Department of Statistics and Informatics

College of Administration and Economics.

University of Salahaddin- Erbil

Subject: Probability Theory.

Course Book : *Higher Diploma (1ˢᵗ Semester)*

Lecturer's name: Dr.Alan Ghafur Rahim

Academic Year: 2023 - 2024

Course Book

1. Course name	**Probability Theory**
2. Lecturer in charge	**Dr. Alan Gh. Rahim**
3. Department/ College	**Department of Statistics & Informatics/ College of Administration and Economics.**
4. Contact	**e-mail:** alan.rahim@su.edu.krd **Tel: (optional)**
5. Time (in hours) per week	**Theory: 2 hours** **Practical: 1**
6. Office hours	**Sunday: 2:30 – 5:30**
7. Course code	
8. Teacher's academic profile	**I was awarded a B.Sc. in Statistics from the University of Salahaddin in 2007. I received a M.Sc. degree in applied statistics at Salahaddin University in 2012. After getting my master's degree I was appointed as an assistant lecturer at the Department of Statistics/Salahaddin University. I finished my PhD degree in applied Statistics in 2022. From 2012 till now I have been working as a lecturer in the Statistics Department – Salahaddin University. I taught a wide range of subjects including Applied Statistics, Principles of Statistics, Probability Theory, Biostatistics, Quality Control, Spss, and Statistical Inference.**
9. Keywords	**Classical Probability, Conditional Probability, Bayes Theorem, Random variable, and Probability Distribution.**

10. Course overview:

 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 cuss ion 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.

Probability theory provides a mathematical foundation to concepts such as "proba-

bility", "information", "belief", "uncertainty", "confidence", "randomness", "vari-

Ability", "chance" and "risk". Probability theory is important to empirical sci-

entists 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 per- ception (e.g., automatic speech recognition, computer vision) and artificial intel- ligence are based on probabilistic models. Moreover probability theory is also proving very valuable as a theoretical framework for scientists trying to under- Stand 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 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
Students are expected to:
❖ Follow university policies when attending class and lab, and taking sudden quizzes and exams.

❖ **Students 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

A course with a large proportion of its teaching taking place in lectures will need to have a high level of essential interest to students to keep them engaged. There are lots of talks about what is a good teaching technique in academic circles, they often come out with different forms such as classical teaching with blackboard, power-point presentations for the head titles and definitions and summary of conclusions, classification of materials, and any other illustrations, students will be asked to prepare reports on probability topics and they should participate as much as possible in lecture's discussions. Also, it is useful to fulfill some seminars by students to encourage them to learn and discuss the subject without a lecturer.

14. Assessment scheme

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

1- Midterm Exam :20%
2- HW, quizzes, interactive activities: 30%
3- Final Exam : 50%

15. Student learning outcome:

Learning outcomes describe the measurable skills, abilities, knowledge or values that students should be able to demonstrate as a result of a completing a course. Statistics and probability are important topics in mathematics education, as they help students develop critical thinking, data analysis, and decision making skills. Teaching probability is finding probabilistic knowledge, pedagogical and technological strategies and materials to engage students in order to:

1. develop critical thinking about the meaning of chance; and,
2. value the importance of applying the concept of probability in real life.

16. Course Reading List and References:

1- Seymour, Lipschutz., Theory and problems of Probability(Schaum's Outline), McGraw-Hill Inc.1974.

2- Tebbs, Joshua M., Introductory probability and statistics I, 1st ed.,2004.

3- Bluman, Allan G., Elementary Statistics (A step by step approach), McGraw-Hill Pub., 8th ed.,2012.

4- Gupta,Parmanand., Business Statistics, 3rd ed., 2008.

5- Mejlbro, Lief., Introduction to Probability(Probability Examples c-1),ventus publishing APS.,2009.

6- Brink , David., Essentials of Statistics (Exercises),ventus publishing APS.,2009.

		Lecturer's name:
17. The Topics:		
	Subject	Dr.Alan Ghafur.
Week 1	• Set Theory	Three hours a week.
Week 2	• permutations	
Week 3	• Combinations.	
Week 4	• Tree Diagrams.	
Week 5	• Classical Probability.	
Week 6	• Conditional Probability.	
Week 7	• Multiplication Rule and Independence.	
Week 8	• Bayes Theorem.	
Week 9	• Random Variables, The probability density function (Discrete and Continuous).	
Week 10	• Mathematical Expectation and Variance of the random variables.	
Week 11	• Joint Probability Distribution Function	
Week 12	• Marginal Probability Distribution Function	
Week 13	• Binomial Distribution.	
Week 14	• Poisson Distribution.	
Week 15	• Normal Distribution.	

18. Practical Topics (If there is any)

In this section The lecturer shall write titles of all practical topics he/she is going to give during the term. This also includes a brief description of the objectives of each topic, date and time of the lecture.

19. Examinations:

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?

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?

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?

4-Three unbiased coins are tossed. What is the probability of getting at most two heads?

5-What is the probability of getting a sum 9 from two throws of a dice?

6-Two dice are thrown simultaneously. What is the probability of getting two numbers whose product is even?

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?

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?

9-Two dice are tossed. The probability that the total score is a prime number?

10-A card is drawn from a pack of 52 cards.The probability of getting a queen of club or a king of heart?

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?

12-Two cards are drawn together from a pack of 52 cards. The probability that one is a spade and one is a heart?

13- If a classroom contains 5 students, what is the probability that at least two of them have the same birthday? We are given two urns as follows:

14- Urn A contains 5 red and 3 white balls. Urn B contains 2 red and 4 white balls. An urn is selected at random, a ball is drawn and put into the other urn, and then a ball is drawn from the second urn. Find the probability that both balls drawn are of the same color.

15- Urn A contains 6 red marbles and 4 blue marbles, and urn B contains 3 red marbles and 5 blue marbles. (1) If a marble is drawn from each urn, what is the probability that they are both of the same colours? (2) If two marbles are drawn from each urn, what is the probability that all four marbles are of the same colour

20. Extra notes:

21. Peer review   پێداچوونەوەی هاوەڵ

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