Department of Statistics

College of administration and Economics

University of Salahaddin-Hawler

Subject: Mathematical Statistics

Course Book – 3rd Year (2st semester)

Lecturer's name: Marwan Tariq Hassan-(MSc)

Academic Year: 2022/2023

Course Book

1. Course name	Mathematical Statistics
2. Lecturer in charge	Marwan T. Hassan
3. Department/ College	Statistics and informatics/Administration and Economics
4. Contact	e-mail: marwan.hasan@su.edu.krd
5. Time (in hours) per week	Theory: 3 Practical: N/A
6. Office hours	Monday: 10:30-12:30& Tuseday:9:30-10:30
7. Course code	
8. Teacher's academic profile	I was worked as assistant researcher in 2007 till 2009 in Department of Statistics at College of Administration and Economics at University of Salahaddin. I gained a master's degree in the same college and university in 2011. During my teaching experience, I have taught a lot of classes such as, Mathematics, Differential Equation, Computer, Mathematical Statistics, and SPSS.
9. Keywords	pdf, cdf, expectation, order statistics.

10. Course overview:

  Mathematical Statistical is considered a topic in department of statistics, because at the beginning the student will get familiar with statistical distribution most of the researches are depending on this distribution for analyzing data.

-Via statistics students will learn proving any rules and how they formed, we will make students learn them especially according to their distributions.

-How medium Variance, Moments, covariance for each function is found in different researches.

-How using Mathematical statistics in proper time according to discrete and continuous is found, and which of them is suited (fitted) with that distribution, so that we'll be able to find medium and variance.

11. Course objective:

  First: Knowing data, they are continuous or discrete.
Second: Learning how to find medium and variance for statistics function (discrete or continuous).
Third: Learning some fundamental rules in Mathematical Statistics and knowing where and how they are used.
Fourth: knowing the time using distribution and knowing which data are suited with them.
Fifth: Learning useful information in transforming data so in the fourth stage ,at the beginning will get full familiarity with connected topic which is *Statistical Inference* (the basic subject in Fourth stage).

12. Student's obligation

Students should be follow these requirement sin the class:

They have to come to the class on time.

They have to bring their lectures to the class every day.

If any student misses the quiz, he or she will get zero.

They have to bring their homework on time.

13. Forms of teaching

This lessons use several methods of teaching such as PowerPoint presentation to show the underline headings and using white board as well. Sometimes, student will be asking to discuss and share their ideas on this filed during the lecture with participating his/her classmates. From the beginning of the course, a hand out of the lecture will be given to the students to see what they are studying during this course.

14. Assessment scheme

Midterm exam: 20 % marks.

Class assignments & quizzes: there will be weekly class assignments and quizzes;20 % marks.

There will be extra assignments, which give the students extra marks.

Final exam: 60 % marks.

The examination schedule will be announced by the exam board of the department of statistics.

15. Student learning outcome:

Students will understand the basic rules of logic, including the role of axioms or assumptions and appreciate the role of mathematical proof in formal deductive reasoning.

Students will also be able to formulate and solve abstract mathematical problems and recognize real-world problems that are amenable to mathematical analysis, and formulate mathematical models of such problems. They can apply mathematical methodologies to open-ended real-world problems. They will also be able to recognize the connections between different branches of mathematics like between theory and applications.

16. Course Reading List and References:

❖ Introduction to Mathematical Statistics, 6th Ed 2004. by Hogg, McKean, and Craig.

❖ Mathematical Statistics, 2nd Ed 2003, by Jun Shao,

❖ **Introduction to Mathematical Statistics, 3rd Ed 1970. by Hogg, McKean, and Craig.**

❖ **Introduction to Mathematical Statistics, 4th Ed 1983. by Hogg, McKean, and Craig.**

Date	17.Topics	Notes
	Chapter One Mathematical Expectation & Moment	
First week	- Mathematical Expectation	
Second week	- Moment (Non – Central & Central) - Coefficient of Skewness	
Third week	- Coefficient of Kurtosis - Cheby Shev's Inequality	
Fourth week	- The Moment Generating Function	
	Chapter Two Joint &Conditional Probability	
Fifth week	- Joint Probability Density Function - Joint Probability Mass Function - Joint Cumulative Distribution Function	
Sixth week	- Marginal Probability Distribution Function - Expectation Joint Mathematical Function	
Seventh week	- Covariance & Correlation Coefficient - Joint moment generation function	
Eighth week	- Stochastic Independence	
Tenth week	- Conditional Probability Distribution Function - Conditional Probability Cumulative Distribution	
Eleventh week	- Conditional Expectation & Variance	
	Chapter Three Transformation	
Twelfth	- Transformation of Discrete type - Transformation of Continuous type	
Thirteenth week	- Order Statistics	

| Fourteenth week | - Univariate Probability distribution function | |
| Fifteenth week | - Exam and Review of year | |

18. Practical Topics (If there is any)

We don't have any practical lessons at all.

19. Examinations:

Example (1): Let x be a r.v. with

$$f(x) = \begin{cases} 2(1-x) & 0 < x < 1 \\ 0 & o.w \end{cases}$$

Find:

1) $M_1 \& M_2$ 2) $E[(6x + 3x^2)]$ 3) σ^2

Solution:

1. $M_1 \& M_2$

$M_1 = E(x) = \int_0^1 x(2(1-x))dx = \int_0^1 (2x - 2x^2)dx = x^2 - \frac{2x^3}{3} I_0^1 =$
$1 - \frac{2}{3} - 0 = \frac{1}{3}$

$M_2 = E(x^2) = \int_0^1 x^2 f(x)dx = \int_0^1 (2x^2 - 2x^3)dx = \frac{2x^3}{3} - \frac{2x^4}{4} I_0^1 = \frac{2}{3} - \frac{2}{4} - (0) = \frac{1}{6}$

2. $E(6x+3x^2) = 6E(x) + 3E(x^2) = 6*\frac{1}{3} + 3*\frac{1}{6} = \frac{5}{2}$

3. $\sigma^2 = v(x) = E(x^2) - (E(x))^2 = \frac{1}{6} - (\frac{1}{3})^2 = \frac{1}{6} - \frac{1}{9} = \frac{3}{54} = \frac{1}{18}$

20. Extra notes:

Final exam will be determined by the exam board of the college.

Notice that, this syllabus may be subject to changes; we may take either longer or shorter time to finish them.

21. Peer review	پێداچوونەوەی هاوەڵ