Name of Faculty Mentor	**Atul Kumar Ray**
Novel Engaging CourseTitle	**Basics and Applications of Matheamatica (2000099)**
Objectives of Course	1. To introduce basics of Mathematica 2. To solve Algebraic equations easily with Mathematica 3. To do Integration and Differentiation of real life problems 4. To know the use of Mathematica in statistics and Data analysis 5. To know the application of Mathematica in Science and Engineering
Content	**Introduction of Mathematica**: Basic of Mathematica, Calculations, Parentheses, Brackets, and Braces, Algebraic Manipulation, syntax for defining variable and functions, entering exponents, radicals, and fractions, Special Characters, Piecewise-defined Functions, Abs, Floor, and Mod, Lists, Creating and manipulating Lists, Union and Join, Loops, Creating Table, map and apply, 2 Dimensional and 3 Dimensional Graphics and Plots **Algebra using Mathematica**: Solving Algebraic Equations, finding root of a Polynomial and finding polynomial from Given Root, Methods for finding root, Generating Polynomials, Decomposing Polynomials into their constituent parts, Dividing Polynomials by Other Polynomials, Solving system of linear equations, methods **Calculus using Mathematica**: Computing Limits, working with Piecewise Functions, Using Power Series Representations, Differentiating Functions, Integration, Solving Minima and Maxima Problems, Solving Vector Calculus Problems, Generating Functions and Sequence, Solving DifferentialEquations, Solving Difference Equations, DSolve and NDSolve, **Statistical and Data Analysis**: Computing Common Statistical Metrics of Numerical and Symbolic Data, Generating Pseudorandom Numbers with a Given Distribution, Working with Probability Distributions, Demonstrating the Central Limit Theorem, Covariance and Correlation of Vectors and Matrices, Measuring the Shape of Data, Fitting Data Using a Linear and Nonlinear Model, Creating Interpolation Functions from Data, Testing for Statistically Significant, Difference Between Groups Using ANOVA, Hypothesis Testing with Categorical Data **Few Applications in real life (Science and Engineering)**: Working with Chemical Data, Modeling Predator-Prey Dynamics, modeling a Vibrating String, Modeling Electrical Circuits. **Image Processing**: Extracting Image Information, Converting Images from RGB Color Space to HSV Color Space, Enhancing Images Using Histogram Equalization, **Finite element method**
Contact hrs	30 hrs
Outcomes of Course	After completion of the course, students will be able to: 1. Know the basic syntax of Mathematica 2. Solve Algebraic equations easily with Mathematica 3. Solve differential equations based on real life problems 4. Use concepts of Mathematica in statistics and Data analysis 5. Apply Mathematica in different discipline of Science and Engineering