هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission
اعتماد
NCAAA
2024
TP-153

Course Specification
(Bachelor)

Course Title:	**Experimental Design**
Course Code:	**STA 1426**
Program:	**Bachelor of Science in Applied Statistics**
Department:	**Mathematics and Statistics**
College:	**Science**
Institution:	**Imam Mohammad Ibn Saud Islamic University**
Version:	**2024 – V1**
Last Revision Date:	**2 October 2024**

Table of Contents

A. General information about the course:

1. Course Identification

1. Credit hours:					
3 (2 Lectures, 1 Lab, 1 Tutorial)					
2. Course type					
A.	☐University	☐College	☒ Program	☐Track	☐Others
B.	☒ Required		☐Elective		
3. Level/year at which this course is offered: Level 7 / Year 4					
Level 7 / Year 4					
4. Course General Description:					
A study of the design and analysis of experiments. A model-based approach examines both theoretical and practical issues associated with experimentation. Topics include randomized block designs, Latin-square designs, linear mixed models, split-plot designs, response surface methodology, mixture models and fractional 2^k experiments are studied. Applications of experimental planning and analysis of variance play a prominent part. The course content is valuable when planning and carrying through experiments.					
5. Pre-requirements for this course (if any):					
STA 1332					
6. Co-requisites for this course (if any):					
None					
7. Course Main Objective(s):					
• To provide students with a comprehensive understanding of the principles of experimental design, including key concepts such as control, randomization, replication, and blinding. • To equip students with the skills to apply appropriate statistical methods for designing experiments, analyzing data, and interpreting results. • To develop students' abilities to critically evaluate existing experimental studies, identifying strengths, weaknesses, and potential biases. • To guide students in formulating research questions and developing experimental proposals that adhere to scientific and ethical standards. • To provide hands-on experience in designing and conducting experiments, including data collection, analysis, and reporting findings.					

2. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	60	100%
2	E-learning	0	0%
3	Hybrid • Traditional classroom • E-learning	0	0%
4	Distance learning	0	0%

3. Contact Hours (based on the academic semester)

No	Activity	Contact Hours
1.	**Lectures**	**45**
2.	**Laboratory/Studio**	**15**
3.	**Field**	**0**
4.	**Tutorial**	**15**
5.	**Others (specify)**	**0**
Total		**75**

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	To describe some of the factors affecting reproducibility and external validity.	K1, K2	3 lecture hours\week Classroom discussions	Direct: Regular Exams, Lab Assignments,
1.2	To list the different types of formal experimental designs.	K2, K3	• 1 tutorial hour\week • 1 lab hour\week	Direct: Regular Exams, Short Quizzes
2.0	Skills			
2.1	To develop techniques of problem solving.	S1, S2	Self-study Real-life problems	Direct: Participations, Lab Exam, Short Quizzes
2.2	To differentiate the type of experiment.	S2, S3	Real-life problems	Direct: Short Quizzes
2.3	To design and analyze factorial experiments for investigating multiple factors.	S4, S5	Self-study	Direct: Lab Exam, Participations
3.0	**Values, autonomy, and responsibility**			
3.1	To exhibit ethical considerations in experimental design and data handling.	V1, V2	Self-study Real-life problems	Direct: Group Mini project Lab Exam
3.2	To formulate independent research questions and design experiments to address them.	V2, V3	Individual project work where students design their own experiments.	Direct: Assessment of individual research proposals.
3.3	To apply statistical methods autonomously to analyze experimental data.	V2	Hands-on practice using statistical software for data analysis.	Direct: Practical exams assessing data analysis skills.

C. Course Content

No	List of Topics	Contact Hours
1	**Introduction:** Strategy of Experimentation. Some typical Applications of experimental Design. Basic principle. Guidelines for design experiments.	4
2	**Simple Comparative Experiments:** Basic Statistical concept; Sampling and Sampling Distribution; Inference about the Difference in Means; Randomized Design; Paired Comparison Designs.	12
3	**Randomized Blocks, Latin Square, and Related Designs:** Complete Block Design; The Latin Block Design; The Greco Latin Design.	12
4	**Introduction to Factorial Designs:** Basic Definitions and Principles; The Advantage of Factorials; The Two-Factor Factorial Design; The General Factorial Design; Fitting Response Curves and Surfaces.	12
5	**The 2^k Factorial Design:** The 2^2 Design. The 2^3 Design.	12
6	**Design with Random factors:** The Random effect Model; The Two Factor Factorial with Random Effect; The Two Factor Mixed Model.	8
Total		**60**

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	HomeWorks, Quizzes, Mini projects	During the term	10%
2.	First Midterm	Week 5-6	25%
3.	Second Midterm	Week 10-11	25%
4.	Final Exam	Week 15	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	***Design and Analysis of Experiments***, 8th Edition, D.C. Montgomery, John Wiley & Sons, 2013. ISBN 978-1-118-14692-7.
Supportive References	1- ***Experiments with Mixtures***, 2nd Edition, J.A. Cornell, John Wiley & Sons, 1990. 2- **Experiments: Planning, Analysis, and Optimization,** 2nd Edition, C. F. Jeff Wu, Michael S. Hamada, John Wiley & Sons, 2009. 3- **Statistical Analysis of Designed Experiments, 3rd Edition, Springer-Verlag, 2009.**
Electronic Materials	**Course Website: Learning Management Systems (Blackboard)**
Other Learning Materials	**None**

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	▪ Each class room should be equipped with a whiteboard and a projector. ▪ Laboratories should be equipped with computers and an internet connection.
Technology equipment (projector, smart board, software)	The rooms should be equipped with data show and Smart Board. All computers should be equipped with the following software: ▪ Microsoft Excel ▪ IBM SPSS ▪ R-Project ▪ MATLAB
Other equipment (depending on the nature of the specialty)	None

F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	Student and teaching staff	Surveys and Questionnaires
Effectiveness of Students assessment	Course Coordinator	Peer Reviews
Quality of learning resources	Students and teaching staff	Classroom Observations
The extent to which CLOs have been achieved	Student Representatives	Student Performance Evaluations (exams, projects) CLOs Excel sheet.
Other	None	

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

Assessment Methods (Direct, Indirect)

G. Specification Approval

COUNCIL /COMMITTEE	MATHEMATICS AND STATISTICS DEPARTMENT COUNCIL
REFERENCE NO.	8/1446
DATE	(08/10/2024) 05/04/1446