

# Final Report of the Workshop

## Recent Trends in Differential Equations: Theory, Computation and AI/ML

February 03–07, 2026

Department of Mathematics and Computing  
NIT Jalandhar

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### 1 Introduction

The Department of Mathematics and Computing, National Institute of Technology Jalandhar, successfully organized the workshop entitled “*Recent Trends in Differential Equations: Theory, Computation and AI/ML*” during February 03–07, 2026. The workshop was designed to expose participants to contemporary developments in differential equations, numerical methods, scientific computing, optimal control, and machine learning based approaches for solving mathematical models.

The event brought together experts from reputed institutions who delivered lectures on theoretical foundations, computational techniques, and modern data-driven methods. The workshop provided a valuable platform for faculty members, researchers, and students to interact with distinguished speakers and learn about recent advances in the field.

### 2 Objectives of the Workshop

The main objectives of the workshop were:

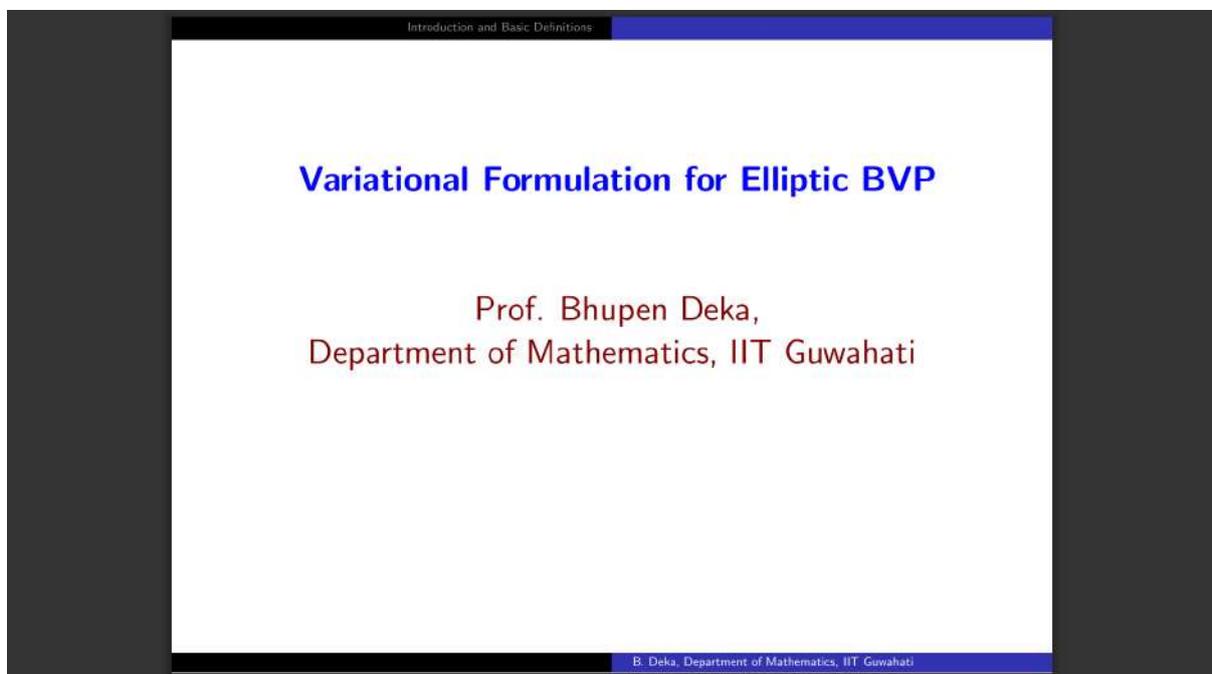
- To provide participants with exposure to recent trends in differential equations and their applications.
- To introduce modern computational and numerical techniques for solving differential equations.
- To create awareness about emerging AI/ML-based methodologies in scientific computing.
- To promote academic interaction between participants and invited experts from leading institutions.
- To motivate students and young researchers to explore interdisciplinary research involving mathematics, computation, and machine learning.

### 3 Themes Covered

The workshop covered a broad spectrum of topics including:

- Variational formulation for elliptic boundary value problems,
- Gradient discretisation method and hybrid numerical schemes,
- Finite element methods,
- Weak Galerkin finite element method for elliptic PDEs,
- Finite element methods for elliptic and parabolic problems,
- Optimal control problems: formulations and approximations,
- PINN, DRM, and VPINN: analysis and computation,
- Physics-informed neural networks for solving differential equations,
- Introduction to scientific computing.

### 4 Invited Speakers and Lectures



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# The gradient discretisation method and hybrid numerical schemes (HMM and HHO)

Hanz Martin Cheng

Workshop on Recent Trends in Differential Equations: Theory, Computation, and AI/ML  
February 6, 2026



Hanz Martin Cheng

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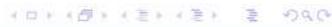
# Finite Element Methods

## Mesh, Affine Mappings and Interpolation Estimates

Dr. Naresh Kumar

Department of Mathematics  
National Institute of Technology, Jalandhar

DETCM Workshop, 2026

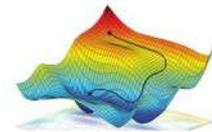


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# Recent Trends in Differential Equations: Theory, Computation and AI/ML

## Physics-Informed Neural Networks for Solving Differential Equations

**Sangeeta yadav**  
**Assistant Professor**  
**Department of Computer Engineering**  
**University of Delhi**



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## PINN, DRM, and VPINN: Analysis and Computation

Ramesh Chandra Sau

Department of Mathematics, IISER Tirupati

*Recent Trends in Differential Equations: Theory, Computation, and AI/ML*  
(DE-TCM 2026)  
NIT Jalandhar

February 03–07, 2026

Distributed control Problem Neumann Boundary Control Problem Robin

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## Optimal Control Problems: Formulations and Approximations

THIRUPATHI GUDI

Department of Mathematics  
Indian Institute of Science  
Bangalore-12

Dr B R Ambedkar National Institute of Technology, Jalandhar

Based on joint work with  
S. Chowdhury, A.K. Nandakumaran, Ramesh Ch. Sau, G. Mallik, Arnab Pal

Thirupathi Gudi Optimal Control Problems

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## INTRODUCTION TO SCIENTIFIC COMPUTING

**Recent Trends in Differential Equations: Theory, Computation and AI/ML**  
February 03–07, 2026  
Department of Mathematics and Computing, NIT Jalandhar

Dr. Jitendra Kumar

Professor  
Department of Mathematics  
Indian Institute of Technology ROPAR



## 5 Highlights of the Workshop

The workshop was marked by a rich blend of theory and computation. The lectures on variational methods, finite element methods, and weak Galerkin approaches strengthened the participants' understanding of core numerical analysis techniques for differential equations. A particularly important feature of the workshop was the inclusion of lectures on Physics-Informed Neural Networks (PINNs), Deep Ritz Method (DRM), and VPINNs, which introduced participants to modern machine learning based strategies for solving differential equations. These sessions demonstrated how AI/ML tools can be integrated with mathematical modeling and numerical methods to address challenging scientific problems. The lecture on scientific computing also provided participants with a broader computational perspective, connecting mathematical theory with practical implementation.

## 6 Participation and Interaction

The workshop witnessed 65 offline and 90 online active participation from faculty members, research scholars, postgraduate students, and undergraduate students. The interactive nature of the sessions encouraged participants to engage with speakers through discussions and questions. The workshop created an academic environment conducive to learning, collaboration, and research exchange.

## 7 Outcomes of the Workshop

The workshop achieved its intended goals successfully. The important outcomes include:

- Enhanced understanding of modern analytical and numerical techniques for differential equations.
- Increased awareness of current research problems in finite element methods, hybrid schemes, and optimal control.
- Exposure to AI/ML-based approaches such as PINNs and related methods for scientific computing.
- Strengthened academic interaction among participants and experts from various institutions.
- Motivation for students and researchers to pursue advanced research in computational mathematics and interdisciplinary applications.

## 8 Conclusion

The workshop “*Recent Trends in Differential Equations: Theory, Computation and AI/ML*” was successfully conducted from February 03–07, 2026 at the Department of Mathematics and Computing, NIT Jalandhar. The workshop served as an excellent platform for disseminating knowledge on recent theoretical, computational, and AI/ML-based developments in differential equations. The invited lectures were highly informative and beneficial for all participants. Overall, the event was a great success and contributed significantly to the academic and research environment of the department.

## 9 Inaugural session







## 10 Valedictory session



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Department of Mathematics and Computing  
NIT Jalandhar

**Convener:**

Dr. Naresh Kumar

