Proposed "Karyashala"

Hands-on training on high order mathematical techniques for engineering and physical sciences

December 22-27, 2023

PDPM IIITDM Jabalpur

Objective: The aim of the programme is to provide knowledge from basic to advance mathematical techniques with algorithm and programming experience for engineering and physical problems to research scholars. In this one week course, we shall focus on all mathematical techniques from finite difference method to finite element method, spectral method, wavelets and various transforms Laplace transform, Fourier transform, Discrete Fourier transform, Z-transform etc. at single platform. Along the mathematical concept, importance and utility of these techniques, a live hands-on experience for ECG and biomedical signal processing, image restoration and additive techniques for smart structures etc. will be given. Last but not the least, basics of research methodology, writing a research papers in LateX, effective manners to write a research paper will be discussed in the Karyashala.

About the Institute:

IIITDM Jabalpur is an autonomous Institute fully funded by Central Government. The institute was established by Government of India in 2005 and given the status of "national importance" in 2014. This is a fully residential campus spread over 250 acre land and situated among the picturesque hills and nature reserve forest at Dumna Airport Road Jabalpur.

The institute is committed to current trend research and offers B.Tech. M.Tech. and Ph.D. programme in CSE, ECE and ME branch of engineering, B.Des., M.Des., and Ph.D. in Design discipline and Ph.D programme in Mathematics and Physics under the umbrella of Natural Sciences.

Patron:

Prof. Bhartendu K Singh, Director, PDPM IIITDM Jabalpur

Speakers:

1. Prof. Mani Mehra, IIT Delhi
2. Prof. Sanjeev Kumar, IIT Roorkee
3. Prof. Vivek Agrawal, DTU Delhi
4. Prof. V K Gupta, IIITDM Jabalpur
5. Prof. P K Jain, IIITDM Jabalpur
6. Prof. Anil Kumar, IIITDM Jabalpur
7. Prof. L K Balyan, IIITDM Jabalpur
8. Prof. Deepmala, IIITDM Jabalpur

Contents:

Module 1: Basics of Matlab, data format, expression of vector and matrix, calculations of derivatives and integrals using Matlab, 2D and 3D plotting, , building bars and sliders, demonstrations on mathematical problems

Experts: Prof. P K Jain (IIITDM JBP)

1-2	Basics of Matlab, data format, expression of vector and matrix, calculations of derivatives and integrals using Matlab
3	2D and 3D plotting, , building bars and sliders
4-5	Hands-on training of MATLAB software in LAB

Module 2: Review of Laplace transforms, inverse Laplace transform and applications; Unilateral and bilateral Z-transforms; introduction of Fourier transforms, finite and infinite Fourier transforms, discrete Fourier transforms and their applications.

Experts: Prof. Sanjeev Kumar (IIT Roorkee) and Prof. Anil Kumar (IIITDM JBP)

Lectures	Topic to be covered
6-7	Review of Laplace transforms, inverse Laplace transform and applications
8	Unilateral and bilateral Z-transforms
9-10	Introduction of Fourier transforms, finite and infinite Fourier transforms
11-12	Discrete Fourier transforms and their applications
13-15	Hands-on training using Software MATLAB including basics of Matlab

Module 3: Wavelet method, Applications of Signal processing using wavelet method, finite difference methods, spline, cubic spline, B-spline, modified B-splines, BVPs, IVPs and their solutions using aforesaid methods.

Experts: Prof. Mani Mehra (IIT Delhi) and Prof Vivek Agrawal, DTU Delhi)

Lectures	Topics to be covered
16-18	Wavelet method, Applications of Signal processing using wavelet method
19-20	4th order difference methods, cubic spline, B-spline, modified B-splines
21-22	BVPs, IVPs and their solutions
23-25	Hands-on training using Software MATLAB

Module 4: Finite Element Methods and Spectral Methods:

Experts: Prof. V K Gupta (IIITDM JBP) and Prof. L K Balyan (IIITDM JBP)

Lectures	Topics to be covered
26-30	Finite Element Methods and applications in engineering
31	Introduction to global approach method and their comparisons with local approach methods; discretization of the methods
32-33	Spectral methods for periodic problems; Fourier Galerkin methods and Fourier collocation methods
34	Extension of the method for non-periodic methods
35-37	Hands-on training using Software MATLAB

Module 5

Experts: Prof. Deepmala (IIITDM JBP)

Lectures	Topics to be covered
38	Research Methodology and Guidelines on publishing research papers
39	Paper Writing in LaTeX, insertion of figures and tables etc
40	Technical Report Writing

Contact:

Convener

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