



IIT DELHI

Established in 1961, Indian Institute of Technology Delhi is one of the premier educational institutions in the country and counted among the top institutions in the world. Situated in the National Capital, IIT Delhi has been instrumental in providing solutions to technological and societal problems through innovative academic and research activities. The institute has nearly 35 academic units that imparts knowledge on Engineering, Science, Design, Social Science, among others. IIT Delhi has been consistently placed among top academic universities around the globe. In 2018, IIT Delhi has been awarded the status of "Institution of Eminence" by Government of India which granted almost-full autonomy, leaving this institute to make its own decisions with enhanced research funding.

DEPARTMENT OF MATHEMATICS

The Department of Mathematics strives to be recognized for excellence among academic institutions in India and abroad. It offers BTech and Dual degree in Mathematics and Computing (MaC), and MSc Mathematics. Department offers Doctoral and Post-Doctoral research opportunity in all the major areas of mathematics, statistics and theoretical computer science.. Department also offer summer research and Doctoral position under Quality improvement programme for the candidates from various institutes.

Resource Faculty

Prof. K. Sreenadh

Prof. Kamana Porwal

Prof. Debdip Ganguly

Prof. Harish Kumar

Dept. of Mathematics, IIT Delhi



Course Coordinator

Prof. Harish Kumar

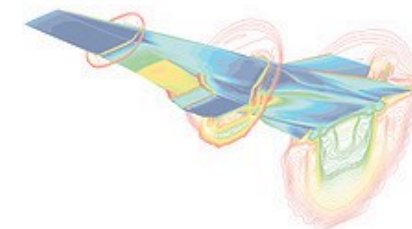


Contact

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TEQIP-III Sponsored
Online Short-term
Course on



Partial Differential Equations: Theory and Computations

30th November to
4th December 2020



By

Department of Mathematics
Indian Institute of Technology,
Delhi

Introduction

This short-term course introduces modern theoretical and computational methods for partial differential equations. It will serve as an excellent starting point for the candidates interested in PDEs theory, related numerical methods, and applications.

Course Contents:

First-order equations: Classification, Method of characteristics, general solutions, shocks, discontinuous data, generalized solutions, R-H condition.

Second-order equations: Elliptic and parabolic equations, Greens functions, Poisson integral formula, harmonic functions, and properties. Maximum principles: Weak and strong maximum principles, Hopf Maximum principle and applications. Sobolev spaces: Weak Derivatives, Definitions, completeness and embedding theorems. Weak solutions, Lax-Milgram, and applications.

Finite Volume Methods for Hyperbolic PDEs:

Linear Advection Equations, Numerical Schemes, and stability. Finite Volume method for Scalar conservation laws. Exact Riemann Solver (Godunov's Solver), Approximated Riemann Solvers, Numerical Implementations, Boundary Conditions. Stability and Consistency of first-order schemes. Harten's Lemma. Lax-Wendroff's for convergence of the schemes.

Finite Element Methods for Elliptic PDEs:

Equivalence of Galerkin and Ritz variational formulations, Introduction to finite element method, Lagrange finite elements, Cea's lemma, Interpolation on simplices, Asymptotic error analysis of conforming finite element method, Implementation of conforming finite element method for Dirichlet and Neumann problem in one and two dimensions

Learning Objective:

- ◆ To have a basic understanding of PDE theory.
- ◆ To understand the existence of the solution and basic properties.
- ◆ To develop the ability to design and implement stable and convergent numerical methods for a wide class of PDEs.

On successful completion of the course, the participants will be able to:

- ◆ Study the basic behavior of the PDEs and analyze the well-posedness of the given problem.
- ◆ Understand the "weak solutions" and study their existence.
- ◆ Discretize the PDEs with suitable numerical methods and study their convergence.

Participation:

- ◆ **This course is designed for faculty members from all disciplines of science and engineering from TEQIP-III institutions only.**
- ◆ **No registration fee for TEQIP-III participants.**
- ◆ **Participation from outside of TEQIP-III institutions is not permitted in this course.**
- ◆ **Based on first come first serve basis, a maximum of 50 participants will be allowed to register for the course.**

Registration

Interested faculty members at TEQIP-III institutions should register by depositing a refundable security deposit of Rs. 2000/- to the IIT Delhi CEP Account with following details:

- ◆ **Name of the Account holder: IITD CEP ACCOUNT**
- ◆ **Account number: 36819334799**
- ◆ **Name of the Bank: STATE BANK OF INDIA**
- ◆ **Branch Address: Indian Institute of Technology, Hauz Khas, New Delhi-110016**
- ◆ **IFS Code: SBIN0001077**
- ◆ **SWIFT Code: SBININBB547**
- ◆ **MICR Code: 110002156**
- ◆ **IITD PAN no.: AAATI0393L**
- ◆ **GSTN: 07AAATI0393L1ZI**

After paying the security deposit, please fill online registration form on the following link:

<https://forms.gle/rXWXPM8geePTKDGB6>

Deadline for Registration: 20th November 2020

Important note: Reimbursement of refundable security deposit for the participants as well as declined participants will be processed after successful completion of the course.