



College of Science  
Department of Mathematics  
Course syllabus: Statistical Methods  
First semester 2019/2020

1. Instructor Information:

Instructor Name	Loai Alzoubi	
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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; continuous probability distributions, 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  $\sigma$  is known and when it is unknown); hypothesis tests, developing null and alternative hypothesis, hypothesis testing and decision making (when the population mean  $\sigma$  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: 401233	Course Title: Probability and Statistics	Level : Second year
Course Nature: Theoretical	Prerequisite: None	Lecture time: 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 $\mu$ .
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  $\mu$ .
  - 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+3	<u>Chapter 3</u> Descriptive Statistics: Numerical Measures	3.1 Measures of location 3.2 Measures of variability	86 – 100  end of sections exercise
3+4+5	<u>Chapter 4</u> Introduction to Probability	4.1 Experiments, counting rules, and assigning probabilities 4.2 Events and their probabilities 4.3 Some basic relationships of probability 4.4 Conditional probability	150 – 178  end of sections exercise
6+7+8 +9	<u>Chapter 5</u> Discrete Probability Distributions	5.1 Random variables 5.2 Discrete probability distributions 5.3 Expected value and variance 5.4 Binomial probability distribution 5.5 Poisson probability distribution	194 – 220  end of sections exercise
9+10+ 11	<u>Chapter 6</u> Continuous Probability Distributions	6.2 Normal probability distribution 6.4 Exponential probability distribution	234 – 255  end of sections exercise
12	<u>Chapter 7</u> Sampling and Sampling Distributions	7.3 Point estimation 7.4 Introduction to sampling distribution 7.5 Sampling distribution of $\bar{X}$	273 – 286  end of sections exercise
13	<u>Chapter 8</u> Interval Estimation	8.1 Population mean: $\sigma$ known 8.2 Population mean: $\sigma$ unknown	309 – 322  end of sections exercise
14+15	<u>Chapter 9</u> Hypothesis Tests	9.1 Developing null and alternative hypothesis 9.3 Population mean: $\sigma$ known 9.4 Population mean: $\sigma$ unknown 9.6 Hypothesis testing and decision making	350 – 385  end of sections exercise
15+16	<u>Chapter 14</u> Simple Linear Regression	14.1 Simple linear regression model 14.2 Least squares method 14.3 Coefficient of determination 14.6 Using the estimated regression equation for estimation and prediction	600 – 632  end of sections exercise

## 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
<b>Class Work (Quizzes, Homework and Attendance of the lecture)</b>		
<b>First exam</b>	<b>25 %</b>	<b>7<sup>th</sup> Week</b>
<b>Second exam</b>	<b>25 %</b>	<b>12<sup>th</sup> Week</b>
<b>Final exam</b>	<b>50 %</b>	<b>End of Semester</b>
<b>Total</b>	<b>100 %</b>	

## 9. Text Book:

<b>The main reference</b>	Statistics for Business and Economics
<b>Author(s)</b>	David R. Anderson, Dennis J. Sweeney, and Thomas A. Williams
<b>Publisher</b>	South-Western College pub.
<b>Year</b>	2005
<b>The edition</b>	9th edition
<b>The reference website</b>	<a href="https://www.amazon.com/Statistics-Business-Economics-Ninth-Anderson/dp/0324380259">https://www.amazon.com/Statistics-Business-Economics-Ninth-Anderson/dp/0324380259</a>

## 10. References and additional resources:

1)	David M. Lane, Introduction to Statistics (online edition) <a href="https://onlinestatbook.com/Online_Statistics_Education.pdf">https://onlinestatbook.com/Online_Statistics_Education.pdf</a>
2)	Narayan C. Giri, Introduction to Probability and Statistics (2nd Edition)