

Linear Algebra and Ordinary Differential Equations

Semester No 2	Code MATH-121	Credit Hours 3-0
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COURSE DESCRIPTION:

The objective of the course is to develop an understanding of Linear Algebra & Ordinary Differential Equations.

TEXT AND MATERIAL

Textbooks: D. G. Zill and W. S. Wright, Advanced Engineering mathematics (5th edition)- (Chapter 1 to 4, 7, 8).

PREREQUISITE:

MATH-101 Calculus and Analytic Geometry

COURSE LEARNING OUTCOMES:

Upon successful completion of the course, the student should be able to:

No	CLO	PLO	Level of Learning
1	Define and demonstrate properties of matrices used to solve systems of linear equation	PLO 2	C3
2	Solve first and higher-order ODEs using conventional methods	PLO 2	C3
3	Apply the Laplace transform to solve initial value problems	PLO 2	C3

ASSESSMENT SYSTEM:

Quizzes	10-15%
Assignments	5-10%
OHTs	30-40%
ESE	40-50%

TOPICS COVERED WITH THEIR CONTRIBUTION TO PLOs:

Week No	Ref	Description	Quizzes	Assignment	CLO No
1-2	Introduction of Linear Algebra 8.1 8.2 8.4, 8.5, 8.7	<ol style="list-style-type: none"> 1. Course outline, objectives, teaching plan and assessment methods 2. Matrix algebra 3. System of linear algebraic equations 4. Determinants and Cramer's rule 5. Inverse of a matrix. 	02	01	1
3-4	Vector Spaces 7 . 6	Subspaces, linear dependence/independence, basis & dimension Inner product spaces.			
5-6	Eigenvalues and Eigenvectors 8.8	<ul style="list-style-type: none"> • Eigenvalues and Eigenvectors 			
7	OHT-1				
8-9	First Order Ordinary Differential Equations 1.1 1.2 1.3	Introduction to differential equations (Definitions and terminology; initial value problems) Separable equations	02	01	2
10-11	2.4 2.3 2.5 2.7-2.8	<ul style="list-style-type: none"> • Exact equations • Linear equations • Solution by substitutions (Homogeneous, reducible to separable equations & Bernoulli equations) • Linear/Nonlinear models (Applications of linear and non-linear first order ODEs). 			

12	Linear Differential Equations of Higher Order 3.1 3.2 3.3	Preliminary theory, IVP, BVP, Linear dependence and linear independence. Constructing a second solution from a known solution Homogeneous linear equations with constant coefficients			
13	OHT-2				
14	Non-Homogeneous Linear Equations 3.4 3.5 3.6	Non-Homogeneous linear equations with constant coefficients <ul style="list-style-type: none"> • Undetermined coefficients. • Variation of parameters. • Non-Homogeneous linear equations with variable coefficients • Cauchy-Euler equation 	02	01	3
15	Laplace Transform 4.1-4.2	Laplace transform and inverse transform			
16	Laplace Transform 4.3 -4.4	<ul style="list-style-type: none"> • Translation theorems and derivatives of a transform • Applications of Laplace transforms 			
17	Course Overview	Revision			
18	END SEMESTER EXAMINATION				