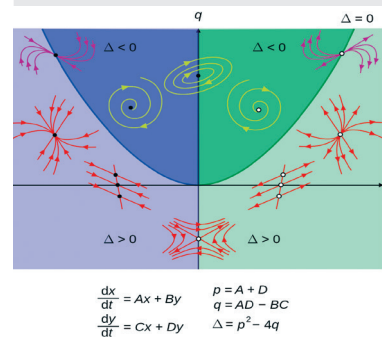


# 22BEAS101 ORDINARY DIFFERENTIAL EQUATIONS AND LINEAR ALGEBRA

Hours Per Week :

L	T	P	C
1	2	2	3



Source: <https://www.study24x7.com/article/1227/how-to-prepare-for-engineering-mathematics-for-gate>

**PREREQUISITE KNOWLEDGE:** Basics of differentiation and integration.

## COURSE DESCRIPTION AND OBJECTIVES:

The goal of this course is to determine the rates of change or rates by which factors, such as acceleration or weight, change. To impart analytical ability in solving mathematical problems as applied to the respective branches of engineering.

## MODULE-1

### UNIT-1

4L+8T+8P=20 Hours

#### ORDINARY DIFFERENTIAL EQUATIONS:

**First Order Differential Equations:** Order and degree of a differential equation, Variable Separable method (review) Linear differential equations, Bernoulli's differential equations, Exact and non-exact differential equations.

**Higher Order Differential Equations:** Linear differential equations with constant coefficients, method of variation of parameters.

### UNIT-2

4L+8T+8P=20 Hours

#### APPLICATIONS AND NUMERICAL METHODS FOR ODE:

Applications of ODE: Newton's law of cooling, Law of natural growth and decay, LR circuits.

Numerical Methods for ODE: Taylor series method, Picard's method, Euler's and modified Euler's method, 4th order Runge-Kutta method.

#### PRACTICES:

- Compute inverse of a matrix if exists.
- Explain with suitable examples how rank of matrix is independent of the elementary operations.
- Explain with suitable examples how rank of matrix is unique.
- Discuss with suitable examples when eigen values and eigen vectors are possible for a matrix.
- Discuss the possibility of solution of a system of equations.
- Discuss when inverse and power of a matrix exist using Cayley-Hamilton theorem.

## MODULE-2

### UNIT 1

4L+8T+8P=20 Hours

#### MATRICES:

Rank of a matrix, Echelon form, Normal form, PAQ form, Gauss Elimination method, Gauss-Jordan method, Finding Eigen values and Eigen vectors, Linear Transformation: Definition and Examples, Orthogonal transformation: Definition and Examples. Second Order Differential Equations

**SKILLS:**

- ✓ Find rank of a matrix using different methods.
- ✓ Compute the eigen values and eigen vectors of a matrix.
- ✓ Find analytical solution of a differential equation using appropriate method.
- ✓ Demonstrate any one numerical method to solve differential equation.

**UNIT 2****4L+8T+8P=20 Hours****APPLICATION OF MATRICES:**

Finding Inverse of a matrix by Gauss-Jordan method, Consistency of System of linear equations, Cayley-Hamilton theorem (without proof), Power of a matrix, Diagonalization of a matrix, Quadratic forms.

**PRACTICES:**

- When inverse of a matrix exist and find it.
- How does rank of matrix is independent of the elementary operations? Explain with suitable examples.
- How does rank of matrix is unique, explain with suitable examples.
- When eigen values and eigen vectors are possible for a matrix? Discuss with suitable examples.
- Discuss the possibility of solution of a system of equations.
- Discuss when inverse and power of a matrix exist using Cayley-Hamilton theorem.

**COURSE OUTCOMES:**

Upon successful completion of this course, students will have the ability to:

CO No.	Course Outcomes	Blooms Level	Module No.	Mapping with POs
1	Apply the analytical method for solving differential equations and applications.	Apply	1	1, 2, 9, 12
2	Apply differential equations in real life problems.	Apply	1	1, 2, 9, 12
3	Apply the concepts of rank, eigen values and eigenvectors of a matrix and finding inverse of a matrix and powers of a matrix.	Apply	2	1, 2, 9, 12
4	Analyze the solution of a system of linear equations and find it.	Analyze	2	1, 2, 9, 12

**TEXT BOOKS:**

1. N. P. Bali, K. L. Sai Prasad, "A Textbook of Engineering Mathematics I, II, III", 2nd Edition Universal Science Press, New Delhi, 2018.
2. B. S. Grewal, "Higher Engineering Mathematics", 44 Edition, Khanna Publishers, 2018.

**REFERENCE BOOKS:**

1. Erwin Kreyszig, "Advanced Engineering Mathematics", 10th Edition, John Wiley & Sons, Inc, 2015.
2. H. K. Dass and Er. Rajanish Verma, "Higher Engineering Mathematics", 3rd revised edition, S. Chand & Co., 2015.
3. B. V. Ramana, "Advanced Engineering Mathematics", TMH Publishers, 2020.
4. T. K.V. Iyengar et al, "Engineering Mathematics, I, II, III", S. Chand & Co., New Delhi, 2018.