هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

T-104
2022

Course Specification

Course Title:	**Design and Analysis of Experiments**
Course Code:	**INE 3314**
Program:	Bachelor of **Industrial Engineering**
Department:	**Industrial Engineering**
College:	**Engineering**
Institution:	**King Khalid University**
Version:	**2**
Last Revision Date:	**4 March 2025**

Table of Contents:

A. General information about the course:

Course Identification					
1. Credit hours:	3				
2. Course type					
a.	University ☐	College ☐	Department☒	Track☐	Others☐
b.	Required ☒	Elective☐			
3. Level/year at which this course is offered:	6				
4. Course general Description This course deals with the models and methods of design of experiments and their analysis and industrial applications. Also, introduces methods of hypotheses tests on means and variables, errors analysis, and fixed, mixed random design types in Industrial Engineering field and results evaluation					
5. Pre-requirements for this course (if any): INE 3312					
6. Co- requirements for this course (if any): NIL					
7. Course Main Objective This course is primarily designed for majors in Mechanical Engineering at the undergraduate level; however, it is appropriate for science and engineering students with background in statistics and interested in the characterization and improvement of manufacturing and services processes through experimentation. The purpose of the course is to prepare students for: i) mastering the theoretical and applied framework needed to effectively design, conduct, and analyze experiments in the general engineering field and ii) conducting estimable research in the experimental design area. Opportunities to use the principles taught in the course arise in all phases of engineering work, including new product design and development, process development, and manufacturing process improvement. Computer software packages (SAS, Stat Graphics etc.) to implement the methods presented will be illustrated extensively, and the students will have opportunities to use it for homework assignments and the term project.					

1. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1.	Traditional classroom	30	100
2.	E-learning		
3.	Hybrid		

No	Mode of Instruction	Contact Hours	Percentage
	• Traditional classroom • E-learning		
4.	Distance learning		

2. Contact Hours (based on the academic semester)

No	Activity	Contact Hours
1.	Lectures	30
2.	Laboratory/Studio	
3.	Field	
4.	Tutorial	20
5.	Others (specify)	
	Total	60

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

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
1.0	Knowledge and understanding			
1.1	The student should understand the statistical basis of analysis of variance	VI, VE, V3	Lectures and tutorials	Assignments Midterm Exam Final Exam
1.2	The student should understand the basic concepts of design of experiments.			
1.3	The student should demonstrate the ability to understand different types of experimental design.			
1.4	The student should demonstrate the ability to design experiments and analyze the data for real problems...			
1.5	The student should learn how to use computer software to analyze experimental data. They will also be able to use the techniques, skills, and modern engineering tools necessary for engineering practice, through the use of library, internet, computer programs and word processors.			
2.0	Skills			

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
2.1	The student must apply the fundamental concepts of design and analysis of experiments to a practical application. This application should involve the definition of the problem under study, the actual design of experiment, data collection, data analysis, uncertainty and error analysis, the validation of the results and conclusions and recommendations	S1	Lectures and tutorials	Assignments Midterm Exam Final Exam
2.2	Use Statistical & DOE software packages to analyze experimental data.	S3, S4		
2.3	Students should be able to work and write reports together as team members and communicate more efficiently through oral/poster presentation.			
2.4	The students will be able to understand professional responsibility through data collection procedures, review of statistical and DOE issues, and public relations and contemporary issues associated with them.			
				Project
3.0	Values, autonomy, and responsibility			
3.1	Work individually or within a team and communicate effectively to perform the assigned tasked (Homework/Group Project)	V3	Lectures and tutorials	Project
3.2				
...				

C. Course Content

No	List of Topics	Contact Hours
1.	Introduction to DOE, its link to IE & its importance as an approach to product and process improvement	4
2	Planning experiments and the main steps for employing DOE along with the aids and tools needed for effective applications of DOE	4
3	Selection of appropriate designs for comparative and factorial experiments	6

4	Assignments of the factors to the selected design: the concept of full & fractional factorial experiments & confounding (aliasing)	6
5	Analyzing experimental data: graphical tools, half normal probability plot, ANOVA & regression analysis, data transformation	6
6	Interpreting & presenting experimental results & case studies	2
7	*Final Exam Review and Q&A* Final project presentation	2

Total		60

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	6 to 8 Assignments	2, 3, 4, 5, 6, 7, 8, 9	35
2.	Quiz 1	3	
3.	Quiz 2	7	
4.	Project	12	5
5.	Mid Term Exam	5	20
6.	Final Exam	13	40
...			100

*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	The Theory of the Design of Experiments. Cox, D.R. and Reid, N., 2000, Chapman & Hall/CRC, **ISBN**-10-158488195X **ISBN**-13-978-1584881957
Supportive References	- Statistical Design and Analysis of Experiments with Applications to Engineering and Science, Mason, L.R., Gunst, F.R. and Hess, L.J., 2003, 2nd Edition, John Wiley & Sons Co. - Montgomery D.C. Design and Analysis of Experiments, 7th Edition, John Wiley and Sons, N.Y., 2009, ISBN: 9780470398821. - Class notes/handouts materials provided by the instructor.
Electronic Materials	Lecture slides on course blackboard webpage
Other Learning Materials	– Multimedia associated with the text book and the relevant websites Customized program available with Software homepage

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	Classrooms
Technology equipment (projector, smart board, software)	projector
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 (Questionnaire)
Effectiveness of students' assessment	Faculty	Direct
Quality of learning resources	Program Leaders	Direct
The extent to which CLOs have been achieved	Faculty	Direct
Other		

Assessor (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify)

Assessment Methods (Direct, Indirect)

G. Specification Approval Data

COUNCIL /COMMITTEE	**REVIEWED BY CURRICULUM COMMITTEE** **APPROVED BY QUALITY COMMITTEE**
REFERENCE NO.	**9-6-47**
DATE	**25/06/1447**