

# SEEM3053: QUALITY IMPROVEMENT METHODOLOGIES

---

## Effective Term

Summer Term 2023

## Part I Course Overview

### Course Title

Quality Improvement Methodologies

### Subject Code

SEEM - Systems Engineering and Engineering Management

### Course Number

3053

### 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

MA2172 Applied Statistics for Sciences and Engineering or MA2177 Engineering Mathematics and Statistics

### Precursors

MEEM3062 (offered until Semester A 2011/12) /SEEM3062 Quality Engineering I /SEEM3102 Quality Engineering

### Equivalent Courses

MEEM3053 Quality Improvement Methodologies

### Exclusive Courses

Nil

## Part II Course Details

### Abstract

The aim of this course is to provide students with a basic understanding of the approaches, systems and techniques to assess and improve product/service quality in a manufacturing/service organization. The principles and techniques of Six Sigma methodology and their practical implementation issues in product and service realization are introduced.

### Course Intended Learning Outcomes (CILOs)

CILOs	Weighting (if app.)	DEC-A1	DEC-A2	DEC-A3
1	Define the various dimensions of quality in product and service realization.	20	x	
2	Elaborate the concepts and principles of the six sigma breakthrough strategy of quality improvement.	30	x	x
3	Explain the key activities and tools involved in each stage of the DMAIC methodology of quality problem solving.	30	x	x
4	Apply a structured problem solving approach to solve quality problems.	10		x
5	Discuss the framework and associated issues of implementing and monitoring of quality improvement projects.	10		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 (Lecture)	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 quality improvement methodologies.	1, 2, 3, 4, 5
			26 hrs/semester

2	Tutorial Exercises	The exercises enable students to digest and apply quality function deployment (QFD) and root cause analysis (RCA) in solving practical problems.	3, 4	6.5 hrs/semester
3	Consultation hours	1 hour per week will be scheduled for clearing doubts of students who can meet the teaching staff on an individual or small group basis in his/her office		13 hrs/semester

**Assessment Tasks / Activities (ATs)**

ATs	CILO No.	Weighting (%)	Remarks (e.g. Parameter for GenAI use)
1 Quiz(s) Students will be assessed via a quiz or several quizzes their understanding of concepts learned in class and reading materials, and their ability to apply subject related knowledge.	1, 2, 3, 4	30	
2 Tutorial Exercises (three exercises) Students will be given exercises to practice applying concepts and methods of the Six Sigma methodology to hypothetical problems, and to critically evaluate the soundness of certain Six Sigma concepts.	3, 4, 5	10	

**Continuous Assessment (%)**

40

**Examination (%)**

60

**Examination Duration (Hours)**

2

**Assessment Rubrics (AR)****Assessment Task**

Quiz(s)

**Criterion**

30 – 40 minutes short quiz(s) to assess students' understanding of the contemporary quality concepts and techniques of quality improvement introduced in the lectures.

**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**

Tutorial Exercises

**Criterion**

The tutorial exercises assess student's ability to apply i/ QFD to translate and prioritize voices of customers into specific product and process requirements, and ii/ RCA to analyze and deduce root causes of practical quality problems. Interpretations of the numerical results and their practical implications are particularly sought for.

**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**

Examination questions are designed to assess student's level of achievement of the intended learning outcomes, with balanced emphasis placed on both conceptual understanding and practical applications of the various quality improvement tools and methodologies.

**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

## Part III Other Information

**Keyword Syllabus**

Product and service quality dimensions

Six Sigma and DMAIC methodology

Define : voice of customer, quality function deployment (QFD) project charter and project execution

Measure and Analysis : rolled throughout yield, SIPOC analysis, data collection, root cause analysis (RCA)

Improve and Control: lean methodologies, kaizen, theory of constraints, control planning and application, Poke Yoke (mistake proofing).

Quality improvement implementation framework, team dynamics, improvement project planning

Design for Six Sigma methodologies

Lean Six Sigma concepts and methodologies

**Reading List****Compulsory Readings**

Title	
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

**Additional Readings**

Title	
1	M Harry and R Schroeder, Six Sigma: The Breakthrough Management Strategy Revolutionizing the World' s Top Corporations, Doubleday, 2000
2	H S Gitlow and D M Levine, Six sigma for green belts and champions: foundation, DMAIC, tools, cases and certification, Pearson/PrenticeHall, 2005
3	Gryna, Quality Planning and Analysis, 4th ed., Mc-Graw Hill, 2001