Course Type	Course Code	Name of Course	L	T	P	Credit
DSC	NGPC104	**Mathematical Geophysics Practical**	0	0	2	1

Course Objective

The primary objective of the course is to introduce practical aspects of mathematical methods concerned with problems of geo-scientific relevance. The purpose of this course will be to implement and practice the symbiotic relationship that exists between mathematics and geophysics.

Learning Outcomes

Upon successful completion of this course, students will:

- Gain a mathematical background for the study of the Earth's dynamics and interactions

Unit No.	Topics to be Covered	Practical Hours	Learning Outcome
1	Arithemetical evaluation of basic matrix operations	2	Practical experience on matrix operations
2	Problems on vector identities: algebraic and calculaus based operations	2	Practical experience on vector operations
3	Implementing Gaussian Elimination: Gauss Jordan method	2	Practical experience on linear equation solving
4	Formulating row-reduced form of rectangular matrices	2	Practical experience on matrix operations
5	Finding basis and dimensions of important vector spaces	2	Practical experience on vector spaces
6	Verification of the orthogonality of four fundamental subspaces	2	Practical experience on subspace theory
7	Implementation of Gram-Schmidt orthogonalisation process	2	Practical experience on orthogonalisation
8	Estimating eigenvalues and performing eigenvalue decomposition of matrices	2	Practical experience on eigenvalue problems
9	Part 1: Implementation of Singular Value Decomposition for dense matrices	2	Practical experience on SVD
10	Part 2: Implementation of Singular Value Decomposition for dense matrices	2	Practical experience on SVD
11	Formulation and verification of Hermitian matrices	2	Practical experience on Hermitian matrix operations
12	Performing linear transforms on large matrices	2	Practical experience on matrix operations
13	Transforming optimaization problems to standard form	2	Practical experience on optimization problem
14	Open practice problem based on fundamnetal interest	2	Motivating experience on individual choice problem
	Total	**28**	

Text Books

1. Mathematical Methods for Physics and Engineering, Riley, K. F., Hobson, M. P., and Bence
2. Linear Algebra and Its Applications by Gilbert Strang

Reference Books

1. Mathematical Methods for Physicists, J. B. Arfken and H. J. Weber (7th edition, Indian reprint, 2017).
2. Luenberger D G, Introduction to Linear and Nonlinear Programming, 2nd edition, Addison Wesley, 1984