



SRI VENKATESWARA UNIVERSITY

**4-Year UG Honours in B.Sc. (Artificial Intelligence) as Major in consonance
with Curriculum framework w.e.f. AY 2026-27**

COURSE STRUCTURE (for Semester III)

Year	Semester	Course	Title of the Course	No. of Hrs /Week	No. of Credits
II	III	5	Data Base Management System	3	3
			Data Base Management System Lab	2	1
		6	Statistical Foundation of AI	3	3
			Statistical Foundation of AI Lab	2	1
		7	Exploratory Data Analysis & Data Visualization	3	3
			Exploratory Data Analysis & Data Visualization Lab	2	1



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II Year Syllabus for 4-Year UG Honours in B.Sc. (Artificial Intelligence) as Major in consonance with the Curriculum framework w.e.f. AY 2026-27

II Year III Semester

Sl. No.	Category	Course No.	Course Name	No. of Hours		Total No. of Hours	No. of Credits		Total No. of Credits
				Theory	Practical		Theory	Practical	
1	Major-Core	5	Data Base Management System	3	2	5	3	1	4
2	Major-Core	6	Statistical Foundation of AI	3	2	5	3	1	4
3	Major-Core	7	Exploratory Data Analysis & Data	3	2	5	3	1	4
4	Minor	1		3	2	5	3	1	4
5	AECC	1	English	4	0	4	3	0	3
6	AECC	1	MIL (Telugu/Hindi/Sanskrit)	4	0	4	3	0	3
7	MDC	2	-	2	0	2	2	0	2
8	SEC	3	SEC: Design Thinking/Problem solving/ others	2	0	2	2	0	2
				24	8	32	22	4	26

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B.Sc. Artificial Intelligence Honours
II year III Semester
COURSE 6: STATISTICAL FOUNDATIONS FOR AI

Theory

Credits: 3

3 hrs/week

Course Objectives

- Develop a strong grasp of statistical concepts and their role in AI modeling.
- Equip students to describe and analyse random variables, expectation, and variance.
- Enable mastery over various discrete and continuous probability distributions relevant to AI.
- Teach methods for evaluating relationships and making predictions through correlation and regression.
- Instil skills for drawing valid conclusions via inference, estimation, and hypothesis testing.
- Introduce students to advanced topics like multivariate and time series analysis, connecting statistical foundations to AI applications.
- Foster data analysis proficiency using Advanced Excel for simulation and model building.

Course Outcomes

By the end of this course, students will be able to:

- Analyse and interpret random variables using expectation and variance.
- Identify and apply discrete and continuous probability distributions to AI problems.
- Evaluate relationships between variables using correlation and regression analyses.
- Perform statistical inference, estimate parameters, and conduct hypothesis testing.
- Apply multivariate and time series analysis for complex, real-world AI scenarios.
- Utilize Advanced Excel tools for data exploration, visualization, and statistical modeling suited for AI tasks.

Unit 1: Random Variables, Expectation, and Variance

Random variables: definition, types (discrete & continuous), and properties, Probability mass function (PMF) and probability density function (PDF), Cumulative distribution function (CDF), Mathematical expectation (mean), variance, and standard deviation, Moments and moment-generating functions.

Unit 2: Probability Distributions

Discrete distributions: Binomial, Poisson, Geometric, Negative Binomial distributions — definitions, properties, and examples. **Continuous distributions:** Uniform, Normal (Gaussian), Exponential, Gamma distributions — definitions, properties, and applications Joint, marginal, and conditional distributions, Introduction to Central Limit Theorem.

Unit 3: Correlation and Regression

Bivariate data and scatter plots, **Correlation:** Pearson and Spearman coefficients, interpretation Simple linear regression: model, estimation, properties, and analysis of variance Multiple linear regression basics (conceptual understanding) Residuals and goodness of fit.

Unit 4: Statistical Inference, Estimation, and Hypothesis Testing

Population and sample, parameters and statistics, Sampling distributions, Point and interval estimation (confidence intervals), **Tests of significance:** z-test, t-test, chi-square test, and F-test, p-values and errors (Type I & II), Power of a statistical test.

Unit 5: Multivariate and Time Series Analysis

Introduction to multivariate data and covariance matrices, Principal Component Analysis (PCA) basics and dimensionality reduction (conceptual), Introduction to clustering (k-means concept), Time series: Trend, seasonal, cyclical, and irregular components, Autocorrelation and lag, moving averages, forecasting basics.

Activities:

Unit 1: Random Variables, Expectation, and Variance

Activities:

Solve problems involving calculation of expectation and variance using real-world datasets.

Advanced Excel exercise: Compute mean, variance, and standard deviation for sample data.

In-class quiz: Define and distinguish discrete/continuous random variables.

Outcome: Students can identify, classify, and compute key properties (mean, variance) for random variables using formulas and Excel.

Evaluation Method: Quiz (written/in-class): 5%, Excel assignment submission: 5%

Unit 2: Probability Distributions

Activities:

Practical Excel session: Simulate and visualize binomial, Poisson, and normal distributions.

Group worksheet: Draw and describe PMFs, PDFs, and CDFs for common distributions.

Homework: Problems on marginal and joint distributions.

Outcome: Students can model and visualize discrete and continuous distributions for AI-relevant scenarios using Excel.

Evaluation Method: Excel lab practical: 5%, Homework/problem set: 5%

Unit 3: Correlation and Regression

Activities:

Excel activity: Prepare scatter plots, calculate Pearson/Spearman coefficients, apply linear regression tool.

Mini-project: Analyse relationships between variables in an AI dataset (e.g., prediction, feature analysis).

Class discussion: Interpret regression outputs and residuals.

Outcome: Students can analyse and interpret relationships and predictions using correlation and regression tools in Excel.

Evaluation Method: Mini-project or report: 8%, Excel lab practical/lab observation: 4%

Unit 4: Statistical Inference, Estimation, and Hypothesis Testing

Activities:

In-class demonstration: Confidence intervals and hypothesis testing in Excel (t-test, z-test, chisquare).

Lab: Conduct sample analysis and interpret p-values, errors.

Group case study: Real or simulated AI problem involving inference.

Outcome:

Students can perform estimation and hypothesis testing, and make statistically valid decisions using Excel analysis.

Evaluation Method: Written/lab-based test: 8%, Group/case study submission: 4%

Unit 5: Multivariate and Time Series Analysis

Activities:

Excel-based PCA (Principal Component Analysis) on a sample dataset (using add-ins or manual approach).

Time series exercise: Calculate and plot moving averages, trends, and seasonal decomposition.

Presentation: Apply a multivariate or forecasting approach to a real AI dataset.

Outcome: Students can summarize multivariate relationships and analyse time series patterns using Excel.

Evaluation Method: Excel analysis/presentation: 8%, Final test/project component: 7%

Recommended Textbooks & References

1. Sheldon M. Ross, Introduction to Probability and Statistics for Engineers and Scientists,
2. Douglas C. Montgomery & George C. Runger, Applied Statistics and Probability for Engineers ,
3. D.C. Agarwal, Statistics for Data Science and AI
4. Larry J. Stephens, Excel Data Analysis: Your visual blueprint for analyzing data, statistics, and AI
5. Online: Khan Academy Statistics & Probability, Coursera Statistics for Data Science, Microsoft Excel Help.

SEMESTER-III
COURSE 6: STATISTICAL FOUNDATIONS FOR AI Lab

Practical

Credits: 1

2 hrs/week

Advanced Excel Lab

1. Random Variable Simulation - Simulate and visualize discrete/continuous random variables using Excel functions and Data Analysis Toolpak.
2. Expectation & Variance Calculation - Use Excel formulas to compute expected value, variance, and standard deviation from given datasets.
3. Modeling Discrete Probability Distributions - Generate and plot Binomial and Poisson distributions; analyse probabilities and mean/variance.
4. Modeling Continuous Distributions - Simulate Normal and Exponential distributions; use NORM.DIST, NORM.INV, EXPON.DIST functions.
5. Correlation Analysis - Calculate Pearson/Spearman correlation coefficients; visualize with scatter plots and trendlines.
6. Linear Regression in Excel - Fit a linear regression model, interpret coefficients, predict new values; use REGRESSION tool.
7. Statistical Inference & Estimation - Create confidence intervals using Excel formulas; visualize sampling distributions.
8. Hypothesis Testing - Perform z-test, t-test, chi-square tests in Excel; interpret p-values and results.
9. Multivariate Analysis - Conduct simple PCA (manual or via add-ins); analyze covariance matrices for multidimensional datasets.
10. Time Series Analysis - Organize time series data, create line charts, calculate moving averages, detect trends and seasonality, basic forecasting.

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II year III Semester
COURSE 6: STATISTICAL FOUNDATIONS FOR AI

MODEL QUESTION PAPER

Time: 3 Hours

Max. Marks: 75

PART-A

Answer any **FIVE** of the following. Each Question Carries 3 marks.

(5X3=15)

1. Short answer question from unit-I
2. Short answer question from unit-I
3. Short answer question from unit-II
4. Short answer question from unit-II
5. Short answer question from unit-III
6. Short answer question from unit-III
7. Short answer question from unit-IV
8. Short answer question from unit-IV
9. Short answer question from unit-V
10. Short answer question from unit-V

PART-B

Answer **FIVE** of the following. Each Question Carries 12 marks.

(5X12=60)

11. a) Essay question from Unit-I
OR
b) Essay question from Unit-I
12. a) Essay question from Unit-II
OR
b) Essay question from Unit-II
13. a) Essay question from Unit-III
OR
b) Essay question from Unit-III
14. a) Essay question from Unit-IV
OR
b) Essay question from Unit-IV
15. a) Essay question from Unit-V
OR
b) Essay question from Unit-V