EASTERN MEDITERRANEAN UNIVERSITY
FACULTY OF ENGINEERING
DEPARTMENT OF INDUSTRIAL ENGINEERING
COURSE OUTLINE
SPRING 2025-26

COURSE CODE	IENG584	**COURSE LEVEL**	Graduate
COURSE TITLE	Advanced Quality Engineering	**COURSE TYPE**	Elective
CREDIT VALUE	(3, 0, 0) 3		
	Name(s)	**E-mail**	**Office**
LECTURER(S)	Asst. Prof. Dr. Ali Baştaş	ali.bastas@emu.edu.tr	IE-C207

CATALOG DESCRIPTION

This course is designed to introduce a conceptual and practical notion of advanced quality control in engineering. It also provides students with methods and philosophy of statistical process control. The course contents include introduction to advanced quality control and improvement concepts in production processes, control charts for variable and attributes, cumulative sum control charts, economic design of control charts, fractional factorial experiments for process design, process optimization with designed experiments, advanced acceptance sampling techniques and lot-by-lot acceptance sampling for attributes.

COURSE OBJECTIVES (COs)

At the end of this course, the student will:

- CO1. Explain and apply the notion and key concepts of advanced quality control and quality improvement concepts in production processes.
- CO2. Construct, interpret, and apply control charts for variables and attributes to monitor process performance and support improvement decisions.
- CO3. Design and use CUSUM (cumulative sum) control charts to detect small and persistent shifts in process parameters.
- CO4. Evaluate and apply principles of the economic design of control charts, including the trade-offs among sampling frequency, sample size, and cost of investigation/false alarms.
- CO5. Plan and analyze fractional factorial experiments for process and product design, including screening key factors efficiently.
- CO6. Conduct process optimization using designed experiments (e.g., model building, response interpretation, factor effects/interactions) and recommend optimal operating conditions based on results.
- CO7. Select and apply advanced acceptance sampling techniques, including advanced acceptance sampling for attributes and variables, and interpret decisions using risks and performance measures.

COURSE LEARNING OUTCOMES (CLOs)

On successful completion of this course, students are expected to **develop knowledge** and **understanding** of:

- Advanced Quality Control and Improvement Notion and Concepts
- Statistical Process Control including Control Charts for Variable and Attribute based Quality Characteristics
- Economic Design of Control Charts
- Fractional Factorial Experiments for Process Design and Optimization
- Advanced Acceptance Sampling Techniques for Attribute and Variable based Quality Characteristics
- Recent, State-of-the-art Literature on Advanced Quality Engineering Concepts
- Emerging Trends in Advanced Quality Engineering

COURSE TEXTBOOKS

1. Mitra, A. (2021). Fundamentals of Quality Control and Improvement (5th ed.). John Wiley & Sons.
2. Montgomery, D. C. (2020). Introduction to Statistical Quality Control (8th ed.). John Wiley & Sons.

GRADING CRITERIA AND METHODS OF ASSESSMENT

Although the student's overall grade will be based on the general assessment of the instructor, the following percentages may give an idea about the relative importance of various assessment tools:

Participation: 5%

Quizzes (2): 15%

Midterm Exam: 15%

Final Exam: 25%

Research Paper: 25%

Seminar Presentation: 15%

Letter grade equivalents of numerical performances will be announced by the Registrar's Office after the last day for the submission of letter grades.

Exams: All examinations will be based on lecture materials.

To pass these exams students will need to have studied the material well in advance in order to understand the concepts, procedures and techniques. All EMU, academic integrity, ethics and disciplinary procedures apply to all assessment activities of this course. Descriptions of these assessments are as following:

Make-up Policy:

Students missing the Midterm or Final examination should provide **a valid, evidencable excuse within three days following the examination they missed**. On the basis of the confirmation of the evidence provided (e.g. valid medical report) for missing the exam, student may qualify for one make-up examination only.

This only applies to the exams and not the quizzes. Thus, there will be **no make-up examinations for the students that miss the quizzes**, irrespective of the excuse provided.

NG (Nil-grade) Policy: The following conditions **MAY** result in the student getting an NG grade from this course:

1. Not attending the Final Exam without a valid excuse.
2. Not attending the Midterm Exam without a valid excuse.
3. Cheating and/or plagiarism during the exams, quizzes and/or assignments.
4. Not conducting the seminar presentation without a valid excuse.
5. Not completing the research paper within the prescribed deadline.

Research Paper – Late Submissions: A penalty (at least 50% reduction in the grade) for late submissions will be applied if the research paper is not submitted on the specified due date and time.

LEARNING / TEACHING METHOD

The teaching/learning method adopted this semester will be in-class lectures, and through further analysis and application of course materials in the form of a research paper. All relevant course materials will be provided via the course page implemented on the EMU Learning Management System LMS. The students

will be provided with updates during the lectures and through posts on the course page on the EMU LMS (and through MS Teams course page if available).

WEEKLY COURSE SCHEDULE

Week	Topics
1	Introduction
2	Notion and Key Concepts of Quality Engineering
3	SPC and Control charts for Variables: $\bar{X}$ and R, $\bar{X}$ and S Charts
4	SPC and Control charts for Variables: I-MR, CUSUM Charts
5	SPC and Control charts for Attributes: P, C charts
6	SPC and Control charts for Attributes: u, U charts
7	Economic Design of Control Charts
	Midterm Exam
8	Acceptance Sampling Plans for Attributes: Single Sampling Plans, AQL, LTPD, AOQ, AOQL, ATI
9	Acceptance Sampling Plans for Attributes: Double Sampling Plans, Dodge-Romig Sampling Plans
10	Acceptance Sampling Plans for Variables: k, M methods using Z, Q scores
11	Design of Experiments Theory
12	Fractional Factorial Experiments for Process Design and Optimization
13	Fractional Factorial Experiments for Process Design and Optimization
14	Review and Seminar Presentations
	Final Exam

IENG584
Advanced Quality Engineering
Spring 2025/26 Term Plan

Week	Week Commencing (Monday)	Slides	Module	Textbook Ref.*	Quiz
WK1	23-Feb		Course Outline & Intro		
WK2	02-Mar	L1	Notion and Key Concepts of Quality	T1 - C1&2	
WK3	09-Mar	L2	SPC and Control Charts for Variables incl. CUSUM	T1 - C7	
WK4	16-Mar				
WK5	23-Mar	L3	SPC and Control Charts for Attributes	T1 - C8	
WK6	30-Mar				Quiz 1
WK7	06-Apr	L4	Economic Design of Control Charts	T1 - C7&8	
MTW		**Midterm Exams: 10-25 April**			
MTW					
WK8	27-Apr	L5	Acceptance Sampling Plans for Attributes	T2 - C15	
WK9	04-May				
WK10	11-May	L6	Acceptance Sampling Plans for Variables	T2 - C16	
WK11	18-May	L7	Design of Experiments incl. Fractional Factorial for Process Design & Optimization	T1 - C11	
WK12	25-May				
WK13	01-Jun				Quiz 2
WK14	08-Jun		Review & Research Seminar Presentations	N/a	
FW	15-Jun	**Final Exams: 15-27 June**			
FW	22-Jun				

Course Textbooks*

T1: Mitra, A. (2021). Fundamentals of Quality Control and Improvement (5th ed.). John Wiley & Sons.

T2: Montgomery, D. C. (2020). Introduction to Statistical Quality Control (8th ed.). John Wiley & Sons.

ACADEMIC HONESTY, PLAGIARISM & CHEATING

This is intentionally failing to give credit to sources used in writing regardless of whether they are published or unpublished. Plagiarism (which also includes any kind of cheating in exams) is a disciplinary offence and will be dealt with accordingly. According to university by laws cheating and plagiarism are serious offences punishable with disciplinary action ranging from simple failure from the exam or report, to more serious action (suspension from the university for up to one semester). Disciplinary action is written in student records and may appear in student transcripts. Any act not suitable for a university student will not be tolerated and may lead to formal disciplinary action. Examples of this are: getting someone else to take the examinations for you, misrepresentation of your own answer sheet as another's work, cheating, knowingly assisting other students to cheat, abusing the tolerance or breaking the discipline of the class.

The research paper reports will be submitted to the Turnitin portal on LMS, and penalties will apply to reports exceeding a similarity limit of 25%.