Indian Statistical Institute, Delhi Centre

BSDS-Mathematics-III - Course information

Class Teacher:

Debdip Ganguly

Name	Course Name	Email
Debdip Ganguly	Mathematics-III	debdip@isid.ac.in/debdipmath@gmail.com

*More details can be found in my website

Teaching Assistants:

Name	Centre	Email
Sneha B	Bangalore	rs_math2105@isibang.ac.in
Rahul Kumar	Delhi	rahulkumarr35@gmail.com
Sayan Acharya	Kolkata	mr.sayanacharya1@gmail.com

Course contents:

Linear Algebra

1. Brief Review : Linear Transformation, Matrix Representations, Spectrum and Diagonalisation.
2. Real and Complex inner product spaces, Orthogonal sets, Gram-Schmidt process, Orthogonal and Unitary Diagonalisation, Singular Value Decomposition, low rank matrix approximation using SVD.

Graph Theory

1. Types of graphs, Simple Graph, Directed Graph, Undirected Graph, Complete Graph. Degree of a vertex in an undirected graph, Indegrees and Outdegrees of a directed graph.
2. Paths and Reachability in Graphs, Graph coloring, Vertex cover, Independent set, Matching, Representing graphs, Adjacency matrix.
3. Breadth-First Search (BFS) algorithm. Depth-First Search (DFS) algorithm. Applications.

Analysis

1. Basics of complex number system. Roots of polynomials. Power series in complex variables, complex exponential.
2. Basic properties of metric spaces. Open and closed sets, notion of convergence and continuity, compactness, completeness.
3. Normed vector spaces and Hilbert spaces (definition and examples). Basic properties of Hilbert spaces: notion of complete orthogonal basis, basis expansion.
4. Multiple integrals as iterated integrals, change of variables in multiple integrals, Jacobian formula.

Reference books:

1. Topology and Moder Analysis by George F. Simmons
2. Introduction to Graph Theory by Douglas B. West
3. Algorithm Design by Jon Kleinberg and Eva Tardos
4. Linear Algebra done right by Shelden Axler
5. Linear Algebra and its application by Gilbert Strang

Information about the class:

1. **Lectures:** We will conduct live lectures in hybrid mode as per Schedule. We will use Zoom for the live lecture. Here is the Link: https://zoom.us/j/94379355931?pwd=tlwmhyMwUBkDKsNp68wsv94oP31IjS.1

   Meeting ID: 943 7935 5931
   Passcode: 757263

2. Tutorial sheet with practice problems will be provided.
3. Weekly Tutorial will be conducted.

Grading Policy:

There will be one MID-SEMESTER of 30%, one END-SEMESTER of 50%, and two quizzes which carry the remaining 20%.

Tentative examination schedule:

Exam	Date and time
Quiz1	13th September
Mid-Semester	October 6th – 10th (Refer to institute exam schedule)
Quiz 2	1st November
End-Semester	December 8th – 19th (Refer to institute exam schedule)

Important guidelines:

1. If you find any difficulty in the course, you should immediately inform the class teacher and the TA. So that we can do my best to help you on this.
2. If you have any problem with the **internet connection**, then you should report the issue to me immediately.