

MATH 4/6636

Instructor: Dr. E. O. George

Class Meeting 4:30 pm - 7:30 pm F Dunn Hall 231. Aug 17, 2020 - Nov 24, 2020

Office: Dunn Hall 229

Office Hours: TThur 1-2 by phone or Zoom
Appointment

Email: eogeorge@memphis.edu

Objectives

The primary goal of this course is to introduce the basic concepts of the theory statistical estimation, hypothesis testing, and their applications. Familiarity with the properties of the standard discrete and continuous probability distributions, covered in MATH 4/6635, is a critical requirement for this course. For this purpose, there will be a very quick review of these distributions in the first lecture. I urge every student to review these distributions :the discrete to be reviewed include the binomial, geometric, negative binomial and Poisson among discrete distributions, and among continuous distributions, the uniform, exponential, beta, gamma and normal. The topics to be covered in this course are included in Chapters 4, 5, 6, 7, and 8. In Chapter 8, we will cover Sections 1 – 3.

Lectures

I will give be giving very comprehensive lectures, with many handouts. The syllabus is intended as a guideline for expectation and evaluation in this course. The instructor reserves the right to make any changes that may be deemed necessary during the semester.

TOPICS: REVIEW OF STANDARD PROBABILITY DISTRIBUTIONS

Lecture 1 and 2

- Binomial
- Geometric and Negative Binomial
- Poisson
- Hypergeometric
- Uniform
- Exponential, Gamma
- Beta
- Normal

BIVARIATE DISCRETE AND CONTINUOUS DISTRIBUTIONS

Lectures 3 and 4

- Bivariate Discrete Random Variables
- Mathematical Expectations
- Covariance and Correlation
- Marginal and Conditional Distributions
- Bivariate Continuous Random Variables
- Mathematical Expectations
- Covariance and Correlation
- Marginal and Conditional Distributions
- Calculation of Probabilities of Events Related to Bivariate Random Variables

SPECIAL CASES AND APPLICATIONS IN LINEAR REGRESSION

Lecture 5

- The Trinomial and Multinomial Distributions
- The Bivariate Normal Distribution
- The Least Squares Regression Line

DISTRIBUTIONS OF FUNCTIONS OF RANDOM VARIABLES

Lectures 6 and 7

- Distributions of Transformations of a Random Variable
- Probability Integral Transformation and Random Number Generation
- Joint Distributions Several Independent Random Variables
- Independence of Functions of Independent Random Variables
- Use of Moment Generating Function for Deriving Distributions

SAMPLING DISTRIBUTIONS OF STATISTICS

Lecture 8

- Linear Combination of Normal Random Variables
- Random Samples
- Independence of Sample Mean and Sample Variance
- The t and F Distributions

Lecture 9

- Central Limit Theorem
- Chebyshev's Inequality
- Order Statistics

POINT ESTIMATION

Lecture 10

- Likelihood Function
- Maximum Likelihood Estimation
- **TEST I** : Take Home

CONFIDENCE INTERVAL ESTIMATES

Lectures 11

- Confidence Interval Estimates for Mean and Variance
- Parameter Estimates in the Two Sample Problem
- Confidence Interval Estimate for a Proportion
- Confidence Interval for Difference of Two Proportions

HYPOTHESIS TESTING

Lecture 12

- Null and Alternative Hypotheses
- Test Statistics
- Critical Region
- Type I and Type II Errors
- Significance Level
- Power
- P-value

Lecture 13

- Tests of hypotheses about the Normal Mean
- Z-tests and t-tests for Means of Normal Distribution; One and Two populations
- Chi-Square and F-tests for Variances of Normal Distribution
- Tests of hypotheses about Proportion
- Tests of Hypotheses about Equality of Two Proportions
- Power Function of Statistical Tests

Lectures 14 The Neyman-Pearson Lemma

- Derivation of Uniformly Most Powerful Tests
- Chi-Square Tests for Goodness-of-Fit
- **TEST II** : Take Home

COMPREHENSIVE FINAL EXAM(TAKE-HOME)

HOME WORK

- Home work will be assigned weekly
- 4-5 of the assigned problems will be graded
- **No homework will be accepted for any reason after the due date**

FINAL EXAM- COMPREHENSIVE , TAKE-HOME

GRADING:

- Homework – 100points
- Tests- 100 points
- Final Exam -200 points
- If the lower of the two test scores is less than half of the Final Exam Score, it will be replaced by half the Final Score.
- **If you miss any test you will receive a zero on the test.**
- **You must take the Final Exam**

ATTENDANCE: Attendance is required and will be taken during each class period

GRADES: Your grade will be computed according to the following scale based on the percentage of the 500 possible points that you obtain:

90-100%	A
80-89%	B
70-79%	C
60-69%	D
below 60%	F