هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

اعتماد
NCAAA

2024
TP-153

Course Specification
(Bachelor)

Course Title:	**Statistical Analysis of Biological Data**
Course Code:	**STA 6118**
Program:	**Master of Science in Applied Biology**
Department:	**Biology**
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, 2 Lab, 0 Tutorial)					
2. Course type					
A.	☐University	☐ College	Department	☒Track	☐Others
B.	☒ Required		☐Elective		
3. Level/year at which this course is offered:					
Level 1 / Year 1					
4. Course general Description:					
This course comprehensively introduces statistical methods and their application in biological research (in Molecular Biology, Biodiversity, and Biotechnology). It is designed for graduate students in the Master of Science in Applied Biology program who seek to develop a solid foundation in statistical analysis relevant to biological data. The course offers the students the necessary skills to compute and analyze measurements of location and deviations, frequencies, and covariation. The course also emphasizes the utilization of sample data to estimate population parameters. The course focuses on applying univariate and multivariate statistical approaches and explaining statistical ideas without requiring intricate mathematical proofs.					
5. Pre-requirements for this course (if any):					
None					
6. Co-requisites for this course (if any):					
None					
7. Course Main Objective(s):					
• This course comprehensively introduces statistical methods and their application in biological research (in Molecular Biology, Biodiversity, and Biotechnology). It is designed for graduate students in the Master of Science in Applied Biology program who seek to develop a solid foundation in statistical analysis relevant to biological data. The course offers the students the necessary skills to compute and analyze measurements of location and deviations, frequencies, and covariation. The course also emphasizes the utilization of sample data to estimate population parameters. The course focuses on applying univariate and multivariate statistical approaches and explaining statistical ideas without requiring intricate mathematical proofs.					

2. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	60	100%

No	Mode of Instruction	Contact Hours	Percentage
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**	**30**
3.	**Field**	**0**
4.	**Tutorial**	**0**
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	**Describe the basic statistical methods related to principal statiscal inference, linear models, and probability-based methods.**	**K1**	**Lectures, problem-solving, Classroom discussions**	**Direct: Regular Exams, Lab Assignments, Practical exam**
1.2	**Identify the statistical analyses meeting the demands of data analysis in biological research work**	**K1, K2**	**Lectures, problem-solving, Classroom discussions**	**Direct: Regular Exams, Lab Assignments, Practical exam**
1.3	**Recognize the common types of biological and the principles of data collection and generating descriptive statistics.**	**K1**	**Lectures, problem-solving, Classroom discussions**	**Direct: Regular Exams, Lab Assignments, Practical exam**
1.4	**Use computer programs to solve problems in Applied Biology.**	**K1, K2**	**Lectures, problem-solving, Classroom discussions**	**Direct: Regular Exams, Lab Assignments, Practical exam**

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
2.0	**Skills**			
2.1	**Design experiments in varied Applied Biology disciplines and to test a generated hypothesis.**	**S1**	**Lectures, problem-solving, Classroom discussions**	**Direct: Regular Exams, Lab Assignments, Practical exam**
2.2	**Formulate the necessary approaches to problems relevant to biological data analysis.**	**S2, S3**	**Lecturing, Interactive learning.**	**Direct: Assignments, Practical exam**
2.3	**Evaluate the significance of critical analysis and interpretation, and draw the appropriate conclusions.**	**S3, S4**	**Lecturing, Interactive learning.**	**Direct: Assignments, Practical exam**
2.4	**Utilize the appropriate statistical methods and computer analyzing packages.**	**S1**	**Lectures, problem-solving, Classroom discussions.**	**Direct: Regular Exams, Lab Assignments, Practical exam**
3.0	**Values, autonomy, and responsibility**			
3.1	**Show the ability to work independently and cooperate with a team to collect and analyze biological data.**	**V1**	**Lectures, problem-solving, Classroom discussions**	**Direct: Regular Exams, Lab Assignments, Practical exam**
3.2	**Share in specialized meetings and present professionally the outputs of statistical analyses to varied audiences.**	**V2**	**Lectures, problem-solving, Classroom discussions**	**Direct: Regular Exams, Lab Assignments, Practical exam**
3.3	**Demonstrate the ability to communicate effectively varied statistical methods and their applications.**	**V4**	**Lectures, problem-solving, Classroom discussions**	**Direct: Regular Exams, Lab Assignments, Practical exam**

C. Course Content

No	List of Topics	Contact Hours
1	**Introduction:** The Meaning of Statistics, The Uses of Statistics, Descriptive and Inferential Statistics, Sources of Data: Surveys and Experiments, Retrospective and Prospective Studies, Demographic	**10**

No	List of Topics	Contact Hours
	Data, Population and Sample, Qualitative and Quantitative Data, Scales of Measurement.	
2	**Exploring Data with Tables and Graphs:** Frequency Distributions for Organizing and Summarizing Data; Histograms; Graphs That Enlighten and Graphs That Deceive; Scatterplots, Correlation, and Regression. ***Applications using statistical software.***	**12**
3	**Describing, Exploring, and Comparing Data:** Measures of Center; Measures of Variation; Measures of Relative Standing and Boxplots. ***Applications using statistical software.***	**12**
4	**Probability and Probability Distributions:** Basic Probability Concepts, Normal Probability Distribution, Discrete Probability Distributions: Binomial and Poisson. ***Applications using statistical software.***	**10**
5	**Estimating Parameters and Determining Sample Sizes:** Sampling and Sampling Distribution; Estimation of mean, variance and proportion for a single population; Error of estimation; Sample size determination; Estimation of the difference between 2 means, ratio of 2 variances and difference of 2 proportions for two populations. ***Applications using statistical software.***	**16**
Total		**60**

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	**Homework, Mini projects**	**During the semester**	**15%**
2.	**First Midterm**	**Week 5**	**25%**
3.	**Lab exam**	**Week 14**	**20%**
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	1. ***Elementary Statistics***, 14th edition; Mario F. Triola, Pearson, 2022. **(Main Reference).** 2. ***Statistics for Environmental Science and Management,*** 2nd Edition, Bryan F. J. Manly, CRC Press, 2009.
Supportive References	***Analyzing Environmental Data,*** Walter W. Piegorsch, A. John Bailer, John Wiley & Sons, Ltd., 2005.
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.
Technology equipment (projector, smart board, software)	The rooms should be equipped with a data show and Smart Board. All computers should be equipped with the following software: • Microsoft Excel • IBM SPSS • R-Project
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	Each student will complete two evaluation forms during the semester and at the end of the course.
Effectiveness of Students' assessment	Instructor	At the end of each semester, the course instructor should complete the course report, which includes a summary of student questionnaire responses appraising progress and identifying changes that need to be made if necessary.
Quality of learning resources	Students	Each student will complete two evaluation forms during the semester and at the end of the course.
The extent to which CLOs have been achieved	Instructor	At the end of each semester, the course instructor should complete the course report, which includes 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.	4/1446
DATE	06/03/1446 (09/09/2024)