

ADD-ON COURSES

Title of the Course : **Introduction to Mathematica for Scientific Computing**
Course Code : **MTHADD 1.4**
Nature of the Course : **ADD-ON Course**
Total Credits : **02 (L=1, T=1, P=2)**
Distribution of Marks : **35 (End Sem) + 15 (In-Sem)**

Course Objectives: The objectives of this Course are-

- Understand the Mathematica environment and syntax.
- Be proficient in using Mathematica for mathematical computations and data analysis.
- Develop skills to visualize complex functions and data.
- Create interactive notebooks and basic applications.

UNITS	CONTENTS	L	T	P	Total Hours
I (5 Marks)	Overview of Mathematica; Navigating the Mathematica environment; Basics of Mathematica syntax; Executing simple commands; Introduction to the notebook interface.	01	01	02	04
II (5 Marks)	Working with variables and functions; Basic arithmetic and algebraic computations; Introduction to Mathematica's built-in functions; Exploring mathematical functions and their properties.	01	01	04	06
III (5 Marks)	Conditional expressions and pattern matching; Loops and iteration methods (For, While, Do); Defining functions and procedures; Local and global variables; Introduction to functional programming with Map, Apply, and Fold.	01	01	04	06
IV (5 Marks)	Importing and exporting data; Data manipulation techniques; Descriptive statistics and data visualization; Working with lists and matrices; Introduction to symbolic computation.	01	01	04	06
V (5 Marks)	Plotting functions and data in 2D and 3D; Customizing plots (labels, legends, colors); Interactive graphics and dynamic visualization; Introduction to geometric computations and graphics.	01	01	04	06
VI (5 Marks)	Creating interactive notebooks with Manipulate; Developing dynamic models and simulations; Introduction to building user interfaces within Mathematica notebooks; Sharing and exporting Mathematica content.	01	01	02	04
VII (5 Marks)	Exploring advanced topics (differential equations, linear algebra, optimization); Application examples from various scientific and engineering fields; Introduction to Mathematica's capabilities in machine learning and data science; Tips for effective	01	01	02	04

	programming and problem-solving in Mathematica.				
	Total	07	07	18	32

Where, **L: Lectures** **T: Tutorials** **P: Practicals**

MODES OF IN-SEMESTER ASSESSMENT: (15 Marks)

- One Internal Examination - **10 Marks**
- Others (any one or more) - **05 Marks**
 - Seminar presentation on any of the relevant topics
 - Assignment
 - Group Discussion
 - Quiz
 - Viva-Voce

LEARNING OUTCOMES:

After the completion of this course, the learner will be able to:

- Execute Mathematica commands and functions for various computations.
- Manipulate and analyze data using Mathematica.
- Visualize data and functions graphically.
- Construct interactive demonstrations using Mathematica's dynamic capabilities.

SUGGESTED READINGS:

- Stephen Wolfram, "An Elementary Introduction to the Wolfram Language", 2015, Wolfram Media.
- Cliff Hastings, Kelvin Mischo, Michael Morrison, "Hands-On Start to Wolfram Mathematica and Programming with the Wolfram Language", 2nd Edition, 2015, Wolfram Media.
- Paul Wellin, "Programming with Mathematica®: An Introduction", 2013, Cambridge University Press.