ADSE3102: QUALITY ENGINEERING

Effective Term
Semester A 2023/24

Part I Course Overview

Course Title
Quality Engineering

Subject Code
ADSE - Advanced Design and System Engineering
Course Number
3102

Academic Unit
Systems Engineering (SYE)

College/School
College of Engineering (EG)

Course Duration
One Semester

Credit Units
3

Level
B1, B2, B3, B4 - Bachelor's Degree

Medium of Instruction
English

Medium of Assessment
English

Prerequisites
Nil

Precursors
MA1200 Calculus and Basic Linear Algebra I or
MA1300 Enhanced Calculus and Linear Algebra I or
MA2506 Probability and Statistics

Equivalent Courses
SEEM3102 Quality Engineering or
SDSC3102 Quality Technologies

Exclusive Courses
Nil

Part II Course Details

Abstract

The aim of this course is to provide students with a basic understanding of the approaches and techniques to assess and improve process and/or product quality. The objectives are to introduce the principles and techniques of Statistical Quality Control and their practical uses in product and/or process design and monitoring; and the basic concepts of experimental design.

Course Intended Learning Outcomes (CILOs)

	CILOs	Weighting (if app.)	DEC-A1	DEC-A2	DEC-A3
1	Understand quality engineering concept, beware of some basic techniques for quality improvement, and acquire fundamental knowledge of statistics and probability.	10	x		
2	Apply the basic seven tools for quality problem solving and planning.	10		x	
3	Apply control charts to analyze and improve the process quality, including > understand the relationship between process quality and variations in manufacturing processes,, > construct control charts and identify the special causes variations, > calculate the non-conformance rate and improve the manufacturing process quality.	45		x	
4	Design a simple sampling plan, construct its OC curve and evaluate its effectiveness for a given process	15			
5	Acquire some basics of the experimental design and its application, including > construct a full and partial 2k factorial design matrix; > analyze the main factor effects and their interactions; > develop Taguchi’ s loss function for a simple design problem;	20		x	

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.

Teaching and Learning Activities (TLAs)

	TLAs	Brief Description	CILO No.	Hours/week (if applicable)
1	Large Class Activities	Take place in classroom setting and consist of lecturing and student activities in between. Students will be grouped in the large classroom to work on mini-tasks.	1, 2, 3, 4, 5	3 hours/week

Assessment Tasks / Activities (ATs)

	ATs	CILO No.	Weighting (%)	Remarks (e.g. Parameter for GenAI use)
1	Individual assignment Students need work independently to complete the exercises, which include understanding basic fundamentals, and applying learned knowledge for problems solving.	1, 2, 3, 4, 5	20	
2	In-class test Students will be assessed in the mid-term test for their understanding of fundamentals in the learned topics, and problems solving taught in the completed lectures.	1, 2, 3, 4	20	

Continuous Assessment (%)

40

Examination (%)

60

Examination Duration (Hours)

2

Additional Information for ATs

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

Assessment Rubrics (AR)

Assessment Task

Individual assignment

Criterion

Each assignment has 5-10 big problems for students to complete. Each problem may include several small questions. Every questions and problems will be graded numerically in 100% scale.

Excellent (A+, A, A-)
High

Good (B+, B, B-)
Significant

Fair (C+, C, C-)
Moderate

Marginal (D)
Basic

Failure (F)
Not even reaching marginal levels

Assessment Task
In-class test

Criterion
Every CILO taught will be examined to have an immediate feedback of the learning performance. The results are marked numerically in 100% scale

Excellent (A+, A, A-)
High

Good (B+, B, B-)
Significant

Fair (C+, C, C-)
Moderate

Marginal (D)
Basic

Failure (F)
Not even reaching marginal levels

Assessment Task
Examination

Criterion
Closed-book examination.

Excellent (A+, A, A-)
High

Good (B+, B, B-)
Significant

Fair (C+, C, C-)
Moderate

Marginal (D)
Basic

Failure (F)
Not even reaching marginal levels

Additional Information for AR
Examination and course work will be numerically marked and grades awarded accordingly.

Part III Other Information

Keyword Syllabus

- The Basic QC Tools of quality improvement;
- Basic statistics and probabilities for quality and reliability;
- Variable and attribute control charts;
- Additional SPC techniques for variables;
- Process capability indices and analysis;
- Quality control in high-quality production environment;
- Acceptance sampling;
- Factorial design, analysis of variance (ANOVA);
- Introduction to Taguchi loss function and design.

Reading List

Additional Readings

	Title
1	Dale H. Besterfield, Quality Improvement, ninth edition, Prentice Hall, 2013
2	Douglas C. Montgomery, Introduction to Statistical Quality Control, eighth edition, John Wiley & Sons, Inc. 2019
3	Lecture notes