هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

اعتماد
NCAAA

2024
TP-153

Course Specification
(Bachelor)

Course Title:	**Nonparametric Statistics**
Course Code:	**STA 1261**
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 3 / Year 2					
4. Course General Description:					
This course aims at introducing the nonparametric techniques in statistical analysis and the use of these techniques in a variety of disciplines. Nonparametric statistics essentially refer to the so-called smoothing procedures for curve estimation, in contrast to traditional nonparametric methods such as rank-based tests. This course covers tests for single samples and for paired samples, k-sample method, paired comparisons and blocked designs, tests for trends and association, and multivariate tests.					
5. Pre-requirements for this course (if any):					
STA 1102					
6. Co-requisites for this course (if any):					
STA 1203					
7. Course Main Objective(s):					
• To provide students with a comprehensive understanding of nonparametric statistical methods, including their advantages and limitations compared to parametric techniques. • To equip students with the skills to identify scenarios in which nonparametric methods are appropriate, particularly when data does not meet the assumptions required for parametric tests. • To develop students' abilities to perform key nonparametric tests, such as the Wilcoxon rank-sum test, Kruskal-Wallis test, and Friedman test, for comparing groups and analyzing ordinal data. • To prepare students to accurately interpret and communicate the results of nonparametric analyses, emphasizing the practical implications of findings in various contexts. • To provide hands-on experience with statistical software for conducting nonparametric analyses, enhancing students' computational skills and practical application.					

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**	**15**
3.	**Field**	**0**
4.	**Tutorial**	**15**
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 recognize when not to use a nonparametric method.**	**K1, K2**	3 lecture hours per week	**Direct:** Regular Exams
1.2	**To define different nonparametric methods in estimation, testing, model fitting, and in analyses.**	**K1, K2, K3**	1 tutorial hours per week 1 lab hours per week Self-study	**Direct:** Short Quizzes
2.0	**Skills**			
2.1	**To formulate, test and interpret various hypothesis tests for location, scale, and independence problems.**	**S1, S2**	Self-study Real-life problems	**Direct:** Participations Short Quizzes
2.2	**To summarize data using both graphical and numerical methods for use in nonparametric statistical methods.**	**S1, S2**	Real-life problems	**Direct:** Short Quizzes
2.3	**To use statistical methods, including nonparametric bootstrapping, to construct and interpret interval estimators for population medians and other population parameters based on rank-based methods.**	**S3, S4, S5**	Self-study	**Direct:** Participations
2.4	**To produce and interpret statistics and graphs, using nonparametric density estimation and nonparametric function estimation techniques.**	**S5, S3, S4**	Self-study Real-life problems	**Direct:** Regular Exams Participation Short Quizzes
2.5	**To explain the relationship between parametric tests and nonparametric tests**	**S1, S3**	2 tutorial hours per week Self-study	**Direct:** Regular Exams Participation Short Quizzes
3.0	**Values, autonomy, and responsibility**			
3.1	**To employ ethical concepts and rules to determine viable alternatives in any given situation.**	**V1, V2**	Personal questions	**Direct:** Participation
3.2	**To operate meaningfully and productively with others.**	**V1, V3**	Teamwork and class discussions.	**Direct:** Homework Mini projects

C. Course Content

No	List of Topics	Contact Hours
1.	Objectives of the nonparametric statistical procedures presented in the course, Ranking data, Ranking data with tied values, Counts of observations.	4
2.	Describing data and the normal distribution, Computing and testing kurtosis and skewness for sample normality, Computing the Kolmogorov–Smirnov one-sample test.	10
3.	Computing the Wilcoxon signed rank test statistic, Computing the sign test statistic, Performing the Wilcoxon signed rank test and the sign test using PSS package, Statistical power.	9
4.	Computing the Mann–Whitney U-test statistic, Computing the Kolmogorov–Smirnov two-sample test statistic, Performing the Mann–Whitney U-test and the Kolmogorov–Smirnov two-sample test using SPSS.	10
5.	**Paired Comparisons & Blocked Designs:** Sign Test & Signed Rank Tests, Permutation Test for a Randomized Complete Block Design " Friedman's Test, Cochran's Q, Kendall's W".	8
6.	**Tests for Association:** Spearman Rank Correlation, Kendall's Tau, Permutation Tests for Contingency Tables, Fisher's Exact for a 2x2 Table.	7
7.	**Paired Comparisons & Blocked Designs:** Sign Test & Signed Rank Tests, Permutation Test for a Randomized Complete Block Design " Friedman's Test, Cochran's Q, Kendall's W".	6
8.	**Nonparametric Bootstrap Methods:** The Basic Bootstrap Method. Bootstrap Intervals for Location-Scale Models. BCA and Other Bootstrap Intervals. Correlation and Regression. Two-Sample Inference. Bootstrap Sampling from Several Populations. Bootstrap Sampling for Multiple Regression.	6
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 (lab Exam)	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	**Nonparametric Statistics for Non-Statisticians: A Step-by-Step Approach**, Gregory W. Corder, Dale I. Foreman, Willey, 2011.
Supportive References	1- **Applied Nonparametric Statistical Methods, 4th Edition**; P. Sprent, Nigel C. Smeeton, Chapman & Hall/CRC Texts in Statistical Science, 2007.

	2- An Introduction to Modern Nonparametric Statistics, 1st Edition; James J. Higgins, Duxbury Press, 2004. ISBN-13: 9780534387754.
Electronic Materials	**Course Website: Learning Management Systems (Blackboard)**
Other Learning Materials	**Statistical Package for Social Sciences (SPSS)**

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**