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| Mathematica Software | |
| Class: B. Sc .III | Level:6 |
| Name of Co-ordinator: Miss. B.R. Tambe | |

Department of Mathematics

1. Title: Mathematica Software
2. Year of implementation: 2020-21

Structure of Skill Development Course

| Level | Theory Hours | Practical Hours | Total Hours | Credits | No. of students in batch |
|-------|--------------|-----------------|-------------|---------|--------------------------|
| 8 | 20 | 30 | 50 | 02 | 30 |

Syllabus

Learning Objectives:

1. Purpose of this course is to show students that mathematical software like Mathematica is relevant to their studies.
2. To introduce Mathematica Software.
3. Aware students about how Mathematical concepts are easy using mathematica.
4. Student should be able to solve mathematical problems using Mathematica software.

Theory Syllabus (20 Hrs)

Unit I: Introduction to Mathematica

- Basics
 - ❖ Structure of Mathematica
 - ❖ Mathematica Kernel
 - ❖ Expression Input and Output

- ❖ Interactive Use of Mathematica
- ❖ Symbolic calculations
- ❖ Numerical Calculations
- ❖ Derivative and partial derivatives of a function
- ❖ Functions and Their Graphs
- ❖ Programming

Unit II: Mathematics with Mathematica

- Algebra
 - ❖ Factoring and Expanding Polynomials
 - ❖ Finding Roots of Polynomials with Solve and NSolve
 - ❖ Solving Equations and Inequalities with Reduce
- Calculus
 - ❖ Computing Limits
 - ❖ The Derivative
 - ❖ Visualizing Derivatives
 - ❖ Higher Order Derivatives
 - ❖ Inflection Points
 - ❖ Differential Equations
 - ❖ Integration
- Multivariable Calculus
 - ❖ Vectors
 - ❖ Dot product and the norm
 - ❖ Cross product
 - ❖ Plotting functions of two variables with plot 3D
- Linear Algebra
 - ❖ Tensors and Arrays
 - ❖ Matrices
 - Entering and editing matrices
 - ❖ Performing Gaussian Elimination
 - ❖ Matrix Operations
 - ❖ Minor and Cofactors
 - ❖ Solving Linear System

❖ Eigenvalues and Eigenvectors

Practical Syllabus (30 Hrs)

List of Experiments: -----24 hr

1. Introduction and structure of Mathematica.
2. Kernel and Input-Output Expression.
3. Symbolic and Numerical Calculations using mathematica.
4. Functions and Graphics.
5. Algebra
6. Study of limits, Derivatives and Integration using Mathematica
7. Study of Vectors and its operations graphically using Mathematica
8. Linear Algebra with Mathematica

Project/ Field Visits/ Industrial Visit-----06 hr

Learning Outcomes:

1. Students learn structure of Mathematica.
2. Students learn about Mathematica kernel and input output expression.
3. Students learn how to calculate symbolic and numerical Calculations using Mathematica.
4. Students are able to understand and plot the graph of functions.
5. Students find limits, derivative, integration of function and also they learn different mathematical concepts via. Matrices their operations, eigenvalues, eigenvectors.

Recommended Books:

1. Bruce F. Torrence, Eve A. Torrence, The Student's Introduction to Mathematica ® A Handbook for Precalculus, Calculus, and Linear Algebra, Second edition (USA, New York: Cambridge University Press, 2009), Page No. 16-44, 298-310, 40-43
2. Kenneth Shiskowski and Karl Frinkle, Principles of Linear Algebra with Mathematica. (Hoboken, New Jersey: John Wiley & Sons, 2011), Page No. 1-96, 147-194, 195-250, 251-332, 335-380

BOS Sub Committee:

3. Miss. B.R. Tambe

External Expert

Dr. S.B. Bhalekar

(Associate Professor, Hyderabad University)