ADIKAVI SRI MAHARSHI VALMIKI UNIVERSITY, RAICHUR

SYLLABUS

B.Sc. Three Year Degree Program for the Subject

ARTIFICIAL INTELLIGENCE

With Effect from 2024-25

DISCIPLINE SPECIFIC CORE COURSE (DSC) FOR SEM I-IV, SKILL ENHANCEMENT COURSE (SEC) FOR SEM IV/V/VI and ELECTIVE COURSES FOR SEM V AND VI

AS PER N E P (Revised): 2024

SEMESTER: III

Course Code: CC 3	Course Title: Probability and Statistics
Course Credits: 04	Contact Hours per Week: 04
Total Contact Hours: 64	IA Marks: 20
Exam Marks: 80	Examination Duration: 03 Hours

Course Learning Objectives:

1. This course aims to make the students trained to handle randomness scientifically using theory of probability.
2. This course intends to make the students able to represent the statistical data in a systematic way and analyze it to draw meaningful information from them.
3. Through plentiful examples and exercises, this course provides the students scope to apply probabilistic and statistical techniques to deal with the real-life problems.

Course Outcomes: On successful completion of the course, the students shall be able to

1. Understand and apply basic concepts of probability theory, including conditional probability and Bayes' theorem.
2. Analyze and model random experiments using discrete and continuous probability distributions (e.g., Binomial, Poisson, Normal).
3. Compute and interpret measures of central tendency and dispersion, such as mean, median, variance, and standard deviation.
4. Perform statistical inference through estimation and hypothesis testing (Z-test, t-test, chi-square test).
5. Apply techniques of correlation and regression analysis to study relationships between variables.
6. Use sampling techniques and understand sampling distributions for decision-making.
7. Solve real-world problems involving uncertainty and variability using appropriate statistical tools and software (e.g., Excel, R, Python).

Unit-I **16 Hrs.**

Basic concepts of Statistics, qualitative and quantitative data, classification of data, construction of frequency distribution, diagrammatic representation of data.

Measures of Central Tendency: Arithmetic mean, median and mode—their properties Measures of Dispersion: Range, mean deviation, quartile deviation, variance and standard deviation.

Unit-II **16 Hrs.**

Correlation: Definition, scatter diagram, types of correlation, measures—Karl Pearson's correlation coefficient and Spearman's rank correlation coefficient.
Regression: Linear regression-fitting by least square method and interpretation.

Unit-III **16 Hrs.**

Concepts of probability: Experiment and sample space, events and operations with events,

probability of an event, basic probability rules, applications of probability rules, conditional probability.
Random Variables: Discrete and continuous random variable, probability distribution of a random variable, probability mass function, probability density function, expectation and variance of a random variable.
Standard Probability Distributions: Binomial probability distribution, Poisson probability distribution, Normal probability distribution.

Unit-IV **16 Hrs.**

Sampling Distribution: Concept of Population and Sample, parameter and statistic, sampling distribution of sample mean and sample proportion.
Statistical Inference: Estimation and Hypothesis Testing (only concept).
Hypothesis Testing for a Single Population: Concept of a hypothesis testing, tests involving a population mean and population proportion (z test and t test).
Chi square test for independence of attributes and goodness of fit.

Text books:

1. Manish Sharma, Amit Gupta, The Practice of Business Statistics, Khanna Book Publishing Company, 2010 (AICTE Recommended Textbook)
2. Das N. G., Statistical Methods, Combined Edition, Tata McGraw Hill, 2010.
3. Ross Sheldon M., Introduction to Probability and Statistics for Engineers and Scientists, 6th Edition, Elsevier, 2021.
4. Miller Irwin and Miller Marylees, Mathematical Statistics with Applications, Seventh Edition, Pearson Education, 2005

References:

1. Pal Nabendu and Sarkar Sahadeb, Statistics: Concepts and Applications, Second Edition, PHI, 2013
2. Montgomery Douglas and Runger George C., Applied Statistics and Probability for Engineers, Wiley, 2016.
3. Reena Garg, Engineering Mathematics, Khanna Publishing House, 2024

SEMESTER: III

Course Code: LAB 3	Course Title: Probability and Statistics Lab using Python
Course Credits: 02	Contact Hours per Week: 04
Total Contact Hours: 32	IA Marks: 10
Exam Marks: 40	Examination Duration: 03 Hours

List of Assignments

1. Calculate Mean, Median, Mode for a given dataset using Python.
2. Compute Range, Variance, and Standard Deviation of a dataset.
3. Draw Histogram and Frequency Distribution Table using Matplotlib/Pandas.
4. Simulate a Coin Toss and Dice Roll Experiment using random module.
5. Implement Basic Probability Calculations using set theory and Python.
6. Verify Conditional Probability and Bayes' Theorem with code and example.
7. Generate and plot Binomial Distribution (e.g., success in trials).
8. Generate and visualize Poisson Distribution (e.g., calls per hour).
9. Generate and plot Normal Distribution using numpy and scipy.stats.
10. Compare Empirical vs. Theoretical Distributions on a dataset.
11. Perform Z-test and T-test on two sample datasets (using scipy.stats).
12. Conduct Chi-Square Test for Independence (e.g., contingency table).
13. Carry out One-Way ANOVA using real-world data (e.g., student marks).
14. Construct Confidence Intervals for mean and proportion.
15. Calculate Pearson and Spearman Correlation Coefficient between two variables.
16. Perform Simple Linear Regression and visualize regression line.
17. Implement Multiple Linear Regression using sklearn.
18. Perform Random Sampling Techniques (simple, stratified, systematic).
19. Visualize Sampling Distribution of Mean through repeated sampling.
20. Fit a curve (linear or polynomial) and Evaluate Goodness of Fit (R^2 score).

Examination:

- Student has to answer and execute **Two** programs

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Evaluation Scheme for Lab Examination:

Criteria	**Marks**
Writing Program	10
Execution	20
Record + Viva-Voce	10
IA	10
Total	**50**