# Department of Computer Technology B. Tech in Computer Science and Engineering (IOT)

### Vision of the Department

To be a well-known centre for pursuing computer education through innovative pedagogy, value-based education and industry collaboration.

### Mission of the Department

To establish learning ambience for ushering in computer engineering professionals in core and multidisciplinary area by developing Problem- solving skills through emerging technologies**.**

## Session 2025-2026

**Mission:** Means to achieve Vision

**Vision:** Dream of where you want.

**Program Educational Objectives of the program (PEO):** (broad statements that describe the professional and career accomplishments)

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| PEO1 | **Preparation** | **P: Preparation** | **Pep-CL abbreviation**  **pronounce as Pep-si-lL easy to recall** |
| PEO2 | **Core Competence** | **E: Environment (Learning Environment)** |
| PEO3 | **Breadth** | **P: Professionalism** |
| PEO4 | **Professionalism** | **C: Core Competence** |
| PEO5 | **Learning**  **Environment** | **L: Breadth (Learning in diverse areas)** |

**Program Outcomes (PO):** (statements that describe what a student should be able to do and know by the end of a program)

## Keywords of POs:

Engineering knowledge, Problem analysis, Design/development of solutions, Conduct Investigations of Complex Problems, Engineering Tool Usage, The Engineer and The World, Ethics, Individual and Collaborative Team work, Communication, Project Management and Finance, Life-Long Learning

**PSO Keywords:** Cutting edge technologies, Research

“I am an engineer, and I know how to apply engineering knowledge to investigate, analyse and design solutions to complex problems using tools for entire world following all ethics in a collaborative way with proper management skills throughout my life.” *to contribute to the development of cutting-edge technologies and Research*.

**Integrity:** I will adhere to the Laboratory Code of Conduct and ethics in its entirety.

## Name and Signature of Student and Date

(Signature and Date in Handwritten)

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| **Session** | **2025-26 (ODD)** | **Course Name** | **Mathematical Foundation of Data Analysis** |
| **Semester** | **5** | **Course Code** | **23IOT1526** |
| **Roll No** | **49** | **Name of Student** | **Omkar Panchal** |

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| Practical Number | 1(A) and 1(B) |
| Course Outcome | CO1-Understand the various statistical techniques to interpret and analyze the data.  CO2-Apply probability theory to solve the given problem  CO3-Perform sampling distribution to estimate the given data and predict the solution using Regression  CO4-Analyze the data using hypothesis and other testing methods |
| Aim | A) Solve the problems using probability distribution in R for  discrete random variables.  B) Solve the problems using probability distribution in R for  continuous random variable. |
| Problem Definition | 1. A local bakery sells three types of pastries: Croissants, Muffins, and Donuts. The daily sales for each type of pastry follow a certain probability distribution. The owner wants to understand the sales pattern better to manage inventory efficiently. 2. You are analyzing the distribution of heights among adult males in a particular city. Previous studies suggest that the heights follow a normal distribution with a mean (μ) of 175 cm and a standard deviation (σ) of 10 cm. |
| Theory  (100 words) | 1. A discrete random variable takes only countable values, such as the number of books on a shelf or the result of a coin toss. Its probability distribution lists the possible values along with their probabilities. The expected value, or mean, represents the long-run average outcome when the experiment is repeated many times. Variance describes how much the values differ from the mean, while standard deviation expresses this spread in the same units as the original data, making it easier to interpret. Variance is in squared units, whereas standard deviation provides a more direct sense of data dispersion. 2. A continuous random variable can take infinitely many uncountable values within a specific range, with no gaps between possible outcomes. It is described by a probability density function, and probabilities are assigned over intervals rather than exact values. In R, the norm() function calculates different matrix norms such as one norm, infinity norm, Frobenius norm, maximum modulus, or spectral norm, depending on the selected type. The dnorm() function returns the probability density of a normal distribution for a given value, based on the provided mean and standard deviation, and is widely used in statistical calculations and probability-based modeling. |
| Procedure and Execution  (100 Words) | Steps for implementation:  A)  1. List outcomes: 0,1,2,3.  2. Input probability vectors per pastry.  3. Confirm each vector sums to 1.  4. Write function to compute mean, variance, SD.  5. Apply function to each pastry.  6. Display calculated statistics.  7. Arrange plotting layout (1×3).  8. Create bar plots of PMFs.  9. Label axes, titles.  10. Save script and plots.  B)   1. Define mean (μ) and standard deviation (σ). 2. Create height range sequence. 3. Compute PDF using dnorm(). 4. Plot PDF curve. 5. Use pnorm() for probability <165 cm. 6. Use pnorm() difference for 170–180 cm. 7. Use qnorm() for 90th percentile. 8. Simulate 1000 heights with rnorm(). 9. Plot histogram. 10. Overlay theoretical PDF curve. |
| Code:  A)    B) A screenshot of a computer  AI-generated content may be incorrect. |
| Output:  A)      B)A screenshot of a computer  AI-generated content may be incorrect.A screenshot of a computer  AI-generated content may be incorrect.A screenshot of a computer  AI-generated content may be incorrect. |
| Output Analysis | Practical 1(A) – Discrete   * Croissants sell most on average (1.7/day), followed by Muffins (1.3) and Donuts (1.1). * Donuts show slightly more sales variation. * Bar plots show most likely sales: Croissants (2), Muffins (1), Donuts (1).   Practical 1(B) – Continuous   * 15.87% shorter than 165 cm, 38.3% between 170–180 cm. * 90th percentile ≈ 187.82 cm. * Simulated heights match the bell-shaped PDF |

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| Link of student Github profile where lab assignment has been uploaded | https://github.com/OmkarPanchal06/MFDA\_LAB |
| Conclusion | Using probability distributions in R, sales data for pastries was analyzed to find average demand and variation, guiding stock management. Height data followed a normal curve, allowing probability calculations and percentile estimation. These approaches demonstrate how statistical modeling supports informed decisions in both business and population studies. |
| Plag Report (Similarity index < 12%) |  |
| Date | 14/08/2025 |