



Department of Mathematics

College of Education

Salahaddin University-Erbil

Subject: Distribution Theory

Course Book – (MSc)

Lecturer's name: Kurdistan I. Mawlood

Academic Year: 2023/2024

Course Book

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| 1. Course name | Distribution Theory |
| 2. Lecturer in charge | Kurdistan I. Mawlood |
| 3. Department/ College | Statistics /College of Administration and Economics |
| 4. Contact | e-mail: kurdistan.mawlood@su.edu.krd |
| 5. Time (in hours) per week | Theory: 3 Practical: 0 |
| 6. Office hours | (3 hours), Wednesday 9 -12 |
| 7. Course code | |
| 8. Teacher's academic profile | |
| 9. Keywords | Mean, variance, moment generating function, coefficient of skewness. Coefficient of kurtosis, Parameters, estimators, point estimation, properties of estimator and methods of estimation. |
| 10. Course overview: The general purpose of this course is to study the basic concepts of Distribution Theory This course is divided into two parts. The first part deals with properties of distribution functions, and the second part deals with estimation (point estimation and confidence intervals), properties of an estimator, methods for finding estimators | |
| 11. Course objective: students will learn the basic probability theory which is the starting point of the rest of their study on statistics. Random variables and its moments will be discussed. Students will be familiar with many common distributions, continuous or discrete, univariate or multivariate, that provide rich families for modeling real data. Based on these discussions students then will learn various properties of random sample along with some convergence concepts. | |
| 12. Student's obligation Students have the obligation to participate in course examinations and other assessed performances. Examination frauds and copying of assignments or material are not allowed. Students are anticipated to attend classes and to submit assignments on the due date. Students are also expected to participate in tutorials. Students have representatives in the groups they can come to meetings to show their support, they ..have the right to report incidents of discrimination. | |

13. Forms of teaching

Different forms of teaching will be used to reach the objectives of the course: power point presentations for the head titles, definitions and summary of conclusion, classification of material and any other illustrations. There will be classroom discussions and the lecture will give enough background to translate, solve, analyse, and evaluate problems.

14. Assessment scheme

During the study, there will be three Exams, all exams are closed book.

Grading:

Exam I 25%

Paper, home works and daily activities 25%

Exam III 50%

15. Student learning outcome:

At the end of this course, students are expected to be able to understand and find reasonable properties of estimators, provide a method for using sample data to construct estimates of population characteristics, and to use sample data to decide between two competing claims, or hypotheses, about a population.

16. Course Reading List and References:

- Introduction to Mathematical Statistics, 5th edition; Hogg and Craig, 1995.
- Introduction to Probability Theory and Statistical Inference, 3rd edition; Larson, 1982.
- Statistical inference / George Casella, Roger L. Berger.-2nd edition 2002.
- Principles of Statistical Inference, D.R. Cox, 2006.
- An introduction to Probability and Mathematical Statistics, Rohatgi, V. K. , 1976.
- Theory of Point Estimation, E.L. Lehmann George Casella 2nd edition 1998.
- Six sigma distribution Modeling, Andrew D. Sleeper 2007.

17. The Topics:

Lecturer's name

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| <ul style="list-style-type: none"> • Basic Definitions • Order Statistics • Estimation (properties of an estimator) • Unbiased estimator • Biased Part & Unbiased in Limit • Mean Square Error • Consistent estimator • Score function • Fisher Information • Sufficiency (method 1) • Sufficiency (method 2 conditional) • Sufficiency (method 3 factorization) • Jointly Sufficient • Completeness • Efficiency (Relative Efficiency) • Cramer-Rao Lower Bound • Methods of Estimation • Moments Method • Maximum Likelihood method • Minimum Variance method • The probability density functions • Discrete Uniform Distribution • Bernoulli Distribution • Binomial Distribution • Categorical Distribution • Multinomial Distribution • Poisson Distribution • Geometric Distribution • Negative Binomial Distribution • Hyper geometric Distribution • Continuous Uniform Distribution • Normal Distribution • Beta Distribution • Gamma Distribution • Invers Gamma Distribution • Weibull Distribution • Rayleigh Distribution • Dirichlet Distribution • Pareto Distribution | <p>Lecturer's name ex: (2 hrs)</p> <p>ex: 18/12/2023</p> |
| <p>18. Practical Topics (If there is any)</p> | |
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19. Examinations:

1. Compositional:

1 - Let X_1, X_2, \dots, X_n be a random sample of size n from uniform distribution $Uni(0, \theta)$, find the distribution of sample median.

2 - Let the random variable X has Binomial distribution with parameter θ ,

$\theta = \frac{x}{n}$ a consistent estimator for the parameter θ .

3 - Let X_1, X_2, \dots, X_n be a random sample of size n from Normal distribution $N(\theta, \sigma^2)$, show that the family of X is complete.

4 - In a random sample of size n from Geometric distribution $Geom(\theta)$,

show that $T = \sum x_i$ is sufficient estimator for θ

5- Let X_1, X_2, \dots, X_n be a random sample of size n from Gamma distribution $\Gamma(2, \theta)$, Find GRLB for $\phi(\theta) = \ln \theta$.

2. True or false type of exams:

3. Multiple choices:

20. Extra notes:

21. Peer review

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