysis, FMEA, FTA and other problem-solving approaches will be discussed.

Prerequisites (*): Probability and Statistics (MAT521, ECS526, or equivalent). For reasons to request a comprehensive statistics analysis level see: <http://www.asq.org/certification/quality-engineer/bok.html>

Course Requirements:

Students are required to have SU computer accounts, for email communication with the Instructor, among Teams, to access Blackboard, and to use Minitab & Quality Companion © SW to solve problems and HW. Finally, students will work in Study Groups, to prepare and present HW & PPTs collective assignments. A detailed explanation of the required Group HW & PPT Presentations is appended to this Syllabus.

Zero Tolerance: no type of student dishonesty, or of improper or illegal behavior, will be tolerated.

Weekly Class Outline

Week	Topic	Chapter(s)
1	Intro; Juran, Basic Concepts; Company-wide Q; COPQ	1, 2, RIAC
2	Quality Assessments & Audits; ISO/Baldrige/Standards	2, 16
3	Quality improvements: Gurus, Quality Tools & Process Capability	3, RIAC
4	Six Sigma (DMAIC) improvement; More on Process Capability	20, 3, ASQ
5	Design for Quality (DFSS); Matrix Tools: QFD. Qual. Comp. SW	4, 11
6	Design of Experiments (DOE) in Quality improvement	18, EcoSim
7	Fractional Factorial Design of Experiments. Applications.	ASQ, RIAC
8	Midterm: Quality Assessment, Improvement, Lean, Inspections	All Above
9	Spring Break; no classes	
10	Lean Manufacturing/VSM/5Ss; Supply Chains; Outsourcing	12, 13
11	Inspections, Testing and Metrology: MSA/Gage R&R	15; ASQ
12	Acceptance Sampling; OC function; Sample Size	15, START
13	Statistical Process Control/SPC; Control Charts	20, START
14	Reliability models: FMEAs, Fault Trees; data analysis tools	5, 19, ASQ
15	Final Group Project Presentations	STARTs

(*) Topics in Chapters 17 and 18 are part of MFE634 statistics pre-requisite (MFE526). Hence they are not covered in MFE634. All MFE634 course material is extensively based on such statistical subjects.

Grade Determination:

Student course final grade will be based upon the following components:

1. Midterm Exam	25%
2. Average of best in-class quizzes	15%
3. Final, comprehensive exam	30%
4. HW, Presentations & Participation	10%
5. Final Portfolio	20%

Teams, Quizzes and Final Portfolio

Engineers use statistics to solve problems and to take decisions under uncertainty. In addition, engineers often work in multidisciplinary Groups/Teams, and must be able to present their work to peers and non-technical personnel. Toward these goals MFE634 student Study Groups/Teams will be formed the first day of class. Team members will meet periodically and interact via email, to study, solve problems, prepare class presentations, and other course assignments.

A Team Leader will be assigned to each group the first day, and an elected one will replace it. Team presentations and HW will be discussed and critiqued by their peers, and then graded. The revised Group Power-point presentations constitute a part of their Final Portfolio.

There will be periodical quizzes. The quiz with the lowest grade (or absence) will be dropped.

At the end of the course, each Team will deliver a complete (hard & computerized) copy of their work (Portfolio). Each team member will keep a copy, as part of the course documentation. There will be a different topic for each Team (*). Each team will work individually.

Teams select a Topic from the list below. Each Team will use such topic to apply the material they are learning, and prepare weekly HW & PPT presentations, based on such applications. Group grades depend on quality and correctness of procedures implemented and the number of applicable elements developed. PPT presentation time is 15 minutes. Questions on methodology used will then be asked from randomly selected Team members.

(*) There are Eight different team Quality Engineering topics to choose from:

1. An Epidemic Prevention operation (ZITA infection spread control)
2. An Industrial Rescue (Specific industrial re-shoring efforts)
3. A Demographic Crisis management (illegal immigration and repatriation)
4. An Industrial Production Disaster (Flint MI water system mis-management)
5. A Health Care organization (Medicare system extension analysis)
6. A Weather Disaster Management (Baton Rouge Flood & Sandy Storm)
7. An Anti-Terrorism Prevention Operation (Airport access & safety control)
8. Total Electricity Loss Mitigation (Puerto Rico's generators burned down)

Teams will use their assigned topics to provide specific examples of the application of different QE/QA methods discussed in class, to the improvement or solution of topic problems. Judgement about a topic moral value or other such assessment, is not a course issue, nor will be allowed.

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MFE634 Eight Team Quality Engineering topics to choose from:

1. An Epidemic Prevention operation (Ebola infection prevention/control)
2. An Industrial Rescue (manufacturing jobs re-shoring efforts)
3. An International Relief effort (Ebola eradication & international aid)
4. A Health Insurance organization (Obama-Care & internet deployment)
5. A Health Care organization (Veterans Administration hospital system)
6. A Judicial Organization (the US prison & incarceration systems)
7. A Charitable/Service Organization (Habitat for Humanity)
8. A Government Organization (USAid: Agency for Int'l Development)

Eight team Quality Engineering topics:	Group
1. Ebola Epidemic Prevention operation	G-3
2. An Industrial Rescue (re-shoring)	G-5
3. Ebola eradication & international aid	G-7
4. Obama-Care & internet deployment	G-4
5. Veterans Admin Hospital System	G-1
6. US prison & incarceration systems	G-6
7. Service Organization: Habitat for Humanity	G-2
8. USAid: Agency for Int'l Development	G-8

An important comment on the Spirit of these Final Project Topics: we are not looking into their merits or otherwise (which is the work of politicians and directors), but of the possible flaws they have had, and on ways to improve them, which is what Quality Engineers do. They are:

1. **An Epidemic Prevention operation** (Ebola infection prevention/control): we are interested in ways of improving this disease to spread outside its initial area
2. **An Industrial Rescue** (manufacturing jobs re-shoring efforts): problems have risen from taking these jobs away; find ways to solve them via repatriating them.
3. **An International Relief effort** (Ebola eradication & international aid): ways of improving eradication efforts of Ebola in the areas where they have grown.
4. **A Health Insurance organization** (Obama-Care & internet deployment): the big problems occurred in the deployment of the Web Page for obtaining the Health Insurance this law provides (not the merits/demerits of this law)
5. **A Health Care organization** (Veterans Administration hospital system): the serious administrative problems occurred in VA, that led to the Resignation of the Secretary of the VA (who was a minister in the Obama cabinet) and ways to improve on them.
6. **A Judicial Organization** (the US prison & incarceration systems): the problems associated with the large prison population (cost, human, social, etc.) and ways to improve on these situations
7. **A Charitable/Service Organization** (Habitat for Humanity): problems occurred, and ways to improve on the deliverance of their services, especially abroad.