Program: B Tech All Program [except CSBS, CSE(DS) 311 (VT)] MBA Tech All Program				**Semester :** I/ II	
Course: Linear Algebra and Differential Equations				**Code:**	
Teaching Scheme				**Evaluation Scheme**	
Lecture (Hours per week)	**Practical (Hours per week)**	**Tutorial (Hours per week)**	**Credit**	**Internal Continuous Assessment (ICA) (Marks - 50)**	**Term End Examinations (TEE) (Marks- 100)**
3	0	1	4	Marks Scaled to 50	Marks Scaled to 50

Pre-requisite: Knowledge of fundamental concepts in Algebra, Differential and Integral Calculus.

Course Objective

This course aims to instil in prospective engineers knowledge of concepts and techniques in Linear
Algebra and Differential Equations. It also prepares the students to deal with advanced level of Mathematics and applications that would be essential for their disciplines.

Course Outcomes

After completion of the course, students will be able to-

1. Demonstrate understanding of the fundamental concepts of Linear Algebra and carry out related computational skills
2. Use effective mathematical methods for solving Differential Equations
3. Analyse functions, matrices and equations
4. Apply Calculus techniques and Algebraic skills to solve real life problems

Detailed Syllabus

Unit	Description	Duration
1.	**Linear Equations and Vector Spaces** Rank of Matrix, System of linear equations, Vector space, Subspace of vector space, Linear span, Linear independence and dependence, Basis, Dimension.	10
2.	**Linear Transformation and Eigenvalues** Linear transformation, Matrix associated with linear transformation, Composition of linear maps, Kernel and Range of a linear map, Rank- Nullity Theorem, Inverse of a linear transformation, Cayley- Hamilton Theorem, Eigenvalues, Eigenvectors, Eigenvalues of symmetric, skew- symmetric, Hermitian and Skew-Hermitian matrices, Diagonalization, Orthogonal	12

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	Diagonalization of a real symmetric matrix.	
3.	**First order Ordinary Differential Equations** Exact equations, Equations reducible to exact equations using integrating factors, Linear equations, Bernoulli equation, Orthogonal trajectories.	05
4.	**Higher order Ordinary Differential Equations** Higher order linear differential equations with constant coefficients, operator method, undetermined coefficients, Wronskian, variation of parameters method, Euler-Cauchy equation, power series solution: Example - Legendre and Bessel Differential Equations.	12
5.	**Partial Differential Equations** Introduction, Formation of Partial Differential Equations, Classification of second order Partial Differential Equations, Integrals of Partial Differential Equations, Solutions of Partial Differential Equations by the Method of Direct Integration, separation of variables method to simple problems in Cartesian coordinates, Initial & boundary value problems and solutions by separation of variables.	06
	Total	**45**

Text Books

1. B.V. Ramana, *Higher Engineering Mathematics*, 1st Edition , McGraw Hill Education, 2017.
2. B.S. Grewal, *Higher Engineering Mathematics*, 44th Edition, Khanna Publishers, 2017.
3. D. Poole, *Linear Algebra: A Modern Introduction*, 3rd Edition , Brooks/Cole, 2010.

Reference Books

1. G. B. Thomas, *Calculus*, Pearson, 13th Edition 2014.
2. Veerarajan T, *Engineering Mathematics- I*, 1st Edition, McGraw-Hill Education, 2016.
3. Erwin Kreyszig, *Advanced Engineering Mathematics*, 10th Edition ,Wiley India, 2017.
4. G. Strang, *Introduction to linear algebra*, 5th Edition, Wellesley Cambridge Press, 2016.
5. G. F. Simmons, *Differential equations with applications and historical notes*, 2nd Edition McGraw- Hill Education, 2017.
6. W. E. Boyce and R. C. DiPrima, *Elementary Differential Equations and Boundary*

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Value Problems, 9th Edition, ,Wiley India, 2015.
7. S.L. Ross, *Differential Equations*, 3rd Edition,Wiley India, 2016
8. H. K. Dass, *Advanced Engineering Mathematics*, 22nd Edition ,S. Chand, 2019.

Tutorial Work
8 to 10 Tutorial exercises based on the syllabus.

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