Course Type	Course Code	Name of Course	L	T	P	Credit
DE	NGLD512	Introduction to Data Science for Geosciences	3	0	0	3

Course Objective
This course will introduce numerical techniques for analyzing data and formulating models in Geosciences. Students will be acquainted with a high-level programming language to learn data analysis and manipulation, sophisticated plotting, and numerical modelling in the same interface.

Learning Outcomes
Upon successful completion of this course, students will be able to: • Discover fields of data science typically not covered in traditional courses. • Understand the methods that treat the common characters of geoscientific data.

Unit No.	Topics to be Covered	Lecture Hours	Learning Outcome
1	Elementary Statistics: Collection of data – classification and tabulation; charts and diagrams; Useful mathematical devices; Frequency distribution; Measures of Central Tendency; Measures of Dispersion; Moments, Skewness and Kurtosis.	8	This will help the student to understand the concepts of fundamental statistics.
2	Data as Vector and Matrices: Matrix algebra; elementary matrix operations, matrix multiplications; Determinant; Eigen values and Eigen vector.	6	This will help the student to understand the concepts of matrix algebra
3	Introduction to MATLAB Programming: Algorithm; MATLAB script; Input and Output; Data Structure	4	This will help the student to understand the basics of MATLAB programming
4	Selection Statements: if statement; if-else statement; Nested if-else statement; Switch statement; "is" function.	4	This will help the student to understand the selection operation in MATLAB
5	Loop statement and Vectorizing code: for loop; Nested for loop; While loop; Loops with Vectors and Matrices, Vectorizing, Timing	4	This will help the student to understand the Repetition operation in MATLAB
6	Regression and curve fitting using MATLAB: Linear regression; analysis of variance; multiple regression; polynomial regression; reduced major axis; nonlinear regression; splines	6	This will help the student to understand the methods of Regression and curve fitting using MATLAB
7	Spatial data analysis using MATLAB: Contouring; Trend analysis; Semi variogram; kriging	6	This will help the student to understand the methods of spatial analysis using MATLAB
8	Directions and Compositional data analysis using MATLAB: Graphical display of directional data; Statistics of Directional data; Compositional data plotting.	4	This will help the student to understand the methods of directional and compositional data analysis using MATLAB
Total		42	

Textbooks:
1. Das, N. G. 2017. Statistical Methods (Combined Edition Volume I & II), McGraw Hill Education (India) Pvt. Ltd. 952 p.
2. Attaway, S. 2019. MATLAB: A Practical Introduction to Programming and Problem Solving (Fifth Edition), Butterworth-Heinemann, 604 p.

Reference Books:
1. Middleton, G. V. 2000. Data Analysis in the Earth Sciences using MATLAB. Prentice Hall, 260 p.