| | | **National Institute of Technology Meghalaya**<br>An Institute of National Importance | | | | | | **CURRICULUM** | |
|---|---|---|---|---|---|---|---|---|---|

| Programme | **Master of Technology in Mechanical Engineering** | | | | | Year of Regulation | | **2018** | |
|---|---|---|---|---|---|---|---|---|---|
| Department | **Mechanical Engineering** | | | | | Semester | | **I** | |

| Course Code | Course Name | | Credit Structure | | | | Marks Distribution | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | L | T | P | C | INT | MID | END | Total |
| **MA701** | **Advanced Engineering Mathematics** | | 3 | 0 | 0 | 3 | 50 | 50 | 100 | 200 |

| Course Objectives | To provide a depth knowledge of some advanced mathematical approaches of linear algebra, numerical methods and probability theory. | Course Outcomes | CO1 | Able to understand the concept of vectors sapces and linear transformation |
|---|---|---|---|---|
| | | | CO2 | Able to apply numerical methods to solve system of linear equations |
| | To implement mathematical techniques in solving physical problems arises in science and engineering. | | CO3 | Able to understand needs of numerical methods in solving differential equations |
| | | | CO4 | Able to apply numerical techniques to solve initial and boundary value problems |
| | | | CO5 | Able to understand discrete and continuous random variables |
| | | | CO6 | Able to apply theory of probability in real life problems |

**SYLLABUS**

| No. | Content | Hours | COs |
|---|---|---|---|
| I | **Linear Algebra**<br>Vector Space over C, linear independence and basis, linear Transform and matrices, eigenvalues, orthogonality; Linear systems of algebraic equations, Gauss elimination, LU factorization, Pivoting, Cholesky decomposition. | 12 | **CO1, CO2** |
| II | **Numerical Methods**<br>Basic Principles of Numerical Approximation of ODEs, Euler, improved Euler, Runge-Kutta method; Solution of stiff equations; Linear Multistep Methods, Accuracy, Stability; Difference Methods for BVPs, accuracy; Linear Two-Point BVPs; Nonlinear Two-Point BVPs; The Shooting Method, Ansatz Methods for BVPs; Finite difference representation of derivatives (forward, backward and central difference);  Finite difference method for solving Parabolic, Hyperbolic and Elliptic PDE's. | 14 | **CO3, CO4** |
| III | **Probability Theory**<br>Probability, Bayes Theorem, random variables, moment generating function, expectation and its properties, Markov's inequality, Chebyshev's inequality, geometric and binomial distributions. | 10 | **CO5, CO6** |
| | Total Hours | 36 | |

**Essential Readings**

1. K. Hoffman, R. Kunze, "Linear Algebra", PHI Learning, 2nd edition, 2015

2. K. Atkinson, W. Han and D. Stewart, "Numerical Solutions of Ordinary Differential Equations", 1st edition, Wiley, 2011

3. S. M. Ross, "Introduction to Probability Models", Elsevier, 11th edition, 2014

**Supplementary Readings**

1. E. W.Cheney, D. R. Kincaid, "Numerical mathematics & Computating", Cengage, 7th edition, 2013