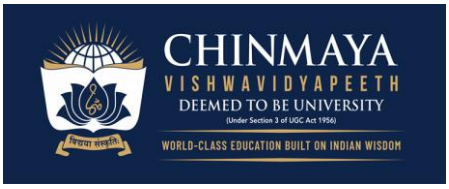

Course Name: Number Theory and Matrices

Programme in which it is offered: B.Sc.B.Ed. Mathematics

Course Category: Core	**Schedule of Offering**: Odd
Course Credit Structure: 4	**Course Code:** EG 252
Total Number of Hours: 75	**Contact Hours Per Week:** 5
Lecture: 3	**Tutorial:** 2
Practical: NA	**Medium of Instruction:** English
Date of Revision:	**Skill Focus:** Employability
Short Name of the Course: NTM	**The course is considered as a Minor/Elective/ in any other school:** No

Course Description

This course is a core course for B.Sc.B.Ed. Mathematics students. This course is an elementary course in number theory, a branch of mathematics that studies integers and their properties. The course also discusses fundamentals of matrix algebra that lay foundation to courses in abstract and linear algebra to be studied in the later semesters in the programme.

Course Introduction

'Integers' is the most fundamental concept in mathematics. The study of integers and their properties form the core of a branch of mathematics called 'Number Theory'. This course is an introduction to elementary number theory. The course also introduces the learners to tools and techniques of matrix algebra.

Course Objective

The major objectives of this course are

1. To familiarize the students with the concepts and techniques of Elementary

number theory

2. To inculcate the skills of problem-solving among the students through a few classic problems.
3. To familiarize the students with the concepts and techniques of matrix algebra
4. To equip the students with the skills of applying the algebra of matrices in solving problems.

Course Outcome

At the end of the course students will be able to

1. State and prove basic theorems on integers
2. Apply appropriate results in solving problems in elementary number theory
3. Describe various operations on matrices and their properties
4. Apply the algebra of matrices in solving system of linear equations

PO-CO Mapping

PO-CO Mapping Matrix

CO/PO Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO1		√			√	√			
CO2					√	√			√
CO3					√	√	√		
CO4					√				√

Prerequisites

The course does not require any pre-requisite course. This is a core course in the B.Sc.B.Ed. Mathematics programme.

Pedagogy

The teaching-learning of the course is organized through lectures, problem-solving sessions and student presentations.

Suggested Reading:

1. Burton, D. M. (2017). Elementary Number Theory. McGraw Hill Education.
2. Niven, Zuckerman and Montgomery (2008). An introduction to the theory of numbers. Wiley.
3. Apostol, T. M. (1998). Introduction to Analytic Number Theory. Narosa.
4. Barnard and Child (2016). Higher Algebra. Arihant Publications.
5. Pillay, Natarajan and Ganapathy (2009). Algebra Volume 1. Viswanathan, S., Printers & Publishers Pvt Ltd.
6. Ayres (2003). Matrices. Schaum's Outlines series.

Module Sessions

Module I: Theory of Numbers I (20 Hours)

Division Algorithm; Divisibility; Prime and Composite Numbers; fundamental theorem of Arithmetic; proving the existence and uniqueness of GCD and the Euclidean Algorithm; the least common multiple; congruences; linear congruences; Simultaneous congruences; Wilson's theorem; Fermat's little theorem and Euler's theorem.

Reading:

a) Burton. 2017.
b) Apostol. 1998.

Activities:

a) Quiz
b) Assignment

Module II: Theory of Numbers II (20 Hours)

Primitive roots, quadratic residues and the law of quadratic reciprocity; Arithmetical functions; the Mobius function, the Euler's function and sigma function; the Dirichlet product of arithmetical functions, multiplicative functions; perfect numbers; The series of Fibonacci and Lucas.

Reading:

a) Burton. 2017.
b) Apostol. 1998.
c) Niven. 2008.

Activities:

a) Quiz
b) Assignment
c) Individual Presentation

Module III: Matrices I (15 Hours)

Matrices of order m x n; Algebra of matrices; Symmetric and Skew symmetric, Hermitian and Skew Hermitian matrices and their standard properties; Determinants; Adjoint of a square matrix, Singular and non-singular matrices, Rank of a matrix, Elementary row / column operations. In-variance of rank under elementary operations, Inverse of a non-singular matrix by elementary operations.

Reading:

a) Ayres. 2003.
b) Bernard. 2016.
c) Pillay. 2009.

Activities:

a) Quiz
b) Assignment

Module IV: Matrices II (20 Hours)

System of m-linear equations in n-unknowns, Matrices associated with linear equations, Trivial and non-trivial solutions, Criterion for existence of non-trivial solution of homogeneous and non-homogeneous systems and their uniqueness.

Number Theory and Matrices

Characteristic equation of a square matrix, Eigen values and Eigen vectors, finding them for a real symmetric matrix, Diagonalization of a real symmetric matrix, Cayley – Hamilton theorem and its applications.

Reading:

a) Ayres. 2003.

b) Bernard. 2016.

c) Pillay. 2009.

Activity:

a) Quiz

b) Assignment

c) Individual Presentation

Evaluation Pattern

Evaluation Matrix

	Component Type	Weightage Percentage weightage	Total Marks	Tentative Dates	Course Outcome Mapping
Continuous Internal Assessment (CIA) Components	Mid-semester exam	50% of CIA	30	Around 9th week	1,2
	Assignment	25% of CIA	15	End of each module	1,2,3,4
	Quizzes	17% of CIA	10	Every two weeks	1,2,3,4
	Presentations	8% of CIA	5	End of two modules	1,2,3,4
	CIA Marks	100% of CIA	60		
ESE		40%	40	End of the semester	1,2,3,4