GUJARAT TECHNOLOGICAL UNIVERSITY

Program Name: Bachelor of Engineering
Level: UG
Subject Code: BE03000251
Subject Name: Probability and Statistics

w. e. f. Academic Year:	2024-25
Semester:	3
Category of the Course:	BSC

Prerequisite:	Basic Probability and Statistics
Rationale:	The course is designed to meet the requirements of various Probability and Statistical concepts for Information Technology and allied branches.

Course Outcome:

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

Sr. No.	CO statement	Marks % weightage
CO-1	Define the basic probability terminology and also can describe random variables and their probability functions.	20 %
CO-2	Observe and analyze the behaviour of various discrete and continuous probability distribution functions.	25 %
CO-3	Compute various statistical measures and further, calculate correlation and regression coefficient.	20%
CO-4	Apply the statistical methods for testing the significance of the large and small sample data by using large sample test, t- test, F- test and Chi-square test.	25 %
CO-5	Apply the least square method for curve fitting.	10 %

Teaching and Examination Scheme:

Teaching - Learning Scheme (in Hours per Semester)					Total Credits = TH/30	Assessment Pattern and Marks					Total Marks
						Theory		Tutorial / Practical			
L	T	P	TW/SL	TH		ESE (E)	PA (M)	PA/ (I)	TW/ SL (I)	ESE (V)	
45	0	30	45	120	04	70	30	20	30	50	200

Where L = Lecture, T= Tutorial, P= Practical, TW/SL = Term-Work / Self-Learning, TH = Total Hours, ESE = End-Semester Examination, PA = Progressive Assessment

Content:

Sr. No.	Content	Total Hrs	% Weightage
01	**Basic Probability:** Experiment, definition of probability, conditional probability, independent events, Bayes' rule, Bernoulli trials, Random variables, discrete random variable, probability mass function, continuous random variable, probability density function, cumulative distribution function, properties of cumulative distribution function.	08	20%

02	**Some special Probability Distributions**: Binomial distribution, Poisson distribution, Poisson approximation to the binomial distribution, Normal, Exponential and Gamma densities, Evaluation of statistical parameters for these distributions.	11	25 %
03	**Basic Statistics:** Measure of central tendency: Moments, Expectation, dispersion, skewness, kurtosis, Linear Correlation, correlation coefficient, rank correlation coefficient, Regression.	10	20%
04	**Applied Statistics:** Formation of Hypothesis, Test of significance: Large sample test for single proportion, Difference of proportions, Single mean, Difference of means, and Difference of standard deviations. Test of significance for Small samples: t- Test for single mean, difference of means, t-test for correlation coefficients, F- test for ratio of variances, Chi-square test for goodness of fit.	12	25 %
05	Curve fitting by the numerical method: Curve fitting by of method of least squares, fitting of straight lines, second degree parabola and more general curves.	04	10 %
	Total	**45**	**100**

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
7	**28**	**35**	0	0	0

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above Levels (Revised Bloom's Taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers.
The actual distribution of marks in the question paper may vary from above table. This subject will be taught by Maths faculties.

Reference Books:

1. P. G. Hoel, S. C. Port and C. J. Stone, Introduction to Probability Theory, Universal Book Stall.
2. S. Ross, A First Course in Probability, 6th Ed., Pearson Education India.
3. W. Feller, An Introduction to Probability Theory and its Applications, Vol. 1, Wiley.
4. D. C. Montgomery and G. C. Runger, Applied Statistics and Probability for Engineers, Wiley.
5. J. L. Devore, Probability and Statistics for Engineering and the Sciences, Cengage Learning.
6. S. C. Gupta and V. K. Kapoor, Fundamental of Mathematical Statistics, Sultan Chand Publication.

List of Open Source Software/learning website:

1. https://archive.nptel.ac.in/courses/111/105/111105090/#
2. https://onlinecourses.nptel.ac.in/noc21_ma74/preview
3. https://onlinecourses.nptel.ac.in/noc23_ma77/preview

4. https://onlinecourses.nptel.ac.in/noc22_mg31/preview

Suggested Course Practical List:

Assign engineering application problems related to the topics mentioned in the content.
It is recommended to perform practicals using VLAB and Excel wherever appropriate and feasible.

- **Self-Learning Activities**

Activity	No. of Hours	Total Hours Claimed	Evaluation Criteria
Assignments on topics like Basic probability, Random variables and probability distributions, Basic statistics- measures of central tendency, measures of dispersion, skewness and kurtosis, correlation and regression and hypothesis testing, curve fitting.	Completing ten assignments (2h each)	20	Evaluation based on assignment submitted
Online video based learning	Duration of video = 10h Report preparation = 5h	15	Report or presentation based on learning through video.
Online participation in two Quizzes	4 hours for preparation of each quiz and 1hour for participation in each quiz.	10	Quiz scores
Online Course (MOOC/NPTEL/SWAYAM/etc.) on probability theory and descriptive statistics and applied statistics.	Minimum course duration of 10 hours	10	Assessment through an examination at the end of the course. Certificate submission required
Implementing descriptive statistics calculations in MS-Excel spreadsheet	Doing Two Spreadsheets based assignments (5h each)	10	Review based on the implementation, results, and presentation of results analysis
Modeling and Simulation of Engineering Systems (Developing statistical models and performing simulations)	Model formulation (5h) + Simulation and result analysis (5h)	10	Evaluation based on model accuracy, computational efficiency, and interpretation of results
Developing Posters, Charts, or	Designing and	15	Assessment based on

PowerPoint Presentations on Subject related Technical Topics	presenting visual content		creativity, clarity, and presentation skills

Note

- The activities listed above are suggestive, and faculty members have the flexibility to select and modify them as needed.
- The total self-learning hours remain fixed at 45 hours, ensuring comprehensive coverage of topics of Probability and Statistics
- Faculty can adjust the distribution of hours across different activities while maintaining a balanced learning approach.
- All records pertaining to the evaluation and assessment of self-learning activities must be properly maintained and preserved at the institute level. These records should be made available to the university upon request.
- Institutes are encouraged to utilize digital platforms, such as Microsoft Teams, for effective recordkeeping and to ensure transparency in the evaluation and assessment of self-learning activities.

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