Department of Computer Science & Engineering
(School of Technology)
MATH2361: Probability And Statistics
(No. of hrs/week: 3   Credits: 3)
@Semester –V

10-07-2023

Dr Malikarjuna Reddy Doodipala
MSc, M.Phil, PGDCA, Ph D,
Department of Mathematics
GITAM Hyderabad

Why is this Course Designed ...?

This course is designed to Impart Knowledge on ....
- The Concepts of Data Science
- Fundamental Properties of Probability, Distributions
- Correlation and Regression
- Testing of Hypothesis for
  -Small and Large Samples In Engineering Applications.

Course Learning Objectives...

In this course, By the end of this chapter, students should be able to:

- To familiarize the students with the foundations of Data Science, probability and
   statistical methods.
- To explain the concepts in random variables and several distributions in engineering
   applications.
- To teach the concepts of correlation, regression and estimations and their properties.
- To explain the concept of testing of hypothesis for large samples.
- To impart knowledge on small sample tests.

Course Learning Outcomes…

Upon successful completion of this course, students will be able to:

- classify the concepts of Data Science and its importance (L3).
- apply discrete and continuous probability distributions (L3).
- explain the association of characteristics through correlation and regression tools (L3).
- identify the components of a classical hypothesis test (L3).
- use the statistical inferential methods based on small and large sampling tests (L4)

UNIT-I: Data Science and Probability

Data Science:

- ▶ Introduction to Statistics
- ▶ Population Vs Sample
- ▶ Collection of Data-primary and Secondary Data,
- ▶ Types of Variables: Dependent, Independent, Categorical and Continuous Variables
- ▶ Data Visualization
- ▶ Measures of Central Tendency,
- ▶ Measures of Dispersion (Variance)

UNIT-I: Data Science and Probability

Probability:
- Concept Definitions
- Probability axioms,
- addition law and multiplicative law of probability,
- conditional probability,
- Baye's theorem (without proof).

UNIT-I : Learning Outcomes

After completion of this unit, the student will be able to
- summarize the basic concepts of data science and its importance in engineering (L3).
- analyze the data quantitatively or categorically, measure of averages, variability (L4).
- define the terms trial, events, sample space, probability and laws of probability (L3).
- make use of probabilities of events in finite sample spaces from experiments (L3).
- apply Baye's theorem to practical problems (L3).

UNIT-II: Random Variable and Probability Distributions

▶ Random variables (Discrete and Continuous),
▶ Probability mass and density functions,
▶ Probability distributions
1. Binomial,
2. Poisson,
3. Normal distributions and their properties(Only Mean Variance)
▶ Applications on Binomial, Poisson and Normal Distributions

UNIT-II: Learning outcomes

After completion of this unit, the student will be able to
- explain the notion of random variable, distribution functions and
  expected value (L3).
- apply Binomial and Poisson distributions to compute probabilities,
  theoretical frequencies (L3).
- explain the properties of normal distribution and its applications (L3).

UNIT-III: Correlation, Regression and Estimation

▶ **Correlation**, correlation coefficient, rank correlation,

▶ **Regression**, lines of regression, regression coefficients,

▶ **Curve fitting** :principle of least squares and curve fitting (straight line, parabola and exponential curves).

▶ **Estimation**: Parameter, statistic, sampling distribution, point estimation,
   Properties of estimators, interval estimation.

UNIT-III: Learning outcomes

After completion of this unit, the student will be able to

- Identify different trends in scatter plots, strengths of association between two numerical variables (L3).
- Make use of the line of best fit as a tool for summarizing a linear relationship and predicting future observed values (L3).
- Estimate the value of a population parameter, computation of point and interval estimations (L3).

UNIT-IV: Testing of Hypothesis and Large Sample Tests

Testing of Hypothesis
- ▶ Formulation of null hypothesis, alternative hypothesis, critical region, two types of errors, level of significance and power of the test.

Large Sample Tests:
- ▶ Test for single proportion, difference of proportions, test for single
- ▶ mean and difference of means,
- ▶ confidence interval for parameters in one sample and two sample problems.

UNIT-IV: Learning outcomes

After completion of this unit, the student will be able to

▶ identify the difference between one-tailed and two-tailed hypothesis tests (L3).
▶ analyze the testing of hypothesis for large samples (L4).

UNIT-V: Small Sample Tests

▶ **Student t-distribution**
test for single mean, two means and paired t-test

▶ **Chi-square tests**
χ2- test for variance
χ2 - test for goodness of fit,
χ2 -test for independence of attributes.

▶ **F-Test:** Testing of equality of variances (F-test),

UNIT-V: Learning Outcomes

After completion of this unit, the student will be able to
- analyze the testing of hypothesis for small samples (L4)
- test for the χ^2-goodness of fit and independence of attributes (L4)

Text Books

10-07-2023

- V.K.Kapoor and S.C.Gupta: Fundamentals of Mathematical Statistics, Sultan Chand & Sons, New Delhi.

- Richard A. Johnson, Iswin Miller and John Freund, Miller & Freund's Probability & Statistics for Engineers, 7/3, Pearson, 2008.

Course Plan

Modules	No. of Classes to be Required
Orientation	02
Unit – I	10
Unit – II	08
Unit – III	08
Unit – IV	08
Unit – V	06
Total	42

Reference Books

10-07-20

- WillamFeller : Introduction to Probability theory and its applications. Volume –I, Wiley
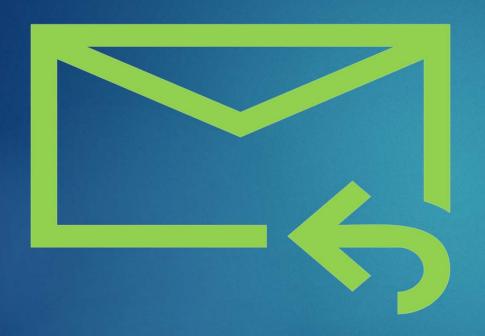
- S. Ross, A First Course in Probability, Pearson, 2002.

Mode of Examination

- External Max.Marks:30

- Internal Max. Marks: 70

- Credits-3

- Purely Descriptive (Internal Choice Based)

- Blue Print : Equal weightage to each unit

- All questions carries equal Marks

Any Questions? Suggestions?

Thank you

Feedback to

mdoodipa@gitam.edu