



**Department of Mathematics**

**College of Basic Education**

**Salahaddin University- Erbil**

**Subject:** *Probability*

**Course Book** –*Second Stage – Second Semester*

**Lecturer's name:** *Dr. Dler Mustafa KHIDHR*

**Academic Year:** *2022-2023*

# Course Book

<b>1. Course name</b>	<b>Statistics</b>
<b>2. Lecturer in charge</b>	<b>Dr DLER MUSTAFA KHIDHR</b>
<b>3. Department/ College</b>	<b>Mathematics/ Basic Education</b>
<b>4. Contact</b>	<b>e-mail: dler.khidhr@su.edu.krd</b>
<b>5. Time (in hours) per week</b>	<b>Theory: 4</b>
<b>6. Office hours</b>	<b>4 hours in week</b>
<b>7. Course code</b>	
<b>8. Teacher's academic profile</b>	<p><b>I graduated from Salahaddin university – Hawler in 2002 college of administration &amp; Economic \ Statistics Department. From 2003, I am working in Salahaddin Uni. In 2007 I achieved a Master's degree in the Department of Statistics college of Science of computer and mathematics, University of Mosul.</b></p> <p><b>I have got PhD in Applied Statistics in February 2020 In University of Sheffield-UK. I studied the first stage students Principles of Statistics at the Department of Mathematics department and through these years supervised Research on the graduation for students of the fourth stage in the Department of Statistics, and, so far, I am working as an assistant teacher in the Department of Mathematics.</b></p>
<b>9. Keywords</b>	<b>Method of counting method of probability, random variable, statistical distributions and among others.</b>
<b>10. Course overview:</b>	<p>Probability is the most important conception modern science, especially as nobody has the slightest notion what it means. Most people have some vague idea about what probability of an event means. The interpretation of the word probability involves Synonyms such as chance, odds, uncertainty, prevalence, risk, expectancy etc. There are many distinct interpretations of the word probability. A completed is cussion of these interpretations will take us to areas such as philosophy, theory of algorithm and randomness, religion, etc. Thus, we will only focus on two extreme interpretations. One interpretation due to the so-called objective school and the other is due to the subjective school.</p> <p>Probability theory provides a mathematical foundation to concepts such as “probability”, “information”, “belief”, “uncertainty”, “confidence”, “randomness”, “vari-</p>

Ability", "chance" and "risk". Probability theory is important to empirical scientists because it gives them a rational framework to make inferences and test hypotheses based on uncertain empirical data. Probability theory is also useful to engineers building systems that have to operate intelligently in an uncertain world. For example, some of the most successful approaches in machine perception (e.g., automatic speech recognition, computer vision) and artificial intelligence are based on probabilistic models. Moreover, probability theory is also proving very valuable as a theoretical framework for scientists trying to understand how the brain works. Many computational neuroscientists think of the brain as a probabilistic computer built with unreliable components, i.e., neurons, and use probability theory as a guiding framework to understand the principles of computation used by the brain.

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

The general purpose of this course is to study the basic concepts of Probability in order to help students understand the value of Probability in acquiring knowledge, so that preparing them with in-depth learning probability, some statistical methods. After taking this course, students will be able to use basic Probability, including techniques of counting, conditional probability, solve mathematical statistics and some distributions, solve probabilistic problems and they will be prepared studying statistical subjects in the 3rd and 4th academic classes. Topics include set theory and techniques of counting and definition of probability, classical probability, conditional of probability and independence, Bayes theorem, random variables, Expectation and variance of random variables, joint and marginal probability distribution, Binomial distribution, Normal distribution, Poisson distribution, with some additional topics that will be identified as the course progress.

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

- **Student readiness is very important to learn and get a note about the lesson because you are amenable to the lesson.**
- **Is not allowed to use a mobile phone in the classroom during the time of lecture until the teacher goes out of the classroom, If you use it, therefore you face legal punishment.**

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

White board and Data show to view the headlines, definitions and tables

### **14. Assessment scheme**

Test 1 = 30+ Quiz

the total = 40

and final exam =60

May be student have some activities and quizzes 5% as part of second exam.

**15. Student learning outcome:**

2. Calculate probabilities by modelling sample spaces, applying rules of the permutations and combinations, multiplicative laws and conditional probability.
3. Construct the probability distribution of a random variable, based on a real-world situation, and use it to compute expectation and variance.
4. Compute probabilities based on practical situations using the binomial and normal distributions.
5. Use the normal distribution to test statistical hypotheses and to compute confidence intervals.
6. Compute correlation coefficient and regression lines.
7. Test for independence of events or of random variables,
8. Compute and interpret conditional probability.
9. Find probability information of a random variable which is defined as a function of another or several other random variables.
10. Above all, thinking widely and make discussion .

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

➤ **Main References:**

- Murray R. Spiegel; John J. Schiller; R. Alu Srinivasan. **Schaum's Outline of Probability and Statistics, Fourth Edition (McGraw-Hill: New York, Chicago, San Francisco, Lisbon, London, Madrid, Mexico City, Milan, New Delhi, San Juan, Seoul, Singapore, Sydney, Toronto, 2013).**
- **Schaum's Outlines Probability, schaum's series**
- Jay L. Devore (**(Probability and Statistics)**) sixth edition

➤ **Secondary References:**

- Douglas C. Montgomery (**(Applied Statistics and Probability for Engineers)**) ,2003, third edition, Arizona Stat University.
- Tebbs, Joshua M., Introductory probability and statistics I, 1st ed.,2004

**17. Subject**

Week	Subject
<b>1</b>	*Set Operations, Finite and Countable sets, Product.
<b>2</b>	*Permutations, Combinations, Binomial Coefficients and theorem, Tree Diagrams.
<b>3</b>	*Sample space and Events, Type of Events, Theorem, Classical Probability.
<b>4</b>	*Conditional Probability, Multiplication Rule, Bayes Theorem.
<b>5-6</b>	Independence.
<b>7-8</b>	*Definition, types of random variables (Discrete and Continuous), The probability density function (p.d.f) for Discrete r.v, Cumulative distribution function (c.d.f) for Discrete r.v, The probability density function (p.d.f) for
<b>9</b>	

<b>10</b>	Continuous r.v, Cumulative distribution function (c.d.f) for Continuous r.v, Mathematical Expectation of the random variables, Variance of Random variables, Moments Generating function (m.g.f) of the random variables, Joint Probability Distribution Function (J.p.d.f), Marginal Probability Distribution Function (m.p.d.f). *Binomial Distribution, Poisson Distribution, Normal Distribution.
<b>11</b>	
<b>12</b>	
<b>13-14</b>	
<b>18. Practical Topics (If there is any)</b>	
<b>19. Examinations:</b>	
<b><u>Some question examples from the previous Exams.</u></b>	
<p>. <b>Compositional:</b>The following are some examples related to compositional questions:</p> <p>1- Tickets numbered 1 to 20 are mixed up and then a ticket is drawn at random. What is the probability that the ticket drawn has a number which is a multiple of 3 or 5?</p> <p>2-A bag contains 2 red, 3 green and 2 blue balls. Two balls are drawn at random. What is the probability that none of the balls drawn is blue?</p> <p>3- In a box, there are 8 red, 7 blue and 6 green balls. One ball is picked up randomly. What is the probability that it is neither red nor green?</p> <p>4-Three unbiased coins are tossed. What is the probability of getting at most two heads?</p> <p>5-What is the probability of getting a sum 9 from two throws of a dice?</p> <p>6-Two dice are thrown simultaneously. What is the probability of getting two numbers whose product is even?</p> <p>7-In a class, there are 15 boys and 10 girls. Three students are selected at random.The probability that 1 girl and 2 boys are selected?</p> <p>8-In a lottery, there are 10 prizes and 25 blanks. A lottery is drawn at random. What is the probability of getting a prize?</p> <p>9-Two dice are tossed. The probability that the total score is a prime number?</p> <p>10-A card is drawn from a pack of 52 cards.The probability of getting a queen of club or a king of heart?</p> <p>11-A bag contains 4 white, 5 red and 6 blue balls. Three balls are drawn at random from the bag. The probability that all of them are red?</p> <p>12-Two cards are drawn together from a pack of 52 cards. The probability that one is a spade and one is a heart?</p> <p>13- What is the probability of selecting a test subject who received a negative test result or lied? Use the chart below:</p>	
<b>20. Extra notes:</b>	
<b>21. Peer review</b>	<b>پیداچونہوہی ھاوہل</b>