

## MSUD102: ENGINEERING MATHEMATICS-II

### Credits and Hours:

Teaching Scheme	Theory	Practical	Tutorial	Total	Credit
Hours/week	4	-	-	4	4
Marks	100	-	-	100	

**Prerequisites:** Basic calculus, mean, median, mode, standard deviation, combinatorial probability

### Outline of the course:

Sr. No.	Title of the unit	Minimum number of hours
1	First order and First degree Ordinary Differential Equations	10
2	Higher Order Ordinary Linear Differential Equations	12
3	Partial Differential Equations and Applications	08
4	Matrix Algebra –II	10
5	Improper and Multiple Integrals	12
6	Probability and Statistics	08

**Total hours (Theory): 60**

**Total hours (Lab): 00**

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### Detailed Syllabus:

<b>1</b>	<b>First order and First degree Ordinary Differential Equations</b>	<b>10 Hrs</b>	<b>17%</b>
Formation of Ordinary Differential Equation, Concept of general and particular solution, Initial value problems, Solutions of first order and first degree differential equations: Linear, Bernoulli, Exact and non-exact differential equations			
<b>2</b>	<b>Higher Order Ordinary Linear Differential Equations</b>	<b>12 Hrs</b>	<b>20%</b>
General Solution of Higher Order Ordinary Linear Differential Equations with Constant coefficients, Methods for finding particular integrals viz. variation of parameters and undetermined coefficients, Linear Differential Equation of higher order with variable coefficients: Legendre's Equations (Special case: Cauchy-Euler equation), System of			

simultaneous first order linear differential equations			
<b>3</b>	<b>Partial Differential Equations</b>	<b>08 Hrs</b>	<b>13%</b>
Formation of Partial Differential Equation, Lagrange's Linear Differential Equations, Special types of Nonlinear First Order Partial Differential Equation			
<b>4</b>	<b>Matrix Algebra –II</b>	<b>10 Hrs</b>	<b>17%</b>
Revision of matrices and determinant, Eigenvalues and Eigenvectors of matrices, Eigenvalues and Eigenvectors of special matrices, Cayley-Hamilton's Theorem and its applications, Crout's method of LU decomposition			
<b>5</b>	<b>Improper and Multiple Integrals</b>	<b>12 Hrs</b>	<b>20%</b>
Introduction to Improper integrals, Definitions and properties of Gamma, Beta and Error functions, Evaluation of double integrals, Change of order of double integration, Transformation to polar coordinates, Applications of double integrals: Area, Evaluation of triple integrals, Transformation cylindrical coordinates, Applications of triple integrals: Volume			
<b>6</b>	<b>Probability and Statistics</b>	<b>08 Hrs</b>	<b>13%</b>
Elementary Probability: Joint and Conditional probability and Bayes theorem, Discrete Probability Distributions: Binomial and Poisson, Continuous Probability Distributions: Exponential and Normal			

### Course Outcome (COs):

At the end of the course, the students will be able to

CO1	formulate models of natural phenomena using differential equations and find its solution using standard methods
CO2	identify, analyze and subsequently solve physical problems analytically whose behaviour can be described by linear and nonlinear differential equations.
CO3	find and explain significant of Eigenvalues and Eigenvectors of a square matrix, use Cayley-Hamilton's theorem to find inverse and power of a square matrix, construct LU decomposition of a square matrix.
CO4	use advanced techniques to evaluate improper integrals, apply multiple integrals to find area and volume in engineering field.
CO5	understand and solve the problems using probability axioms, rules and Bayes theorem, use distributions such as Binomial, Poisson, Exponential and Normal to solve real world problems.

### Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1	-	-	-	-	-	-	-	-	-	-	-
CO2	3	2	1	-	-	-	-	-	-	-	-	-	-	-
CO3	3	1	-	-	-	-	-	-	-	-	-	-	-	-

CO4	3	1	-	-	-	-	-	-	-	-	-	-	-	-
CO5	2	2	1	2	1	1	1	-	-	-	-	-	-	-

Correlation levels 1, 2 or 3 as defined below:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

### Recommended Study Material:

#### ❖ Text Books:

1. Erwin Kreyszig; Advanced Engineering Mathematics, 8<sup>th</sup> Ed., Jhon Wiley & Sons, India, 1999.
2. H. K. Dass and Rajnish Verma; Higher Engineering Mathematics, S Chand & Co Pvt. Ltd.
3. Sheldon Ross; A first course in probability. Pearson, 2014.
4. B. S. Grewal; Higher Engineering Mathematics, Khanna Publ., Delhi, 2012

#### ❖ Reference Books:

1. M. D. Weir et al; Thomas' Calculus, 11<sup>th</sup> Ed., Pearson Education, 2008.
2. James Stewart; Calculus Early Transcendental, 5<sup>th</sup> Ed., Thomson India, 2007
3. C. R. Wylie and L. C. Barrett; Advanced Engineering Mathematics. 1982, McGraw-Hill Book Company.
4. Michael D. Greenberg; Advanced engineering mathematics. Prentice-Hall, 1988.
5. R. V. Hogg, E. A. Tanis and D. L. Zimmerman; Probability and Statistical Inference, 9th edition, Prentice Hall, 2015.
6. Zafar Ahsan; Differential Equations and Their Applications, φ Learning, Pvt Ltd, Third Edition (2017).

#### ❖ URL Links:

1. <http://nptel.ac.in/courses/122107037/>
2. <http://nptel.ac.in/courses/111107108/>
3. <http://nptel.ac.in/courses/122103012/>
4. <http://nptel.ac.in/courses/122104018/>
5. <http://nptel.ac.in/courses/111106100/>
6. <http://nptel.ac.in/courses/122101003/>
7. <https://ocw.mit.edu/courses/mathematics/18-02-multivariable-calculus-fall-2007/lecture-notes/>
8. <https://nptel.ac.in/courses/111105041/>