Course Specification
— (Bachelor)

Course Title:	**Sampling Methods**
Course Code:	**STA 1332**
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, 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 5/year 3

4. Course General Description:

In statistics, sampling methods are used to study the main stages in experimental research and the desirable properties and the criteria of optimality of experimental designs. The course covers the concept of sampling, the type of probability sampling, the systematic sampling, the ratio estimation, the regression estimation, the theory of stratified sampling, the cluster sampling with equal probability, and sampling with unequal probabilities.

5. Pre-requirements for this course (if any):

STA 1231

6. Co-requisites for this course (if any):

None

7. Course Main Objective(s):

- To provide students with a comprehensive understanding of the fundamental concepts and principles of sampling theory, including the importance of sampling in statistical analysis.
- To equip students with the skills to apply various sampling methods, such as random sampling, stratified sampling, cluster sampling, and systematic sampling, appropriately in different research contexts.
- To develop students' abilities to calculate and determine appropriate sample sizes based on desired confidence levels, margins of error, and population characteristics.
- To enhance students' understanding of potential biases in sampling and provide strategies for minimizing these biases to ensure representative samples.
- To familiarize students with various data collection techniques associated with sampling, including surveys, experiments, and observational studies.
- To instill an awareness of ethical issues related to sampling, including informed consent, confidentiality, and the responsible reporting of sampling results.

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 PLOs aligned with the program	Teaching Strategies	Assessment Methods
1.0	**Knowledge and understanding**			
1.1	**To explain the importance of sampling in statistical analysis and research design.**	**K1**	**Lectures, problem solving, Classroom discussions**	**Direct:** Regular Exams, Practical exam
1.2	**To describe various sampling methods and their appropriate applications.**	**K1**	**Lectures, problem solving, Classroom discussions**	**Direct:** Regular Exams, Practical exam
2.0	**Skills**			
2.1	**To appraise the Simple Random Sampling (SRS) method.**	**S1**	**Lecturing, Interactive learning.**	**Direct:** Assignments, Practical exam
2.2	**To differentiate the randomization theory and model-based analysis.**	**S1**	**Lecturing, Interactive learning.**	**Direct:** Assignments, Practical exam
2.3	**To apply Stratified Sampling method, Systematic Sampling (SS) and Cluster Sampling (CS) methods.**	**S3, S4**	**Lecturing, Interactive learning.**	**Direct:** Assignments, Practical exam
2.4	**To employ statistical software tools for sampling design and analysis..**	**S3**	**Lecturing, Interactive learning.**	**Direct:** Assignments, Mini-project Practical exam
3.0	**Values, autonomy, and responsibility**			
3.1	**To employ ethical concepts and rules to determine viable alternatives in any given situation.**	**V1, V2**	**Interactive learning, Group interaction, Problem solving.**	**Direct:** Practical exam, Assignments
3.2	**To justify the output in a collective team environment.**	**V1, V3**	**Group interaction, Problem solving.**	**Direct:** Assignments and Mini-projects

C. Course Content

No	List of Topics	Contact Hours
1.	**Introduction:** Requirements of a good sample, selection Bias, measurements Bias, questionnaire design, sampling and nonsampling errors.	4
2.	**Simple Probability Samples:** Types of probability samples, framework for probability sampling, simple random sampling, confidence intervals, sample size estimation, systematic sampling, when should a random sample be used?	8
3.	**Ratio and regression estimation:** Ratio Estimation. Regression Estimation. Estimation in Domains. Models for Ratio and Regression Estimation. Comparison.	8
4.	**Stratified sampling:** theory of stratified sampling, sampling weights, allocation observations to strata, defining strata, post-stratification, quota sampling.	6
5.	**Cluster sampling with equal probability:** One stage sampling, two stage cluster sampling, using weights in cluster samples.	8
6.	**Sampling with unequal probabilities:** Sampling one primary sampling unit, one stage sampling with replacement, two-stage sampling with replacement, unequal probability without replacement.	10
7.	**Complex Surveys:** Assembling Design Components. Sampling Weights. Estimating a Distribution Function. Plotting Data from a Complex Survey. Design Effects. The National Crime Victimization Survey. Sampling and Experiment Design.	8
8.	**Nonresponse:** Effects of Ignoring Nonresponse. Designing Surveys to Reduce Nonsampling Errors. Callbacks and Two-Phase Sampling. Mechanisms for Nonresponse. Weighting Methods for Nonresponse. Imputation. Parametric Models for Nonresponse. What Is an Acceptable Response Rate?	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 16-17**	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	*Sampling: Design and Analysis*, 1st Edition, Sharon S. Lohr, Duxbury Press, 1999. ISBN-13: 9780534353612
Supportive References	1- *Sampling Techniques*, 3rd Edition, William G. Cochran, John Wiley and Sons, Inc., 1977. ISBN-13: 9780471162407.

	2- ***Model Assisted Survey Sampling,*** 2nd Edition, Jan Wretman, Carl-Erik Sarndal, Bengt Swensson, Springer Verlag, Series: Springer Series in Statistics, 2003. ISBN-13: 9780387406206. 3- ***Sampling Theory and Methods,*** 2nd Edition, S. Sampath, Alpha Science, International Ltd, 2005. ISBN-13: 9781842652145.
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)	**See the attached file**

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**