Course Specification
(Bachelor)

Course Title:	Engineering Statistics and Probability
Course Code:	MTH2102
Program:	Bachelor of Science in Industrial Engineering
Department:	Mechanical and Industrial Engineering Department
College:	College of Engineering and Computing in Al-Qunfudhah
Institution:	Umm Al-Qura University
Version:	2
Last Revision Date:	17 March 2025

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A. General information about the course:

1. Course Identification

1. Credit hours:					
3 Credit hours					
2. Course type					
A.	☐University	☒ College	☐ Department	☐Track	☐Others
B.	☒ Required		☐ Elective		
3. Level/year at which this course is offered:					
Semester 3 / 2nd Year					
4. Course General Description:					
This course provides a comprehensive introduction to statistical concepts and methods essential for industrial engineering applications. It covers descriptive statistics, fundamental probability theory, probability distributions, sampling techniques, statistical inference, regression analysis, and the use of statistical software tools. Students will develop a strong foundation in data analysis, decision-making, and problem-solving techniques using statistical methods. The course emphasizes practical applications in engineering and management, enabling students to analyze and interpret real-world data effectively.					
5. Pre-requirements for this course (if any)**:**					
Calculus (2) for Engineering					
6. Co-requisites for this course (if any)**:**					
7. Course Main Objective(s):					

By the end of this course, students will:

- Equip with foundational knowledge in probability theory, statistical concepts, and their applications in engineering and real-world problem-solving.
- Develop analytical and technical skills to apply descriptive statistics, hypothesis testing, regression analysis, and sampling methods for data-driven decision-making.
- Train students to utilize modern statistical software tools.

2. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	**45**	**100 %**
2	E-learning		
3	Hybrid • Traditional classroom • E-learning		
4	Distance learning		

3. Contact Hours (based on the academic semester)

No	Activity	Contact Hours
1.	**Lectures**	**45**
2.	**Laboratory/Studio**	
3.	**Field**	
4.	**Tutorial**	
5.	**Others (specify)**	
Total		45

B. Course Learning Outcomes (CLOs), Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Code of PLOs aligned with the program	Teaching Strategies	Assessment Methods
1.0	**Knowledge and understanding**			
1.1	**Demonstrate comprehensive understanding of fundamental probability concepts and their applications in engineering problems**	**K1**	• **Lectures and Discussions** • **Problem-Solving Sessions** • **Case Studies and Engineering Applications**	• **Midterm** • **Final Exams** • **Quizes** • **Assignments** • **Homework**
1.2	**Explain and apply core statistical concepts including descriptive statistics, probability distributions, and sampling methods in engineering contexts**	**K1**	• **Lectures and Discussions** • **Problem-Solving Sessions** • **Case Studies and Engineering Applications**	• **Midterm** • **Final Exams** • **Quizes** • **Assignments** • **Homework**

Code	Course Learning Outcomes	Code of PLOs aligned with the program	Teaching Strategies	Assessment Methods
1.3	Explain the principles of statistical inference, including estimation and hypothesis testing	K2	• Lectures and Discussions • Problem-Solving Sessions • Case Studies and Engineering Applications	• Midterm • Final Exams • Quizes • Assignments • Homework
2.0	**Skills**			
2.1	Apply appropriate sampling methods and analyze sampling distributions in engineering problems	S1	• Lectures and Discussions • Problem-Solving Sessions • Case Studies and Engineering Applications	• Midterm • Final Exams • Quizes • Assignments • Homework
2.2	Conduct statistical analysis using modern software tools to solve real-world engineering problems	S4	• Lectures and Discussions • Problem-Solving Sessions • Case Studies and Engineering Applications	• Midterm • Final Exams • Quizes • Assignments • Homework
2.3	Design and perform statistical experiments, analyze data, and interpret results for engineering applications	S2	• Lectures and Discussions • Problem-Solving Sessions • Case Studies and Engineering Applications	• Midterm • Final Exams • Quizes • Assignments • Homework
2.4	Apply regression and correlation analysis techniques to model relationships between variables in engineering systems	S1	• Lectures and Discussions • Problem-Solving Sessions • Case Studies and Engineering Applications	• Midterm • Final Exams • Quizes • Assignments • Homework
2.5	Formulate hypotheses, conduct hypothesis testing,	S1	• Lectures and Discussions	• Midterm • Final Exams

Code	Course Learning Outcomes	Code of PLOs aligned with the program	Teaching Strategies	Assessment Methods
	and estimate population parameters using statistical tools.		• Problem-Solving Sessions • Case Studies and Engineering Applications	• Quizes • Assignments • Homework
3.0	Values, autonomy, and responsibility			

C. Course Content

No	List of Topics	Contact Hours
1.	Descriptive Statistics	5
2.	Introduction to Probability	6
3.	Random Variables and Probability Distributions	8
4.	Sampling Methods and Sampling Distributions	6
5.	Statistical Inference: Estimation	5
6.	Statistical Inference: Hypothesis Testing	6
7.	Regression and Correlation Analysis	6
8.	Introduction to Statistical Software Tools	3
Total		45

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Quiz 1	During 5th Week	10%
2.	Homework Assignments	Continuous Assessment	10%
3.	General Performance /Attendance	Continuous Assessment	5%
4.	Midterm Exam	During 7th-8th Weeks	25%
5.	Quiz 2	During 12th Week	10%
6.	Final Exam	16th – 17th Weeks	40%

*Assessment Activities (i.e., Written test, oral test, oral presentation, group project, essay, etc.).

E. Learning Resources and Facilities

1. References and Learning Resources

Essential References	***Ronald E. Walpole, Raymond H. Myers, Sharon L. Myers, and Keying Ye "Probability & Statistics for Engineers and Scientists" (Ninth edition), Pearson, 2016.***
Supportive References	***Douglas C. Montgomery and George C. Runger; "Applied Statistics and Probability for Engineers", 7th Edition, John Wiley and Sons, New York, 2020***
Electronic Materials	**Lecture material in PPT**
Other Learning Materials	

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	**Standard lecture halls with seating capacity**
Technology equipment (projector, smart board, software)	• **Projectors, smart boards, and internet connectivity** • **Statistical software**
Other equipment (depending on the nature of the specialty)	

F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	Students	Indirect: Survey
Effectiveness of Students assessment	External Assessors	Direct: Q. Committee , Deanship of Improvement and Quality
Quality of learning resources	Program Leaders, Peer Reviewers	Direct: Stakeholders, Quality requirements, Deanship of Improvement and Quality
The extent to which CLOs have been achieved	Instructor, Q. Committee	Direct: Mid exam, HW, Quizzes, Project and Final Exam
Other	Students	Indirect: Survey

Assessors (Students, Faculty, Program Leaders, Peer Reviewers, Others (specify)

Assessment Methods (Direct, Indirect)

G. Specification Approval

COUNCIL /COMMITTEE	**Department of Mechanical and Industrial Engineering**
REFERENCE NO.	**The fifteenth session of the academic year 1446**
DATE	**06/11/1446**