
Bridge Course on Mathematics (Basic Calculus & Linear Algebra)

Total Duration: 15 Hours

Target Audience: First-year undergraduate students from non-math intensive backgrounds

Delivery Format: In-person/Online, divided into 5 sessions of 3 hours each

Overall Learning Objectives

By the end of the bridge course, learners will:

1. Understand foundational concepts of calculus and linear algebra.
2. Develop analytical skills needed for higher-level mathematics.
3. Gain confidence in solving basic problems involving functions, derivatives, matrices, and systems of equations.

Expected Learning Outcomes (CLOs)

Learners will be able to:

- Define and interpret functions, limits, and derivatives.
- Apply differentiation techniques to solve basic problems.
- Understand vector and matrix operations.
- Solve systems of linear equations using matrix methods.
- Interpret the application of calculus and linear algebra in real-world contexts.

Time Plan

Session	Topics Covered	Learning Objectives	Activities	Outcomes
Session 1 (3 hours)	Introduction & Functions Sets, numbers, functions and graphs • Types of functions • Domain, range, and composition of functions	Understand basic functions and how they behave	Interactive lecture, graph sketching, small exercises	Learners define and plot functions; identify domain and range
Session 2 (3 hours)	Limits and Derivatives • Concept of limit • Continuity • Definition of derivative • Basic rules of differentiation	Understand the foundational ideas of limits and differentiation	Concept explanation with real-life illustrations, derivative exercises	Learners compute limits and differentiate basic functions
Session 3 (3 hours)	Applications of Derivatives • Rate of change • Tangents and normals • Maxima and minima	Apply differentiation to solve real problems	Problem-solving sessions, group tasks	Learners use derivatives to solve optimization problems
Session 4 (3 hours)	Basics of Linear Algebra • Vectors and matrices • Types of matrices • Operations: addition, scalar multiplication, transpose	Understand the structure of matrices and perform operations	Demonstrations with examples, matrix manipulation	Learners perform matrix operations and understand their geometric meaning
Session 5 (3 hours)	Systems of Linear Equations & Revision • Solving linear systems using matrix methods (Gauss elimination) • Inverse of a matrix (introductory) • Summary and problem-solving	Solve linear systems using algebraic techniques; reinforce learning	Solving equations in groups, Q&A, recap quiz	Learners solve systems of equations; demonstrate comprehensive understanding

Assessment & Evaluation

- Formative assessment: Quizzes after each session (5–10 mins)
- Summative assessment: Final test (MCQ + problem-solving) in last session (30 mins)
- Feedback: Exit slips / feedback forms at end of course