City University of Hong Kong
Course Syllabus

offered by Department of Systems Engineering
with effect from Semester A 2024 / 25

Part I Course Overview

Course Title:	Quality Improvement: Systems and Methodologies
Course Code:	SYE6047
Course Duration:	One Semester
Credit Units:	3
Level:	P6
Medium of Instruction:	English
Medium of Assessment:	English
Prerequisites: *(Course Code and Title)*	Nil
Precursors: *(Course Code and Title)*	SEEM3062 - Quality Engineering I (offered until 2016/17) or SEEM3102 - Quality Engineering (offered until 2020/21) or ADSE3102 Quality Engineering (offered until 2023/24) or SYE3102 Quality Engineering
Equivalent Courses: *(Course Code and Title)*	SEEM6047 Quality Improvement: Systems and Methodologies (offered until 2021/22)/ ADSE6047 Quality Improvement: Systems and Methodologies (offered until 2023/24)
Exclusive Courses: *(Course Code and Title)*	Nil

Part II Course Details

1. Abstract

To provide students with a basic understanding of the approaches, systems and statistical techniques to assess and improve product/service quality in a manufacturing/ service organization, and to equip students with modern quality improvement tools and appreciation of their implementation issues in product/ service.

2. Course Intended Learning Outcomes (CILOs)

(CILOs state what the student is expected to be able to do at the end of the course according to a given standard of performance.)

No.	CILOs	Weighting (if applicable)	Discovery-enriched curriculum related learning outcomes (please tick where appropriate)		
			A1	*A2*	*A3*
1.	**Define** the various dimensions of quality in product and service realization.	10%	✓	✓	
2.	**Apply** the concepts and principles of total quality management and six sigma quality philosophy in developing company wide quality systems.	20%			
3.	**Apply** structured and data-driven approach to identify quality problem, define and measure key process steps and inputs, and identify potential root causes of the problem.	30%	✓	✓	
4.	**Apply** statistical tools to validate cause and effect relationship between process inputs and outputs, derive and validate improvement solutions to address the root causes of the problem.	30%	✓	✓	
5.	**Discuss** the framework and associated issues of implementing and monitoring of quality improvement projects.	10%	✓		
		100%			

A1: Attitude
Develop an attitude of discovery/innovation/creativity, as demonstrated by students possessing a strong sense of curiosity, asking questions actively, challenging assumptions or engaging in inquiry together with teachers.

A2: Ability
Develop the ability/skill needed to discover/innovate/create, as demonstrated by students possessing critical thinking skills to assess ideas, acquiring research skills, synthesizing knowledge across disciplines or applying academic knowledge to real-life problems.

A3: *Accomplishments*
Demonstrate accomplishment of discovery/innovation/creativity through producing /constructing creative works/new artefacts, effective solutions to real-life problems or new processes.

3. Learning and Teaching Activities (LTAs)

(LTAs designed to facilitate students' achievement of the CILOs.)

LTA	Brief Description	CILO No.					Hours/week (if applicable)
		1	2	3	4	**5**	
Large Class Activities	Learning through teaching is primarily based on lectures. Mini-lectures and small-group exercises will be used to facilitate conceptual understanding and industrial applications of various statistical tools and techniques.	✓	✓	✓	✓	✓	27 hours/sem
Group Term Paper	The team-based term paper provides students with the opportunities to conduct literature-based study of published or real life applications of Six Sigma quality philosophy in various manufacturing and non-manufacturing industries.			✓	✓		6 hours/sem
Exercises	The team-based exercises enable students to design, conduct and analyze factorial experiments and gage R&R study in solving practical problems.				✓		6 hours/sem

4. Assessment Tasks/Activities (ATs)

(ATs are designed to assess how well the students achieve the CILOs.)

Assessment Tasks/Activities	CILO No.					Weighting	Remarks
	1	2	3	4	5		
Continuous Assessment: 50 %							
Large Class Activities and Exercises	✓	✓	✓	✓		30%	
Group Term Paper and Presentation			✓	✓		20%	
Examination: 50 % (duration: 2 hours , if applicable)							
						100%	

For a student to pass the course, at least 30% of the maximum mark for the examination should be obtained.

5. Assessment Rubrics

(Grading of student achievements is based on student performance in assessment tasks/activities with the following rubrics.)

Applicable to students admitted before Semester A 2022/23 and in Semester A 2024/25 & thereafter

Assessment Task	Criterion	Excellent (A+, A, A-)	Good (B+, B, B-)	Fair (C+, C, C-)	Marginal (D)	Failure (F)
1. Exercises	The exercises assess students' ability to design, conduct and analyze factorial experiments and gage R&R study with statistical package. Interpretations of the numerical results and their practical implications are particularly sought for.	High	Significant	Moderate	Basic	Not even reaching marginal levels
2. Group Term Paper and Presentation	Students' ability to solicit, digest, and organize materials of real life Six Sigma applications are assessed through written report and oral presentation. Key activities, results, and possible financial impact of the quality problem solving cycle are required.	High	Significant	Moderate	Basic	Not even reaching marginal levels
3. Examination	Examination questions are designed to assess student's level of achievement of the intended learning outcomes, with balanced emphasis placed on both conceptual understanding of the statistical tools introduced and practical applications of the various quality improvement systems and methodologies.	High	Significant	Moderate	Basic	Not even reaching marginal levels

The quiz(s), laboratory report and the case study will be numerically-marked, while examination will be numerically-marked and grades-awarded accordingly. The areas of achievement to be assessed for each activity are summarized as below.

Applicable to students admitted from Semester A 2022/23 to Summer Term 2024

Assessment Task	Criterion	Excellent (A+, A, A-)	Good (B+, B)	Marginal (B-, C+, C)	Failure (F)
1. Exercises	The exercises assess students' ability to design, conduct and analyze factorial experiments and gage R&R study with statistical package. Interpretations of the numerical results and their practical implications are particularly sought for.	High	Significant	Moderate/Basic	Not even reaching marginal levels
2. Group Term Paper and Presentation	Students' ability to solicit, digest, and organize materials of real life Six Sigma applications are assessed through written report and oral presentation. Key activities, results, and possible financial impact of the quality problem solving cycle are required.	High	Significant	Moderate/Basic	Not even reaching marginal levels
3. Examination	Examination questions are designed to assess student's level of achievement of the intended learning outcomes, with balanced emphasis placed on both conceptual understanding of the statistical tools introduced and practical applications of the various quality improvement systems and methodologies.	High	Significant	Moderate/Basic	Not even reaching marginal levels

The quiz(s), laboratory report and the case study will be numerically-marked, while examination will be numerically-marked and grades-awarded accordingly. The areas of achievement to be assessed for each activity are summarized as below.

Part III Other Information (more details can be provided separately in the teaching plan)

1. Keyword Syllabus

(An indication of the key topics of the course.)

- Product/service quality definition and dimensions
- Six Sigma and DMAIC methodology
- Measure and analysis : measurement system analysis, rolled throughout yield, SIPOC analysis, Gage R&R, confidence interval, hypothesis testing;
- Improve and control: correlation and regression, analysis of variance, DOE (design of experiments), randomized blocks, BIBD, full factorial experiments, designed matrix experiments, control planning and application.
- Quality improvement implementation framework, team dynamics, improvement project planning

2. Reading List

2.1 Compulsory Readings

(Compulsory readings can include books, book chapters, or journal/magazine articles. There are also collections of e-books, e-journals available from the CityU Library.)

NIL

2.2 Additional Readings

(Additional references for students to learn to expand their knowledge about the subject.)

1.	H S Gitlow and D M Levine, Six sigma for green belts and champions: foundation, DMAIC, tools, cases and certification, Pearson/PrenticeHall, 2005
2.	Summer, Donna C S, Six Sigma: Basic Tools and Techniques, Pearson/PrenticeHall, 2007
3.	Greg Brue, Six Sigma for Managers, McGraw-Hill, 2002
4.	Gryna, Quality Planning and Analysis, 4th ed., Mc-Graw Hill, 2001
5.	D.C. Montgomery, Design and Analysis of Experiments, 7th ed., Wiley, 2008
6.	D.C. Montgomery, Introduction to Statistical Quality Control, 5th ed., Wiley, 2005
7.	Hines & Montgomery, Probability and Statistics in Engineering and Management Science, 3rd ed., Wiley, 1990
8.	G. S. Peace, Taguchi Methods : A Hands-On Approach, Addison Wesley, 1993