



# University of Scholars

## Department of CSE

### 2nd Intra-University Math Olympiad 2025

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#### Syllabus (Written)

The written test will challenge undergraduate students with creative, analytical, and problem-solving tasks across major areas of mathematics. The test will consist of 8 structured problems.

#### 1. Linear Algebra

- Eigenvalues and eigenvectors
- Matrices
- Systems of linear equations
- Linear combination and linear independence

#### 2. Calculus

- Limits and continuity
- Techniques of differentiation and integration
- Applications: maxima-minima, area, volume
- Leibnitz's theorem
- Rolle's theorem, Mean value theorem, Taylor's and Maclaurin's theorems.

#### 3. Differential Equations

- First and second-order ordinary differential equations
- Linear differential equations with constant coefficients
- Applications in physical and engineering problems
- Simple partial differential equations

#### **4. Probability and Statistics**

- Basic probability rules
- Combinatorics: permutations, combinations, inclusion-exclusion
- Discrete and continuous distributions (Binomial, Poisson, Normal)
- Expected value and variance

#### **5. Geometry and Vectors**

- Coordinate geometry: conics, lines, circles, intersections
- Vectors in 2D and 3D space
- Dot and cross product applications
- Gradient, divergence and curl
- Green's theorem, Gauss's theorem, Stoke's theorem.

#### **6. Complex Analysis**

- Complex numbers: algebra, polar form
- Euler's formula, De Moivre's theorem
- Complex differentiation and Cauchy- Riemann Equations
- Cauchy's Integral Theorem, Cauchy's Integral Formula

#### **7. Foureier and Laplace Transformation**

- Fourier series, Fourier integral
- Fourier transform
- Laplace transforms
- Inverse Laplace transforms

#### **8. Critical Thinking and Mental Ability**

- Non-routine puzzles requiring logical thinking
- Pattern recognition
- Lateral thinking and creative problem-solving

## Question Setting & Evaluation

- The Olympiad exam will consist of **8 structured questions**, each carrying **10 marks**.
- All questions are compulsory.
- Duration of the exam: **120 minutes**.

## Target Participants

All current undergraduate students of all departments from the University of Scholars.

## Objectives

- Encourage advanced mathematical thinking and application.
- Foster a spirit of intellectual competition and creativity.
- Prepare students for higher-level contests and real-world problem solving.

### For More Information:

Math Olympiad Committee, Department of CSE