بسم الله الرحمن الرحيم

جامعة آل البيت

College of Science
Department of Mathematics
Course syllabus: Bio-Statistics
First semester 2019/2020

1. Instructor Information:

Instructor Name	Loai AlZoubi	
Office Hours	Sunday ,Tuesday, Thursday	١:٠٠-١٢:٠٠
	Monday, Wednesday	11:00-12:30
Office Number and Telephone Extension	51 Bukhary	
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2. Course Description:

Descriptive statistics: measures of location (mean, median, mode, percentile, and quartiles), measures of variability (range, interquartile range, variance, standard deviation, and coefficient of variation); probability , experiments, counting rules, combinations, permutations, assigning probabilities; events and their probabilities; some basic relationships of probability, complement of an event, addition law; conditional probability, independent events, multiplication law; discrete probability distribution, random variables, discrete random variables, continuous random variables; discrete probability distributions; expected value and variance; binomial probability distribution, a binomial experiment, expected value and variance for the binomial distribution; Poisson probability distribution; continues probability distributions, uniform probability distribution, normal curve, standard normal probability distribution, computing probabilities for any normal distribution; exponential probability distribution, computing probabilities for the exponential distribution, relation between poisson and exponential distributions; sampling distributions, point estimation, sampling distribution of $\bar{X}$, expected value of $\bar{X}$, standard deviation of $\bar{X}$; interval estimation (when the population mean σ is known and when it is unknown); hypothesis tests, developing null and alternative hypothesis, hypothesis testing and decision making (when the population mean σ is known and when it is unknown); Simple linear regression model, least squares method, coefficient of determination, using the estimated regression equation for estimation and prediction.

3. Course Information:

Course number: 401235	Course Title: Bio-Statistics	Level : Second year
Course Nature: Theoretical	Prerequisite: None	Lecture time: Sun. Tue. Thu. 2:00-3:00 Mon. Wed. 9:30-11:00
Academic year: 2019 – 2020	Semester: First	Credit Hours: 3

4. Course Objectives:

Main concepts of statistical methods are numerical measures, probability, interval estimation, hypothesis tests, and linear regression. Knowledge and the ability to work with these concepts is essential for further studies of mathematical and statistical subjects, as well as for applications of statistical techniques in other sciences. This course will focus on understanding statistics concepts, analytical reasoning and developing crucial skills in order to calculate, analyze, interpret and communicate the results clearly. Specific course learning objectives are listed below:

1. Calculate and interoperate the numerical measures for a data set.
2. Learn the concepts of probability and its calculation rules.
3. Learn to calculate the probability under any given probability distribution.
4. Learn to use the standard normal cumulative distribution table to calculate probabilities for any normal distribution.
5. Apply the concept of interval estimation to estimate the true population mean μ.
6. Learn about three type of hypothesis testing.
7.Write the linear regression equation.
8. Learn to use linear regression equation to make prediction about future data value.

5. Intended Student Learning Outcomes:

Successful completion of the course should lead to the following outcomes:
1. **Knowledge and Understanding Skills:**   Student is expected to
   1.1. Calculate the numerical measures.
   1.2. Identify sample space and events for a given experiment.
   1.3. Differentiate and calculate various types of counting rules.
   1.4. Differentiate between discrete random variable and continues random variable.
   1.5. Differentiate various types of probability distributions.
   1.6. Use correctly probability rules to calculate probabilities.
   1.7. Apply sampling distribution rule to calculate probability for sample mean $\bar{X}$.
   1.8. Apply interval estimation methods to estimate the true value of the population mean μ.
   1.9. Apply hypothesis testing to make a decision in real world problems.
2. **Intellectual Analytical and Cognitive Skills:** Student is expected to
   2.1. Students should be able to use statistical formulas as well as calculator to solve real world problems.
3. **Subject- Specific Skills:** Student is expected to
   3.1. Perform Hypothesis testing determine whether accept the null hypothesis or not.
   3.2. Predicate future data for a model using the linear regression equation.
4. **Creativity /Transferable Key Skills/Evaluation:** Student is expected to
   4.1. Use statistical formulas and statistical structures to model and solve real world problems.
   4.2. Choose the correct use of quantifiable measurements of real world situations.

6. Course Content:

Week	Chapter	Subject	Pages and Assignments
1+2	Chapter 2 Descriptive Statistics	2.2 Measures of Location 2.4 Measures of Spread 2.8 Graphic Methods	5-41 end of sections exercise
3+4	Chapter 3 Probability	3.1 Introduction 3.2 Definition of Probability 3.3 Some Useful Probabilistic Notation 3.4 The Multiplication Law of Probability 3.5 The Addition Law of Probability 3.6 Conditional Probability	42-76 end of sections exercise
5+6	Chapter 4 Discrete Probability Distributions	4.1 Introduction 4.2 Random Variables 4.3 The Probability-Mass Function for a Discrete Random Variable 4.4 The Expected Value of a Discrete Random Variable 4.5 The Variance of a Discrete Random Variable 4.6 The Cumulative-Distribution Function of a Discrete Random Variable 4.7 Permutations and Combinations 4.8 The Binomial Distribution 4.9 Expected Value and Variance of the Binomial Distribution 4.10 The Poisson Distribution 4.11 Computation of Poisson Probabilities	77 – 114 end of sections exercise
7+8	Chapter 5	5.1 Introduction	115-133

		5.2 General Concepts 5.3 The Normal Distribution 5.4 Properties of the Standard Normal Distribution 5.5 Conversion from an N ($\mu,\sigma2$) Distribution to an N (0,1) Distribution 5.6 Linear Combinations of Random Variables	end of sections exercise
	Continuous Probability Distributions		
9	<u>Chapter 6</u> Estimation	6.1 Introduction 6.5 Estimation of the Mean of a Distribution 6.10 Confidence Intervals	154-199 end of sections exercise
10	<u>Chapter 7</u> Hypothesis Testing: One-Sample Inference	7.3 One-Sample Test for the Mean of a Normal Distribution	214-222 end of sections exercise
11+12 +13	<u>Chapter 8</u> Hypothesis Testing: Two-Sample Inference	8.1 Introduction 8.2 The Paired t Test 8.3 Interval Estimation for the Comparison of Means from Two Paired Samples 8.4 Two-Sample t Test for Independent Samples with Equal Variances 8.5 Interval Estimation for the Comparison of Means from Two Independent Samples (Equal Variance Case) 8.6 Testing for the Equality of Two Variances 8.7 Two-Sample t Test for Independent Samples with Unequal Variances /	279-308 end of sections exercise
14+15	<u>Chapter 10</u> Hypothesis Testing: Categorical Data	10.1 Introduction 10.2 Two-Sample Test for Binomial Proportions 0.3 Fisher's Exact Test 10.6 R $\times$ C Contingency 10.7 Chi-Square Goodness-of-Fit Test	372-431 end of sections exercise
15+16	<u>Chapter 11</u> Regression and Correlation Methods	11.3 Fitting Regression Lines—The Method of Least Squares 11.4 Inferences About Parameters from Regression Lines 11.5 Interval Estimation for Linear Regression 11.6 Assessing the Goodness of Fit of Regression Lines 11.7 The Correlation Coefficient	

7. Teaching and learning Strategies and Evaluation Methods:

Learning Outcomes	Teaching Strategies	learning Strategies	Evaluation Methods
1) Learn the general concept of numerical measures and how to interpret them according their data. 2) Learn the concepts of experiment, sample space, events, and counting rules and their role in calculating probabilities.	- Writing on the blackboard - Ask students questions and discuss them - Solve various issues	Give: * homework * assignments	- Classroom presentations - Discussion - First exam
1) Learn the concepts of discrete random variables and continuous random variables and how to calculate their expectation, variance and probabilities. 2) Learn to calculate probabilities for various type of probability distribution. 3) Learn the concepts of sampling distribution and use it in real world problem.	- Writing on the blackboard - Ask students questions and discuss them - Solve various issues	Give: * homework * assignments	- Classroom presentations - Discussion - Second exam
1) Learn about interval estimation and its applications. 2) Learn to use concept of hypothesis test and solve real world problems. 3) Learn to use concept of linear regression to make predication about future data.	- Writing on the blackboard - Ask students questions and discuss them - Solve various issues	Give: * homework * assignments	- Classroom presentations - Discussion - Final exam

8. Assessment:

Assessment	Grade Proportion	Week/Dates
Class Work (Quizzes, Homework and Attendance of the lecture)		
First exam	**25 %**	**7th Week**
Second exam	**25 %**	**12th Week**
Final exam	**50 %**	**End of Semester**
Total	**100 %**	

9. Text Book:

The main reference	Fundamentals of Biostatistics
Author(s)	Bernard Rosner
Publisher	Cengage Learning
Year	2016
The edition	8th edition
The reference website	http://galaxy.ustc.edu.cn:30803/zhangwen/Biostatistics/Fundamentals+of+Biostatistics+8th+edition.pdf

10. References and additional resources:

1)	Larry Winner, Introduction to Biostatistics, 2004, http://users.stat.ufl.edu/~winner/sta6934/st4170_int.pdf
2)	Chap T. Le, Introductory Biostatistics, 2003, http://www.hstathome.com/tjziyuan/Introductory%20Biostatistics%20Le%20C.T.%20%20(Wiley,%202003)(T)(551s).pdf