

# SYE3102: QUALITY ENGINEERING

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## Effective Term

Semester A 2025/26

## Part I Course Overview

### Course Title

Quality Engineering

### Subject Code

SYE - Systems 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  
ADSE3102 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.

### Learning and Teaching Activities (LTAs)

LTAs		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 ("- " for nil entry)	Allow Use of GenAI?
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	nil	Yes
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	nil	Yes

**Continuous Assessment (%)**

40

**Examination (%)**

60

**Examination Duration (Hours)**

2

**Minimum Continuous Assessment Passing Requirement (%)**

30

**Minimum Examination Passing Requirement (%)**

30

### **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

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#### **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

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#### **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****Compulsory Readings**

Title	
1	Nil

**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