

College of Science
Department of Mathematics
Course syllabus: Introduction in Applied Statistics
First semester 2019/2020

1. Instructor Information:

Instructor Name	Ayat Al-Meanazel		
Office Hours	Sunday ,Tuesday, Thursday	11:00 – 10:00	
	Monday, Wednesday	10:00 – 9:00	
Office Number and Telephone Extension	57 Bukary		
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2. Course Description:

Data , elements, variables, observations, scales measurement, categorical data, quantitative data ; data sources, observational study, experiment ; descriptive statistics: summarizing data for categorical variable, summarizing data for quantitative variable; descriptive statistics: measures of location (mean, median, mode, percentile, and quartiles), measures of variability (range, interquartile range, variance, standard deviation, and coefficient of variation), measures of distribution shape, relative location and detecting outliers, z-scores, five number summaries, box plot, measures of association between two variables, correlation, interpretation of the correlation coefficient; 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: 401238	Course Title: Introduction in Applied Statistics	Level : Second year
Course Nature: Applied and Theoretical	Prerequisite: None	Lecture time: Mon. Wed 12:30 – 14:00
Academic year: 2019 – 2020	Semester: First	Credit Hours: 3

4. Course Objectives:

Main concepts of statistical methods are descriptive statistics (tabular, graphical, and numerical representation) , 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. Learn the concepts of data.
2. Learn the difference between categorical data and quantitative data.
3. Represent data graphically and numerically.
4. Calculate and interoperate the numerical measures for a data set.
5. Learn the concepts of probability and its calculation rules.
6. Learn to calculate the probability under any given probability distribution.
7. Learn to use the standard normal cumulative distribution table to calculate probabilities for any normal distribution.

8. Apply the concept of interval estimation to estimate the true population mean μ .
9. Learn about three type of hypothesis testing.
10. Write the linear regression equation.
11. Learn to use linear regression equation to make prediction about future data value.

12. 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. Represent data graphically and numerically.
 - 1.2. Calculate the numerical measures for a data.
 - 1.3. Identify the shape of the data distribution.
 - 1.4. Identify sample space and events for a given experiment.
 - 1.5. Differentiate and calculate various types of counting rules.
 - 1.6. Differentiate between discrete random variable and continues random variable.
 - 1.7. Differentiate various types of probability distributions.
 - 1.8. Use correctly probability rules to calculate probabilities.
 - 1.9. Apply sampling distribution rule to calculate probability for sample mean \bar{x} .
 - 1.10. Apply interval estimation methods to estimate the true value of the population mean μ .
 - 1.11. 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 summarize and represent data based on the type of data.
 - 2.2. 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. Represent and summarize data of real world studies.
 - 3.2. Perform Hypothesis testing determine whether accept the null hypothesis or not.
 - 3.3. 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.

13. Course Content:

Week	Chapter	Subject	Pages and Assignments
1	<u>Chapter 1</u> Data and Statistics	1.2 Data 5 1.3 Data sources	5 – 13 end of sections exercise
2	<u>Chapter 2</u> Descriptive Statistics: Tabular and Graphical Displays	2.1 Summarizing data for a categorical variable 2.2 Summarizing data for a quantitative variable	34 – 54 end of sections exercise
3+4	<u>Chapter 3</u> Descriptive Statistics: Numerical Measures	3.1 Measures of location 3.2 Measures of variability 3.3 Measures of distribution shape, relative location, and detecting outliers 3.4 Five number summaries and box plot 3.5 Measures of association between two variables	86 – 121 & 125& 130 – 134 end of sections exercise
5+6+7	<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
8+9+10	<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

11+12	<u>Chapter 6</u> Continuous Probability Distributions	6.1 Uniform probability distribution 6.2 Normal probability distribution 6.4 Exponential probability distribution	234 – 255 end of sections exercise
13	<u>Chapter 7</u> Sampling and Sampling Distributions	7.4 Introduction to sampling distribution 7.5 Sampling distribution of \bar{x}	271 – 286 end of sections exercise
13	<u>Chapter 8</u> Interval Estimation	8.1 Population mean: σ known 8.2 Population mean: σ unknown	309 – 322 end of sections exercise
14	<u>Chapter 9</u> Hypothesis Tests	9.1 Developing null and alternative hypothesis 9.3 Population mean: σ known 9.4 Population mean: σ 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

14. Teaching and learning Strategies and Evaluation Methods:

Learning Outcomes	Teaching Strategies	learning Strategies	Evaluation Methods
1) Learn the concept of data and data summarizing both graphically and numerically. 3) Learn to identify the shape of the data distribution. 3) Learn the general concept of numerical measures and how to interpret them according their data. 4) 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

15. Assessment:

Assessment	Grade Proportion	Week/Dates
Class Work (Quizzes, Homework and Attendance of the lecture)	10 %	
First exam	20 %	7th Week
Second exam	20 %	12th Week
Final exam	50 %	End of Semester
Total	100 %	

16. Text Book:

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

17. References and additional resources:

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