Indian Institute of Technology Kharagpur

2022

WEEKEND WORKSHOP

on

Scientific Computing with MATLAB and Octave

3 Weekends (24 hours)

07th May – 22nd May 2022

Civil Engineering

Metallurgical & Materials Engineering

Introduction

The modern STEM curriculum is deemed incomplete without a significant component involving scientific computing. Whether natural or applied sciences, the students and professionals are assumed to have adequate knowledge and skillset in performing technical computations relevant to their domains. Over the last two decades, MATLAB and its open-source counterpart, Octave, have become the *de-facto* tools of technical and scientific computing, particularly when fast-prototyping with large number of built-in tools are desired. MATLAB and Octave are not merely programming languages but complete scientific computing environments with many arrows in their quiver, rendering the high-level programming geared towards scientific goals much more easily accessible to the users.

Program Objectives

This workshop aims at providing a gentle introduction to the fundamental and practical aspects of scientific computing with MATLAB. As many users do not have access to MATLAB, which is proprietary software, the workshop shall also cover Octave programming that has a syntax similar to MATLAB and can be used as an open-source alternative. Both theoretical and hands-on practical aspects shall be covered comprehensively. Besides demonstrating the implementation of numerical algorithms from scratch, the workshop will also include built-in tools for higher-level usage.

This workshop is designed such that it is beneficial to people from various backgrounds, including physics, chemistry, life sciences, and all domains of engineering and technology. The demonstrations will be generic and equally useful to both basic and engineering science users.

What you will learn

Program Content*

- Introduction to MATLAB, Octave and scientific computing
- Index slicing and special matrices; matrix operations and associated functions
- Loops and conditional statements including logical statements
- File input and output including creating 2-D and 3-D plots and movie from a series of plots
- Nuts and bolts of floating point representation in scientific computing
- Creating functions and sub-functions, calling functions, local and global variables
- Interpolation and curve fitting, numerical integration and differentiation
- Solution of linear and non-linear equations through numerical techniques and inbuilt functions/tools
- Playing with randomness and Monte Carlo simulations, Generation of simple random numbers such as uniform, normal, etc.
- Eigenvalue analysis and eigenvectors, simple problems encountered in engineering and science and their solution
- Numerical optimization – unconstrained optimization, Newton method, Descent method
- Solving ordinary differential equations using different methods

*Additional content such as numerical approximation of boundary value problems may be discussed depending on time availability and interest of participants

About IIT Kharagpur

Kharagpur - a dusty town tucked away in the eastern corner of India, famous until 1950 as home to the longest railway platform in the world - became the nursery where the seed of the IIT system was planted in 1951. IIT Kharagpur started its journey in the old Hijli Detention Camp in Eastern India, where some of the country's great freedom fighters toiled and sacrificed their lives for India's independence. Spurred by the success of IIT Kharagpur, four younger IITs sprouted around the country in the two following decades, and from these five came thousands of IITians, the brand ambassadors of modern India. It was the success of this one institution at Kharagpur that wrote India's technological odyssey.

The Institute takes pride in its relentless effort to provide the best platform for both education as well as research in the areas of science and technology, infrastructure designs, entrepreneurship, law, management, and medical science and technology. IITKGP is not just the place to study technology, it is the place where students are taught to dream about the future of technology and beam across disciplines, making differences enough to change the world.

Program Features/ Structure

Theory sessions – **50%**

Demonstration - **50%**

Program Schedule and Venue

3 weekends, 07 May – 22 May 2022

Venue: Online

Platform: MS Teams

Program Fee

For students - INR 1,500 + INR 500 (Application Fee)

For professionals - INR 3,500 + INR 500 (Application Fee)

Who will benefit (Eligibility)

1. For students/faculty of Engineering and Natural Sciences.

2. Industrial researchers keen to learn MATLAB

Last day of Registration

23

April 2022

Accommodation

No accommodation will be provided.

How to Apply

Use the link: **https://erp.iitkgp.ac.in/CEP/courses.htm** to apply ONLINE.

Signup → Login → Profile Fillup → Choose a Program → Apply Now

Payment if applicable is to be done **ONLINE** after getting short listed for the program.

Contact Us

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About the Coordinators

Dr. Amlan Dutta

Dr. Amlan Dutta is an Assistant Professor in the Department of Metallurgical and Materials Engineering, IIT Kharagpur. He has also worked as a scientist at the Dept. of condensed matter physics and material science of the S.N. Bose National Centre for Basic Sciences, Kolkata. His research interests involve atomistic modeling, general scientific computing, data science and materials informatics, theoretical micromechanics of solids, multiscale modeling in materials science, etc. He holds a PhD from the Variable Energy Cyclotron Centre, Dept. of atomic energy, Govt. of India.

Dr. Puneet Kumar Patra

Dr. Puneet Kumar Patra is an Assistant Professor in the Department of Civil Engineering, IIT Kharagpur. Prior to this, he worked as a postdoctoral research scholar in the Department of Biomedical Engineering and Mechanics, Virginia Polytechnic Institute and State University. His research interests include non-equilibrium statistical mechanics, thermodynamics, molecular dynamics simulations and thermal transport characteristics in low dimensional systems. He holds a PhD degree in Mechanics from IIT Kharagpur and a B.Tech. (H) degree in Civil Engineering also from IIT Kharagpur.