Syllabus*: **Advanced Biostatistics (2405011701)**

First/Second Semester 2024- /2025

COURSE INFORMATION	
Course Name: Advanced Biostatistics **Semester:** First semester **Department: Medical laboratory science** **Faculty: Applied medical science**	**Course Code: 2405011701** **Section:** **Core Curriculum**: major compulsory course
Day(s) and Time(s): Sunday 9.30-12.30 **Classroom: postgraduate classroom**	**Credit Hours:** 3 **Prerequisites**:

COURSE DESCRIPTION

Biostatistics deal with important principles of biostatistics in medical practice and research as well as the necessary knowledge, and skills that will enable students to choose the best summary measure for data and to deal effectively with health-related/biological data through employing the basic statistical methods according to the data type.

DELIVERY METHODS

The course will be delivered through a combination of active learning strategies. These will include:

- PowerPoint lectures and active discussion
- Practical exercises
- Video lectures
- E-learning resources: e-reading assignments and practice quizzes through Model and Microsoft Team

FACULTY INFORMATION

Course Coordinator	
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Lecturers	
Name	Omnia Mohammed Elmahdy
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Office Hours:	Sunday 12.30- 2.0 Wednesday 1.0-2.0

REFERENCES AND LEARNING RESOURCES

Required Textbook and resources:

1. Course handouts.
2. Medical Statistics Made Easy, 4th edition 2020, M Harris, G Taylor, Scion Publishing Ltd.
3. Statistics Principles and Methods, 3rd Edition, R. A. Johnson and G. K Bhattacharyya, 2014, John Wiley, New York, USA.
4. Biostatistics: A Foundation for Analysis in the Health Sciences
   Author: Wayne W. Daniel
   Publisher: John Wiley & Sons, Inc., 2005, 8th edition.
5. Fundamentals of Biostatistics (2010) by Bernard Rosner, 7th edition, Brooks/Cole Cengage Learning, Inc.
6. An Introduction to Biostatistics (2015) by Thomas Glover and Kevin Mitchell, 3rd edition, Waveland Press.
7. Principles of Biostatistics (2018), by Pagano Marcello and Gauvreau Kimberlee, 2nd edition, Chapman and Hall/CRC Press.

STUDENT LEARNING OUTCOMES MATRIX*

Core Curriculum Learning Outcomes	Program Learning Outcomes	Course Objectives	Course Student Learning Outcomes	Assessment Method
1. To provide students with the highest educational standards in the field of biostatistics. 2. and a comprehensive understanding of practical techniques and technologies used in the field. 3. In addition, to ensure a thorough understanding of computer	KP1: Demonstrate a deep understanding of the principles of biostatistics, including the description of types of data, its graphical presentation, summarization by estimation the central tendency, and dispersion. KP2: Understand normal distribution and probability distribution. KP3: Hypothesis Testing: One-Sample Inference and Two-Sample Inference. KP4: Hypothesis Testing: Categorical Data KP5: Correlation and Simple Linear Regression KP6: One-Way Analysis of Variance (ANOVA) KP7: Non-parametric statistics	1. Understand the role of biostatistics in public health and medical studies. 2. Use descriptive tools to summarize and display data sets from medical studies. 3. Choose the appropriate statistical procedure to be used in analyzing data sets and interpreting the statistical results. 4. Better understand medical and scientific journal articles which frequently rely heavily on statistical procedures.	K1 understanding of the principles of biostatistics, including the description of types of data, its graphical presentation, summarization by estimation the central tendency, and dispersion. K2: Explaining methods of estimation of probability distribution and its application in analysis of data. K3: Understanding key of hypothesis testing and its application in practice. K4: Understanding key features of hypothesis testing for categorical data analysis. K5: Understanding uses and common types of non-parametric statistics. S1: Understanding the application of Correlation and Simple Linear Regression in the analysis of data in health and biological sciences. S2: Understanding the application of One-Way Analysis of Variance (ANOVA)	1. Practical and different problem solving in the field of health science. 2. First, second and final Exams.

program SPSS, its use in the analysis of data in performing researches and thesis, regarding methodologies and analysis of data.			C1: Understanding the fundamental principles of biostatistics and its importance in practical field. C2: Understand the principles and application of SPSS ant its use in the analysis of data.	
To offer students optimal educational and training opportunities to prepare them for successful application of biostatistics in the field of health and science. In addition, to ensure a thorough understanding of different	SP3: Analyze and interpret laboratory data, assess samples, and apply software tools commonly used in medical laboratory science		K3: Communicating effectively using appropriate conventions and language relevant to biostatistics. S1: Developing problem-solving and analytical thinking skills S3: Understanding and applying statistical methods in the analysis and interpretation of data used in research and thesis. C2: Demonstrating technical skills and ability to perform different biostatistical tests.	

statistical methodologies used and their applications.				
Foster creation and advance methods and test in biostatistics to enhance students to update their knowledge and comprehension and application.	SP1: Critically evaluate scientific research in medical biology and health sciences, collaborate with peers, communicate effectively, manage tasks independently, and solve problems while considering various factors. CP3: Utilize data analysis methods and software tools to interpret diverse data sets, engage in critical thinking, question information, test hypotheses, and propose solutions while considering ethical and social implications in medical research and science.			
To emphasize collaboration in developing effective biostatistical solutions for health problems by analyzing different types of data and implementin	SP2: Communicate proficiently with diverse groups to advocate for the importance of accurate biostatistics and demonstrate proficiency in hypothesis testing skills.		S2: Understanding the application of biostatistics in medical and health sciences C1: Understanding the fundamental principles of biostatistics. C2: Applying biostatistics in clinical practice and decision-making C3: Demonstrating technical skills and ability to perform different biostatistical tests	

g it in practice.				

* يتم تعديلها وفقا لما يتم تحديده لكل مساق بالتنسيق مع الكلية والقسم المعني

ACADEMIC SUPPORT

It is The Hashemite University policy to provide educational opportunities that ensure fair, appropriate and reasonable accommodation to students who have disabilities that may affect their ability to participate in course activities or meet course requirements. Students with disabilities are encouraged to contact their instructor to ensure that their individual needs are met. The University through its Special Need section will exert all efforts to accommodate for individual's needs.
Special Needs Section: Department chair (Dr. Loai Alanagreh)
Tel: 5596,5368
Location: L2-Applied medical science faculty
Email: loai-alanagreh@hu.edu.jo

COURSE REGULATIONS

Participation
Class participation and attendance are important elements of every student's learning experience at The Hashemite University, and the student is expected to attend all classes. A student should not miss more than 15% of the classes during a semester. *Those exceeding this limit of 15% will receive a failing grade regardless of their performance*. It is a student's responsibility to monitor the frequency of their own absences. **Attendance record begins on the first day of class irrespective of the period allotted to drop/add and late registration. It is a student's responsibility to sign-in; failure to do so will result in non-attendance being recorded.**

In exceptional cases, the student, with the instructor's prior permission, could be exempted from attending a class provided that the number of such occasions does not exceed the limit allowed by the University. The instructor will determine the acceptability of an absence for being absent. A student who misses more than 25% of classes and has a valid excuse for being absent will be allowed to withdraw from the course.

Plagiarism
Plagiarism is considered a serious academic offence and can result in your work losing marks or being failed. HU expects its students to adopt and abide by the highest standards of conduct in their interaction with their professors, peers, and the wider University community. As such, a student is expected not to engage in behaviors that compromise his/her own integrity as well as that of the Hashemite University.

Plagiarism includes the following examples, and it applies to all student assignments or submitted work:

- **Use of the work, ideas, images or words of someone else without his/her permission or reference to them.**
- **Use of someone else's wording, name, phrase, sentence, paragraph or essay without using quotation marks.**

- **Misrepresentation of the sources that were used.**

<u>The instructor has the right to fail the coursework or deduct marks where plagiarism is detected</u>

Late or Missed Assignments

In all cases of assessment, students who fails to attend an exam, class project or deliver a presentation on the scheduled date without prior permission, and/or are unable to provide a medical note, will automatically receive a fail grade for this part of the assessment.

- Submitting a term paper on time is a key part of the assessment process. Students who fail to submit their work by the deadline specified will automatically receive a 10% penalty. Assignments handed in more than 24 hours late will receive a further 10% penalty. Each subsequent 24 hours will result in a further 10% penalty.
- In cases where a student misses an assessment on account of a medical reason or with prior permission; in line with University regulations an incomplete grade for the specific assessment will be awarded and an alternative assessment or extension can be arranged.

Student Complaints Policy
Students at The Hashemite University have the right to pursue complaints related to faculty, staff, and other students. The nature of the complaints may be either academic or non-academic. For more information about the policy and processes related to this policy, you may refer to the students' handbook.

COURSE ASSESSMENT

Course Calendar and Assessment

Students will be graded through the following means of assessment and their final grade will be calculated from the forms of assessment listed below with their grade weighting taken into account. The criteria for grading are listed at the end of the syllabus

Assessment	Grade Weighting	Deadline Assessment
Exam 1	30%	10/11/2024 at 9.30
Exam 2	30%	15/12/2024 at 9.30
Final Exam	40%	12/1/2025 at 10.00

Description of Exams

Test questions will predominately come from material presented in the lectures. Semester exams will be conducted during the regularly scheduled lecture period. Exam will consist of a combination of multiple choice, short answer, match, true and false and/or descriptive questions.
Homework: Will be given for each chapter, while the chapter in progress you are supposed to work on them continuously and submit in next lecture when I finish the chapter.
You are also expected to work on in-chapter examples, self-tests and representative number of ends of chapter problems. The answers of self-tests and end of chapter exercises are given at the end of the book.

Quizzes: Unannounced quizzes will be given during or/and at the end of each chapter based upon the previous lectures. It will ensure that you come prepared to the class.

No make-up exams, homework or quizzes will be given. Only documented absences will be considered as per HU guidelines.

Grades are not negotiable and are awarded according to the following criteria*:

Letter Grade	Description	Grade Points
A +	Excellent	4.00
A		3.75
A -		3.50
B +	Very Good	3.25
B		3.00
B -		2.75
C+	Good	2.50
C		2.25
C -		2.00
D+	Pass	1.75
D	Pass	1.50
F	Fail	0.00
I	Incomplete	-

WEEKLY LECTURE SCHEDULE AND CONTENT DISTRIBUTION

"Lecture hours and weeks are approximate and may change as needed"

Week	**Date**	**Topic**
1	**6/10/2024**	**Introduction** - Course orientation. - Introduction to biostatistics and medical statistics: • definition, • Importance of statistics in Medicine and Biology • Uses of statistics • Why study statistics? • Sources of data • Types of variables (qualitative and quantitative variables) with examples • descriptive statistics and inferential statistics with examples • Practical
2	**13/10/2024**	**Data Summarization" Presentation"** - **Methods of presentation of data** • **Graphical presentation** - Bar diagram - histogram - Frequency polygon and F. curve - Scatter-plot (diagram) - Component bar chart (stacked bar chart) - Pie diagram - Box plots (Box and Whisker Diagram • **Tabular presentation** - Frequency Distribution Table
3	**20/10/2024**	**Data Summarization** **- Measurements of central tendency** • Arithmetic mean • Median • Mode

		• Geometric mean • Weighted mean - **Practical**
4	**27/l0/2024**	**Data Summarization** - **Measures of variation, dispersion** • Range • Variance • Standard deviation • Coefficient of Variation • Standard error - **Practical**
5	**3/11/2024**	- **Practical Revision**
6	**10/11/2024**	**First Exam**
7	**17/11/2024**	**Probability distribution.** - Rules of probability - Normal distribution curve - Z value and standard normal distribution - Other types of distribution - Skewed data **Sampling** - Types of probability sampling - Types of non-probability sampling - Factors affecting sample size - Problems of sampling: bias.
8	**24/11/2024**	**Hypothesis Testing** - The concept and steps of hypothesis testing. - Null and alternative hypothesis. - P- value and significance level**.** - Types of errors in hypothesis testing. - The power of the test. - One-tailed and two-tailed test **Confidence interval** - The concept of confidence interval - Factors affecting confidence interval - Calculation of confidence interval and the use of SPSS for its interpretation
9	**1/12/2024**	**T test** - The definition and uses of t- test. - Tests of normality.

		- 1- sample t- test, - 2- sample t- test, - Paired t- test - Application of t-tests by SPSS.
10	**8/12/2024**	**Analysis of Variance** - One way ANOVA definition and uses. - Levene test for homogeneity of variances - Post-hoc Test - Application of one-way ANOVA by SPSS - Interpretation of the results. - Repeated measures ANOVA.
11	**15/12/2024**	**Second Exam**
12	**22/12/2024**	**Hypothesis Testing: Categorical Data** - Pearson's chi-square test • Concept and uses. • Expected and observed frequencies. • Assumptions. • Application by SPSS. - Fisher's exact test - The Chi-Square Test for Goodness of Fit - McNemar's test • Concept and uses. • Application by SPSS.
13	**29/12/2012**	**Nonparametric Statistics** - The concept of Nonparametric Statistics - Examples of Nonparametric tests and their uses: • Sign test • Wilcoxon Signed Rank test • Friedman test • Mann-Whitney U test • Kruskal-Wallis test - Application of non-parametric tests by SPSS - Interpreting and graphing the results
14	**5/1/2025**	**Correlation and Regression** - Definition of correlation and simple linear regression - Pearson's correlation uses - Spearman's correlation uses - Types of correlation plots - Correlation coefficient interpretation - Simple linear regression equation

		- Coefficient of determination interpretation - Application on SPSS program
12/1/2024		**<u>Final exam</u>**

- يمكن اجراء التعديلات المناسبة حسب طبيعة المقرر وبالتنسيق مع الكلية المعنية وتحديد أنواع التعلم بوضوح (الكتروني، مدمج، وجاهي) ونماذج التعلم (نسبة التعلم الوجاهي الى الألكتروني ونسبة التعلم المتزامن الى غير المتزامن) التي سوف يتم اتباعها أثناء تدريس المساقات وبما يتوائم مع نسب الادماج المشار اليها في كتاب مجلس التعليم العالي رقم مع/.1427 .