University of Macau

Faculty of Science and Technology

Department of Electrical and Computer Engineering

Part A: Course Outline

Course Title:	Quality Control		
Course Code:	ELEC 200	Year of Study:	2
Course Mode:	Theoretical with substantial laboratory/ practice content		
Compulsory/Elective:	Compulsory		
Course Prerequisites:	MATH 111		
Prerequisite Knowledge	Probability and Statistics		
Class/Laboratory Schedule:	Theory class: 2 hours; Tutorial/Practice class: 4 hours (per week)		
Duration	One semester	Credit Units	3
Text Books and References:	[1] D.C. Montgomery, Introduction to Statistical Quality Control, 6th ed., John Wiley and Sons, 2009. [2] J.P. Bentley, Introduction to Reliability and Quality Engineering, 2nd ed., Addison-Wesley, 1999. [3] D.C. Montgomery, Applied Statistics and Probability for Engineers, 5th ed., John Wiley and Sons, 2010. [4] D.H. Besterfield, Quality Control, 8th ed., Prentice-Hall, 2008.		
Course Description:	This is an introductory course on statistical quality control. It prepares the student for work in the world of quality, using statistical theory and quality concepts, with modern industrial applications. The study covers basic concepts and principles of quality, quality management and improvement, emphasizes on statistical descriptions of quality and statistical quality control methods including control charts, process and measurement system capability analysis, process design and acceptance sampling, as well as reliability.		
Topics Covered	1. Basic concepts of quality, quality management and improvement, history of quality methodology, statistical methods for quality control, management aspects of quality improvement; 2. Modeling process quality, inferences about process quality; 3. Methods and philosophy of statistical process control; 4. Control charts for variables, control charts for attributes, process and measurement system capability analysis; 5. Factorial experiments for process design and improvement; 6. Lot-by-lot acceptance sampling for attributes; 7. Reliability; 8. MiniTab.		
Course Objectives:	1. Introduce to students some real examples, which involve quality control and improvement. [a, e, h, k] 2. Introduce to students mathematical modeling of process quality. [a, b, e, k] 3. Introduce students to statistical methods for quality control and improvement. [a, b, e, k] 4. Introduce students to design and implement of quality control systems. [a, b, c, e, k]		

<table>
<tr><td>Course Assessment:</td><td>Assignments: 15%
Quiz/Mid-term Exam: 20%
Lab/Practice: 15%
Final Exam: 50%</td></tr>
<tr><td>Relationship to Program Objectives and Outcomes</td><td>This course primarily contributes to EEE program outcomes that develop students abilities to:
a. Ability to apply knowledge of mathematics, science and engineering.
b. Ability to design and conduct experiments.

This course secondarily contributes to EEE program outcomes that develop students abilities to:
c. Ability to design a system, component or process to meet desired needs.
e. Ability to identify, formulate and solve engineering problems.
f. Understanding of professional and ethical responsibility.
h. Broad education necessary to understand the impact of engineering solutions in global and societal context
k. Ability to use the techniques, skills and modern engineering tools necessary for engineering practice.</td></tr>
<tr><td>Course Contents and Relationship to Program Criteria:</td><td>
<table>
<tr><th>Week no.</th><th>Topics</th><th>Program Criteria</th></tr>
<tr><td>1</td><td>Introduction
Basic concepts, history and management aspects of quality, quality management and improvement</td><td>PS, ES</td></tr>
<tr><td>3</td><td>Statistical Modeling and Inference about Process Quality
Statistical modeling of process quality, inferences about process quality</td><td>PS, DIC, ES, LA</td></tr>
<tr><td>5</td><td>Basic Methods of Statistical Process Control and Capability Analysis
Methods and philosophy of statistical process control, control charts for variables, control charts for attributes, process and measurement system capability analysis</td><td>PS, DIC, CS, ES, LA</td></tr>
<tr><td>2</td><td>Factorial Experiments for Process Design and Improvement
Introduction to experimental design, factorial experiment, 2^k factorial design</td><td>PS, DIC, ES, LA</td></tr>
<tr><td>1</td><td>Lot-By-Lot Acceptance Sampling for Attributes
Acceptance sampling problem, single sampling plans for attributes</td><td>PS, DIC, ES, LA</td></tr>
<tr><td>2</td><td>Reliability
Basic concepts and statistical principles of reliability, probability distribution models, reliability of Systems, reliability test and improvement</td><td>PS, DIC, ES, LA</td></tr>
</table>
</td></tr>
<tr><td>Contribution of Course to meet the professional component:</td><td>This course prepares the student for work in the world of quality, using statistical theory and quality concepts. Students should be able to master the basic concepts and principles of quality control, and apply statistical tools and methods to solve real quality control problems.</td></tr>
<tr><td>Course Instructor(s):</td><td>Dr. Feng Wan</td></tr>
<tr><td>Prepared by:</td><td>Dr. Feng Wan</td></tr>
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Part B: General Course Information and Policies

Instructor: Dr. Feng Wan Office: N423
Office Hour: Tuesday 3:30 ~ 6:30 p.m. or by appointment Phone: 4473
E-mail: fwan@umac.mo

Programme Educational Objectives

1. **Problem Solving:** Graduates have the ability to think in a critical and evaluative manner and to consider a broad perspective, in order to solve technical and nontechnical problems.
2. **Leadership and Communication:** Graduates will provide effective leadership, act in an ethical manner and skills will include the ability to communicate well and to work successfully within diverse groups.
3. **Market Acceptance:** Graduates will have successful careers in the academic environment, industrial and government organizations.
4. **Technical Competence:** Graduates will be technically competent and have a thorough grounding in the fundamentals of math and science in electrical and electronics engineering and experience in engineering design. They will be able to use modern engineering techniques, skills, and tools to fulfill societal needs.

Scale: 1 (Highest) to 4 (Lowest)

	Problem Solving	**Leadership and Communication**	**Market Acceptance**	**Technical Competence**
Quality Control	1	3	3	1

Remark:

- Objective for “Problem Solving” can be achieved by assignments, quizzes, mid-term exam, final exam and projects.
- Objective for “Leadership and Communication” can be achieved by field visit, report writing and presentation. However, leadership training is not given by this course.
- Objective for “Market Acceptance” can be achieved by the course subject that is related to quality management and control.
- Objective for “Technical Competence” can be achieved by using fundamentals of math and science related to quality management and control and methods and experience in design and implementation of quality control systems.

Program Criteria Policy:

Course VS Program Criteria

Scale: 1 (Highest) to 4 (Lowest)

Course	PS	DIC	BS	CS	ES	DE	LA	CV	DM
Quality Control	1	3		3	2		4		

Terms:

Probability and Statistics (PS), Differential and Integral Calculus (DIC), Basic Science (BS), Computer Science (CS), Engineering Science (ES), Differential Equation (DE), Linear Algebra (LA), Complex Variables (CV), Discrete Mathematics (DM)

Program Outcome Policy:

Course VS Course Outcomes

(H= Highly Related, S = Supportive, N = None)

Course	a	b	c	d	e	f	g	h	i	j	k	l
Quality Control	H	S	H	S	H	S	N	S	N	N	H	S

The electrical and electronics engineering program outcomes are:

a. Ability to apply knowledge of mathematics, science and engineering.

b. Ability to design and conduct experiments.

c. Ability to design a system, component or process to meet desired needs.

d. Ability to function on multidisciplinary teams.

e. Ability to identify, formulate and solve engineering problems.

f. Understanding of professional and ethical responsibility.

g. Ability to communicate effectively.

h. Broad education necessary to understand the impact of engineering solutions in global and societal context.

i. Recognition of the need for and an ability to engage in life-long learning.

j. Knowledge of contemporary issues.

k. Ability to use the techniques, skills and modern engineering tools necessary for engineering practice.

l. Ability to use the computer/IT tools relevant to the discipline along with an understanding of their processes and limitations

Curriculum Detail

ELEC 200 Quality Control

Timetabled work in hours per week			**No of teaching weeks**	**Total hours**	**No /Duration of exam papers**	**Max marks available from:**	
Lecturer	**Tutor**	**Practice**				**Exams**	**Course**
3	2	1	14	84	2/5 hours	60	40

Term: 3rd

Hours			**Percentage content of**					
Lecturer	Lab/tut	Other	Maths	Basic Science	Engineering Science	Engineering Design and Synthesis	Complementary Studies	Computer Studies
42	6/28	8	40	10	10	20	10	10

Design Elements

% of Design Content	**Design Content in Course Work**	**Design Project**	**Design Content in Laboratories**
10%	X		X

Course Assessment Policy:

- There will be approximately 9 homework assignments.
- Homework is due one week after assignment unless otherwise noted, no late submission is accepted. Zero mark will be given when homework is copied. Possible revision of homework grades may be discussed with the grader within one week from the return of the marked homework.
- Approximately three quizzes will be held during the semester.
- One mid-term exam and one final exam will be given with 2 hours and 3 hours respectively.