

Ministry of Higher Education and Scientific research



**Department of Statistics & Informatics**

**College of Administration and Economics**

**University of Salahaddin -Erbil**

**Subject: Applied Statistics (Elective)**

**Course Book: Higher Diploma (1<sup>st</sup> semester)**

**Lecturer's Name: Dr. Drakhshan Jalal Hassan**

**Academic Year: 2023 - 2024**

# Course Book

<b>1. Course name</b>	Applied Statistics
<b>2. Lecturer in charge</b>	Dr. Drakhshan Jalal Hassan
<b>3. Department/ College</b>	Statistics & Informatics /College of Administration and Economics
<b>4. Contact</b>	e-mail: drakhshan.hassan@su.edu.krd Mobile:07504902074
<b>5. Time (in hours) per week</b>	Theory: (2 hours) Practical: (0)
<b>6. Office hours</b>	Thursday 2:30 PM to 4:30 PM
<b>7. Course code</b>	
<b>8. Teacher's academic profile</b>	I graduated from Salahaddin University-Erbil in 2003 in College of Administration & Economics Statistics department.in 2011, I had master's degree in Statistics from the same university, and I start as assistant lecturer teaching in Statistics department teaching Principle of Statistics, Computer Applications, Operation Research and supervising BSc. students. From 2018, my scientific level changes to lecture, after that I accepted in the PhD in the same college. In 2023, my scientific level changes to assistant professor. Now I am teaching Stochastic Process in the same department.
<b>9. Keywords</b>	probability theory, Sampling and Estimation, Simple Linear Regression, Correlation, Testing Statistical Hypothesis
<b>10. Course overview:</b>	<p>And with the knowledge gained on how to best learn from this data in the Applied Statistics program, you'll be able to choose to work in a variety of fields — engineering, environment, finance, healthcare, government, retail, social sciences and more.</p> <p>Applied Statistics includes planning for the collection of data, managing data, analyzing, interpreting and drawing conclusions from data, and identifying problems, solutions and opportunities using the</p>

analysis.

This major builds critical thinking and problem solving skills in data analysis and empirical research. In addition to career goals, it will prepare you for advanced degree programs in statistics and quantitative fields.

This course includes all information about probability theory, types of random samples, point and interval estimation, simple linear regression models, correlation and basic concepts of statistical hypothesis testing.

### **11. Course objective:**

- 1) By the end of this course you must:
- 2) Be able to discuss and explain what applied statistics is and how it is used in all fields
- 3) Be able to understand common statistical techniques and terminology
- 4) Be able to use and understand key numerical and graphical techniques to present and summarize data
- 5) Be able to understand the basic principles of probability theory.
- 6) Identify common probability distributions used in statistical inference
- 7) Being able to know what it means to draw a random sample from a population and why it is important
- 8) Identify the most commonly used random sampling.
- 9) Learn about the concept of statistical inference.
- 10) Be able to estimate the value of various population parameters from a sample of data
- 11) Be able to test the hypothesis that the value of a population parameter is equal to a certain value.

This may seem like a lot, but these goals are achievable for any student who puts forth a reasonable effort in this course. It won't take super human effort, just a desire to learn, a desire to participate regularly, and a dedication to completing all tasks in a timely manner.

### **12. Student's obligation**

Students are expected to:

- ❖ Follow university policies when attending class and lab, and taking sudden quizzes and exams.
- ❖ Student should be proud of the work that he/she do in this class. Do not allow someone else to copy your homework and do not provide answers to quizzes or tests. If this does occur, credit will be lost and a referral will be written.

### **13. Forms of teaching**

The focus will be on some forms of teaching such as classical teaching with PowerPoint presentations for the head titles, whiteboard, definitions and summary of conclusions,

classification of materials and any other illustrations, solving the examples by sharing the students to get them will understand, and students should participate as much as possible in lecture's discussions.

#### 14. Assessment scheme

During the academic semester the exam is closed book. There for I grade will be based upon the following criteria:

Midterm Exam :20%

HW, quizzes, interactive activities: 30%

Final Exam : 50%

#### 15. Student learning outcome:

After the completion of this course in this academic semester, the students will be able to do the following:

- Appreciate the range of Applied Statistics;
- Collect, organize, summarize and analyze data;
- Test statistical hypothesis concerning population means, populations' proportions, and populations' variance;

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#### 16. Course Reading List and References:

- 1) Crewson, Philip E. (2016). Applied statistics iBook. NJ: Wiley.
- 2) Rasch , Dieter ; Verdooren, Rob ; Pilz, Jürgen (2019). Applied Statistics: Theory and Problem Solutions with R. Wiley. New York.
- 3) Sachs, Lothar (1984). Applied Statistics: A Handbook of Techniques. Second Edition, Springer-Verlag, New York.
- 4) Gupta,S.C. ; Kapoor, V.K. (2014). Fundamentals of Applied Statistics. Fourth Edition, SultanChand & Sons.
- 5) Johnson, R.A. and G.K. Bhattacharyya, Statistics: Principles and Methods. (New York: John Wiley and Sons, 2010) sixth edition.

#### 17. The Topics:

#### Lecturer's name

1) introduction and overview of the course. Some principles of applied

Dr. Drakhshan Jalal Hassan  
Two hours a week

statistics.

- 2) Basic concepts on probability theory
- 3) Expected Value and Variance of a Random Variable
- 4) Some Discrete Probability Distributions
- 5) Sampling and Estimation
- 6) point Estimation
- 7) Interval Estimation
- 8) Simple Linear Regression Models
- 9) Hypothesis Testing in Regression Analysis
- 10) Confidence Intervals and Tests
- 11) Correlation
- 12) Fundamental Concepts Testing Statistical Hypothesis
- 13) Hypothesis Testing about One Proportion
- 14) Hypothesis Testing about One Mean
- 15) Hypothesis Testing about One Variance

**18. Examinations:**

- I. A population size of 10000 individuals consists of 4-layer size, respectively (1000, 3500, 4000, 1500) individuals. A sample size of 400 individuals is to be drawn from this population. How is this done?

$$N=10000, n=400$$

$$N_1=1000, N_2=3500, N_3=4000, N_4=1500$$

$$W_h = \frac{N_h}{N}$$

$$W_1 = \frac{N_1}{N} = \frac{1000}{10000} = 0.1$$

$$W_2 = \frac{N_2}{N} = \frac{3500}{10000} = 0.35$$

$$W_3 = \frac{N_3}{N} = \frac{4000}{10000} = 0.4$$

$$W_4 = \frac{N_4}{N} = \frac{1500}{10000} = 0.15$$

$$n_1 = W_1 * n = 0.1 * 400 = 40$$

$$n_2 = W_2 * n = 0.35 * 400 = 140$$

$$n_3 = W_3 * n = 0.4 * 400 = 160$$

$$n_4 = W_4 * n = 0.15 * 400 = 60$$

$$40+140+160+60=400$$

- II. Human beings vary in the time it takes them to respond to driving hazards. In one experiment in which 100 healthy adults between age 21 and 30 years were subjected to a certain driving hazard, and the sample variance of the observed times it took them to respond was 0.0196 second squared. Assuming that the times to respond are normally distributed, estimate the variability in the time response of the given age group using a 95% C.I.

**Solution:** The confidence level is 0.95, so that  $\frac{\alpha}{2} = 0.025$ . Reading the  $\chi^2$ - Table with  $100-1=99$  degrees of freedom we find that  $C_{0.025}^2 = 128.45$ ,  $C_{0.975}^2 = 128.45$  Substituting in the C.I. for  $\sigma^2$  we obtain the following interval.

$$0.0151 < \sigma^2 < 0.0265$$

Moreover the 95% C.I. on  $\sigma$  is given by

$$0.123 < \sigma < 0.163$$

### 19 Extra notes

If any student cannot make it to an in-class exam due to a documentable reason, please let me know as soon as possible. Makeup will not be allowed for home works. However, I will double count student's future graded assignments in the cases of excused absences.

### 20. Peer review