Course Specification
(Bachelor)

Course Title:	**Probability & Statistics (2)**
Course Code:	**STA 1105**
Program:	**Bachelor of Science in Actuarial and Financial Mathematics**
Department:	**Mathematics and Statistics**
College:	**Science**
Institution:	**Imam Mohammad Ibn Saud Islamic University**
Version:	**2024 – V1**
Last Revision Date:	**None**

Table of Contents

A. General information about the course:

1. Course Identification

1. Credit hours:					
3 (2 Lectures, 0 Lab, 2 Tutorial)					
2. Course type					
A.	☐University	☐College	☒ Program	☐Track	☒ Others
B.	☒ Required		☐Elective		
3. Level/year at which this course is offered: Level 2 / Year 1					
4. Course general Description:					
This course is a calculus-based one. Upon successful completion of this course, the students are introduced to the theory of continuous random variables and their probability distributions. They will understand the concept of test hypothesis for the one sample and two samples and apply the common test hypothesis procedures. They are introduced to correlation and linear regression.					
5. Pre-requirements for this course (if any):					
STA 1104					
6. Co-requisites for this course (if any):					
None.					
7. Course Main Objective(s):					
• To teach students some important scientific concepts of statistics. • To let students be familiar with distributions of continuous random variables. • To expose students to concepts of Expectation and moments. • To let students learn and use some tests of hypothesis. • To let student, learn and use linear regression.					

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**	30
2.	**Laboratory/Studio**	0
3.	**Field**	0
4.	**Tutorial**	30
5.	**Others (specify)**	0
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	Define and outline the theory of continuous random variables and their probability distributions.	K1	Lectures, Classroom discussions.	Direct: Written exam (Problem solve, MCQ, true/false, Proof, Short answer), Quizzes, Assignments
1.2	Outline the procedures of hypothesis testing. .	K3	Lectures, Classroom discussions.	Direct: Written exam (Problem solve, MCQ, true/false, Proof, Short answer), Quizzes, Assignments
1.3	Describe the method of least squares to estimate the parameters in a linear regression model.	K1	Lectures, Classroom discussions.	Direct: Written exam (Problem solve, MCQ, true/false, Proof, Short answer), Quizzes, Assignments
2.0	**Skills**			
2.1	Compute probabilities from cumulative distribution functions and cumulative distribution functions from probability density functions, and the reverse.	S1	Lectures, Classroom discussions.	Direct: • Written exam (Problem solve, MCQ, true/false, Proof, Short answer), Quizzes, Assignments
2.2	Evaluate test hypotheses for the one and two samples. .	S1, S2	Lectures, Classroom discussions, Individual or group work	Direct: Written exam (Problem

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
				solve, MCQ, true/false, Proof, Short answer), Quizzes, Assignments
2.3	Predict the future by using the linear regression model.	S3	Lectures, Individual or group work, Classroom discussions.	Direct: Written exam (Problem solve, MCQ, true/false, Proof, Short answer), Quizzes, Assignments
2.4	Construct hypotheses testing problems that will be solved using Excel	S3	Use of statistical software, Lecturing, Interactive learning	Direct: Lab Quiz, Assignments, Practical exam
2.5	Interpret the output of the statistical software of the test hypothesis of a given data set	S3	Use of statistical software, Lecturing, Interactive learning.	Direct: Lab Quiz, Assignments, Practical exam
3.0	**Values, autonomy, and responsibility**			
3.1	Generate initiatives with independence	V2	Interactive learning, Group interaction, Problem solving.	Direct: Lab Quiz, Practical exam
3.2	Debate in groups	V2	Group interaction, Problem solving.	Direct: Assignments and Mini projects

C. Course Content

No	List of Topics	Contact Hours
1.	**Continuous Random Variables and Probability Distributions:** Continuous Random variables. Probability Distribution and Probability Density Function. Cumulative Distribution Function. Mean and Variance of a Continuous Random Variable Moments. Moment Generating functions.	10
2.	**Some Examples of Continuous Probability Distributions:** Uniform Distribution. Normal Distribution and its Approximations to the Binomial and Poisson Distributions; Gamma and Exponential Distributions. Chi-Square Distribution. t-Distribution. F-distribution.	10

3.	**Tests of Hypothesis for one Sample**: Steps in Hypothesis Testing-Traditional Method. z-Test for the Mean; t Test for the Mean. z-Test for the Proportion. Chi-Square Test for a Variance or Standard Deviation.	15
4.	**Tests of Hypothesis for Two Samples:** Testing the Difference Between Two Means of Independent Samples. Testing the Difference Between Two Means of Dependent Samples. Testing the Difference Between Two Proportions. Testing the Difference Between Two Variances.	15
5	**Correlation and Linear Regression:** Scatter Plots and Correlation. Line of Best Fit; Determination of the Regression Line Fit Equation.	10
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 16**	**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	***Probability & Statistics for Engineers & Scientists,*** *9th Edition, R. Walpole, R. Myers, S. Myers, K. Ye, Pearson Education International, 2012. ISBN 9780321629111. (Main Reference).* **Mathematical Statistics with Applications,** 7th Edition, D. Wackerly, W. Mendenhall, R.L. Scheaffer, Brooks/Cole-Cengage Learning, 2008. ISBN-13: 9780495385080. *(Main Reference).*
Supportive References	• **Introduction to Mathematical Statistics,** 6th Edition, Robert V. Hogg, Joseph McKean, Allen T. Craig, Prentice Hall, 2005. • **Elementary Statistics,** 14th edition; Mario F. Triola, Pearson, 2021.
Electronic Materials	**None**
Other Learning Materials	**None**

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	▪ **Each classroom should be equipped with a whiteboard and a projector.** ▪ **Laboratories should be equipped with computers and an internet connection.**

Items	Resources
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	**Students**	**During the semester and at the end of the course each student will complete two evaluation forms.**
Effectiveness of Students' assessment	**Instructor**	**At the end of each semester the course instructor should complete the course report, including a summary of student questionnaire responses appraising progress and identifying changes that need to be made if necessary.**
Quality of learning resources	**Students**	**During the semester and at the end of the course each student will complete two evaluation forms.**
The extent to which CLOs have been achieved	**Instructor**	**At the end of each semester the course instructor should complete the course report, including a summary of student questionnaire responses appraising progress and identifying changes that need to be made if necessary.**
Other	**None**	

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

Assessment Methods (Direct, Indirect)

G. Specification Approval

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