University of Macau
Department of Electromechanical Engineering
MECH407－Quality Assurance and Control
Syllabus
2nd Semester 2011/2012
Part A – Course Outline

Required elective course in Electromechanical Engineering

Course description:

The aim of this course is to provide a comprehensive understanding of the fundamentals and advance quality assurance and management tools, techniques, frameworks and management approaches. The concept of Total Quality Management (TQM) applied in different organizations, Quality and Quality Standards followed by such entities and the implications of applying the Statistical Process Control Techniques to measure Quality products and services will be taught. The main ideas of Deming, Juran, Feigenbaum, Ishikawa will be also analyzed and compared.

Prerequisite:

None

Textbook:

- Dale H. Besterfield, Carol Besterfield-Michna, Glan H. Besterfield, Mary Besterfield-Sacre, ***Total Quality Management***, 3rd Edition, Prentice Hall, 2003
- Dale H. Besterfield, ***Quality Control***, 6th Edition, Prentice Hall, 2001

References:

- James R. Evans, William M. Lindsay, *The Management and Control of Quality*, Mason, South-Western, Cengage Learning, 2008
- Arthur R. Tenner and Irving J. DeToro, *Total Quality Management – Three Steps to Continuous Improvement*, Addison-Wesley, 1992
- Donna C. S. Summers, *Quality*, 5th Edition, Prentice Hall, 2010
- Donna C. S. Summers, *Six Sigma–Basic Tools and Techniques*, Pearson Prentice Hall, 2007
- Douglas C. Montgomery, *Introduction to Statistical Quality Control*, 5th Edition, John Wiley & Sons, 2005
- Richard E. DeVor, Tsong-how Chang, and John W. Sutherland, *Statistical Quality Design and Control*, Prentice Hall, 1992

Course objectives:

1. Learn the fundamental concept and principles of total quality management, and the various tools available to achieve total quality management. [a, e, g]
2. Understand the statistical approach for quality control, and learn to apply and evaluate quality engineering methods to industrial situations and also assess the benefits obtained. [a, e, l]
3. Understand quality management systems. Create an awareness of the quality standard and accreditation process and its need for the industries. [a, h]

Topics covered:

1. **Introduction to Quality & Total Quality Management –** Review of Syllabus. What is quality? How does it differ from TQM. Basic Approaches of TQM. Historical Review, Deming Philosophy for TQM and Obstacles to it.
2. **Leadership** – Leadership concepts and implementation, Role of senior management Quality councils, Core values and concepts shared values and Ethics, Strategic Planning, Characteristics of Leader, Leadership Survey, Quality Statements, Communication, Decision Making, The 7 habits of highly effective people.
3. **Customer Satisfaction** – Who is customer? Customer perception of Quality and Feedback. Using customer Complaints to enhance quality. Service Quality. Translating Needs into Requirements.

4. **Employee Involvement** – Quality through Motivation. Motivation Theories. Empowerment. Recognition and reward. Gain sharing. Performance Appraisal. Benefit of employee involvement. Employees' survey. Teams. Types of teams. Characteristics of Good Team. Role of Teams in TQM.
5. **Continuous Process Improvement** – What is process? The Juran Trilogy. Improvement Strategies. Types of Problem. The PDSA Cycle. Problem Solving Method. Kaizen Theory and reengineering. Six-Sigma.
6. **Supplier Partnership** – Partnering. Sourcing, Supplier Selection. Principles of Customer-Supplier Relationship. Supplier Rating and relationship development.
7. **Performance Measures** – Performance Measures. Strategies. Performance Measure Presentation. Quality councils. Malcolm Baldrige National Quality Award.
8. **Benchmarking** - Definition, What to Benchmark. Learning from the data.
9. **Quality Management Systems** – Quality systems. ISO 9000 Series and other quality systems. Implementation documentation ISO/QS Elements. Internal Audit and Registration. ISO 9001 requirements. Documentation.
10. **Environmental Management System** – ISO 14000 Series standards. Requirements for ISO 14000. EMS Benefits.
11. **Quality Function Deployment** – The QFD Team, Benefits of QFD. The Voice of the Customer. House of Quality. QFD Process.
12. **Statistical Process Control** – Pareto Diagram. Process Flow Diagram. Cause-and-Effect Diagram. Histogram. Statistical Fundamentals. Variable Control Chart. State of Control. Out-of-Control Process. Process Capability. Control Charts for Attributes. Scatter Diagrams.
13. **Lot-by-Lot Acceptance Sampling** – What is Acceptance Sampling, Sampling plan and types, OC curve for single sampling plans, OC curve properties, Consumer-producer relationship, AOQ, ASN, ATI, Sampling Plan Design

Class schedule and credits:

Timetabled work in hours per week			No of teaching weeks	Total hours	Total credits	No / Duration of exam papers
Lecture	Tutorial	Practice				
2	0	2	14	56	3	1 / 3 hours

Topic Outline:

Week No.	No. of hours	Topics
1	4	**Introduction to Quality & Total Quality Management**
2	4	**Leadership, Customer Satisfaction**
3	4	**Employee Involvement, Continuous Process Improvement**
4	4	**Supplier Partnership, Performance Measures**
5	4	**Benchmarking, Quality Management Systems**
6	4	**Environmental Management System**, **Quality Function Deployment**
7	4	**Mid-term exam**
8,9,10,11	14	**Statistical Process Control**
11,12,13	10	**Lot-by-Lot Acceptance Sampling**
14	4	**Course Review, Project Presentation**

Contribution of course to meet the professional component:

This course prepares students to work professionally in the area of **total quality management and control**.

Relationship to EME programme objectives and outcomes:

This course primarily contributes to Electromechanical Engineering Programme outcomes that develop student abilities to:

(a) an ability to apply knowledge of mathematics, science, and engineering;

(e) an ability to identify, formulate, and solve engineering problems.

The course secondarily contributes to Electromechanical Engineering programme outcomes that develop student abilities to:

(g) an ability to communicate effectively;

(h) the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental and societal context, especially the importance of health, safety and environmental considerations to both workers and the general public;
(l) an ability to use the computer/IT tools relevant to the discipline along with an understanding of their processes and limitations.

Course content:

Maths	Basic Sciences	Engineering Science	Engineering Design and Synthesis	Complementary Studies	Computer Studies	Total 100%
30	0	40	20	0	10	100

Persons who prepared this description:

Dr. Qingsong Xu

Part B – General Course Information and Policies

2nd Semester 2011/2012

Instructor: Dr. Qingsong Xu
Office: B1-A710
Office Hour: By appointment
Phone: (853) 8397-8462
Email: qsxu@umac.mo

Time/Venue:

TBA

Assessment:

Final assessment will be determined on the basis of:

Attendance and in-class Performance:	5%
Homework:	20%
Project:	10%
Mid-term:	25%
Final Exam (Comprehensive):	40%

Grading System:

The credit is earned by the achievement of a grade from 'A' to 'D'; 'F' carries zero credit.

Grades are awarded according to the following system:

Letter Grades	Grade Points	Percentage
A	4.0 (Excellent)	93-100
A-	3.7 (Very good)	88-92
B+	3.3	83-87
B	3.0 (Good)	78-82
B-	2.7	73-77
C+	2.3	68-72
C	2.0 (Average)	63-67
C-	1.7	58-62
D+	1.3	53-57
D	1.0 (Pass)	50-52
F	0 (Fail)	Below 50

Homework Policy:

The completion and correction of homework is a powerful learning experience; therefore:

- There will be approximately 7 homework assignments.
- Homework is due one week after assignment unless otherwise noted, no late homework is accepted.
- Possible revision of homework grades may be discussed with the grader within one week from the return of the marked homework
- The homework grade will be based on the average of the assignment grades.

Quizzes/Mid-terms Exams:

One mid-term exam will be held during the semester. There will be 1 to 2 course projects during the semester.

Note:

- Attendance is strongly recommended.
- Check UMMoodle (webcourse.umac.mo) for announcement, homework and lectures. Report any mistake on your grades within one week after posting.
- No make-up exam is give except for CLEAR medical proof.
- No exam is given if you are 15 minutes late in the midterm exams and 30 minutes late in the final exam. Even if you are late in the exam, you must turn in at the due time.

- Cheating is absolutely prohibited by the university.

Appendix - Rubric for Programme Outcomes

Rubric for (a)	5 (Excellent)	3 (Average)	1 (Poor)
Understand the theoretic background	Students understand theoretic background and the limitations of the respective applications.	Students have some confusion on some background or do not understand theoretic background completely	Students do not understand the background or do not study at all
Use a correct model and formulation correctly	Students choose a model correctly and properly apply correct techniques	Students choose a wrong model sometime, use a wrong formula, or a different technique	Students use a wrong model and wrong formula, or do not know how to model
Compute the problem correctly	Students use correct techniques, analyze the problems, and compute them correctly	Students sometime solve problem mistakenly using wrong techniques	Students do not know how to solve problems or use wrong techniques completely

Rubric for (e)	5 (Excellent)	3 (Average)	1 (Poor)
Identify applications in engineering systems	Students understand problem and can identify fundamental formulation	Students understand problem but cannot apply formulation.	Students cannot identify correct terms for engineering applications
Modeling, problem formulation and problem solving	Students choose and properly apply the correct techniques	Students model correctly but cannot select proper technique or model incorrectly but solve correctly accordingly	Students at loss as to how to solve a problem

Rubric for (g)	5 (Excellent)	3 (Average)	1 (Poor)
Professional Impact	Student's/Team's/Group's document(s)/presentation(s) is/are considered to be of professional quality	Student's/Team's/Group's document(s)/presentation(s) is/are considered acceptable for college level work	Student's/Team's/Group's document(s)/presentation(s) is/are considered unacceptable for college level work
Written Component	Document is nearly error free with sophisticated use of vocabulary, formatted properly, with well developed concise sentences and paragraphs	Document contains some errors with a somewhat colloquial vocabulary, minor formatting issues, with some organizational issues that do not interfere with communication	Document contains many errors, very colloquial vocabulary, with severe organizational issues that interfere with communication. Document would be considered unacceptable.
Oral Component	Presentation is consistent, uniform, clear, direct, complete and captivating with very clear fonts and graphics with an excellent layout that clearly presents the technical content	Presentation is somewhat inconsistent between speakers, occasionally difficult to hear, with an acceptable layout containing acceptable fonts and graphics that adequately presents the technical content	Presentation is very inconsistent between speakers, difficult to hear with a poor layout containing illegible fonts and graphics that poorly presents the technical content. Would be considered unacceptable

Rubric for (h)	5 (Excellent)	3 (Average)	1 (Poor)
Scope of Content	Students will demonstrate material, items, or topics characterized by a sophisticated array of information, insight, and understanding.	Students demonstrate significance reflecting an acceptable degree of perception and thoughts.	Students have limited abilities to relate, incorporate, or demonstrate knowledge of subject with a dynamic breadth.
Impact of Process	Students will employ techniques, designs, ideas, and knowledge demonstrating a profound ability to improve and possess broad applications with a keen a series of actions, changes, or functions	Techniques, designs, ideas, and knowledge present some understanding and ability to demonstrate progression, significance, and influence.	Techniques, designs, ideas, and knowledge present limited progression, significance, and influence

Rubric for (l)	5 (Excellent)	3 (Average)	1 (Poor)
Use modern computer and software tools in engineering practice	Student uses the computer and software to correctly analyze engineering problems and/or create engineering designs, and understands the limitations of the software.	Student uses the computer and software to correctly analyze engineering problems and/or create engineering designs.	Student does not use the computer and software to correctly create engineering designs and/or does not correctly interpret the results.