



# VAAGDEVI COLLEGE OF ENGINEERING

Autonomous

Bollikunta, Khila Warangal (Mandal) Warangal Urban -506005(T.S), [www.vaagdevi.edu.in](http://www.vaagdevi.edu.in)

## DEPARTMENT OF MATHEMATICS

### BOARD OF STUDIES MEETING (2022-2023)

Minutes of meeting of Board of Studies in Mathematics Department held on 07 /11/2022 at 2:00pm

## DEPARTMENT OF MATHEMATICS

S. No	Name with Details	Designation	Phone & Email	Sign
1	Dr. Shafeurrahman Md. Head, Dept. of Mathematics VCE, Warangal.	Chairperson	9866127025 <a href="mailto:Mohmads@vaagdevi.edu.in">Mohmads@vaagdevi.edu.in</a> <a href="mailto:rahaman16@gmail.com">rahaman16@gmail.com</a>	
2	Dr. M.A. Srinivas Prof. of Mathematics, JNTUH CEH	Member (Subject Expert)	9490745460 <a href="mailto:massrinivas@jntuh.ac.in">massrinivas@jntuh.ac.in</a> <a href="mailto:massrinivas@gmail.com">massrinivas@gmail.com</a>	
3	Dr K. Somaiah , <i>Asst. stant</i> Professor, Head, Dept. of Mathematics Kakatiya University	Member (Subject Expert)	9849571898 <a href="mailto:ms.somumaths@gmail.com">ms.somumaths@gmail.com</a>	
4	Dr.M. Srinivas Asst.professor Dept. of Mathematics VCE, Warangal.	Member	<i>9666220166</i> 9866127025 <a href="mailto:Sri.srinivaswgl@gmail.com">Sri.srinivaswgl@gmail.com</a>	
5	Mr. T Santhosh Asst.professor Dept. of Mathematics VCE, Warangal.	Member	9849556765 <a href="mailto:santhosh_t@vaagdevi.edu.in">santhosh_t@vaagdevi.edu.in</a> <a href="mailto:thotasanthosh@yahoo.co.in">thotasanthosh@yahoo.co.in</a>	

The following decisions are taken:

- Approved the syllabi of following courses offered to B.Tech program under (R 22 – Regulations).
  - a. Matrices and Calculus
  - b. Ordinary Differential Equations and Vector Calculus

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B22MA01

## MATRICES AND CALCULUS

L T P C  
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**Course Objectives:** To learn

- Types of matrices and their properties.
- Concept of a rank of the matrix and applying this concept to know the consistency and solving the system of linear equations.
- Concept of eigen values and eigenvectors and to reduce the quadratic form to canonical form
- Geometrical approach to the mean value theorems and their application to the mathematical problems
- Evaluation of surface areas and volumes of revolutions of curves.
- Evaluation of improper integrals using Beta and Gamma functions.
- Partial differentiation, concept of total derivative
- Finding maxima and minima of function of two and three variables.
- Evaluation of multiple integrals and their applications

### UNIT - I: Matrices

10 L

Rank of a matrix by Echelon form and Normal form, Inverse of Non-singular matrices by Gauss-Jordan method, System of linear equations: Solving system of Homogeneous and Non-Homogeneous equations by Gauss elimination method, Gauss Seidel Iteration Method.

### UNIT - II: Eigen values and Eigen vectors

10 L

Linear Transformation and Orthogonal Transformation: Eigen values, Eigenvectors and their properties, Eigen values and Vectors with reference to Symmetric, Skew-symmetric, Hermitian, Skew-Hermitian, orthogonal and Unitary Matrices. Diagonalization of a matrix, Cayley-Hamilton Theorem (without proof), finding inverse and power of a matrix by Cayley-Hamilton Theorem, **Quadratic Forms:** Quadratic forms and Nature of the Quadratic Forms, Reduction of Quadratic form to canonical forms.

### UNIT - III: Calculus

10 L

**Mean value theorems:** Rolle's theorem, Lagrange's Mean value theorem with their Geometrical, Interpretation and applications, Cauchy's Mean value Theorem, Taylor's Series. Applications of definite integrals to evaluate surface areas and volumes of revolutions of curves (Only in Cartesian coordinates),

**Beta and Gamma Functions:** Introduction to Improper Integrals, Definition of Beta and Gamma functions, properties and other forms. Relation between Beta and Gamma functions. Evaluation of Improper integrals using Beta and Gamma functions

### UNIT - IV: Multivariable Calculus (Partial Differentiation and applications) 10 L

Definitions of Limit and continuity. Partial Differentiation: Euler's Theorem, Total derivative, Jacobian, Functional dependence & independence. Applications: Maxima and minima of functions of two variables and three variables using method of Lagrange multipliers.

### UNIT-V: Multivariable Calculus (Integration)

8 L

Evaluation of Double Integrals (Cartesian and polar coordinates), change of order of integration (only Cartesian form), Evaluation of Triple Integrals: Change of variables (Cartesian to polar) for double and (Cartesian to Spherical and Cylindrical polar coordinates) for triple integrals.

1 Dr. Shafeurrahman Md.

2 Dr. M. A. Srinivas

3 Dr. K. Somaiah

4 Dr. M. Srinivas

5 Mr. T. Santhosh

**Course outcomes:** After learning the contents of this paper the student must be able to

- Write the matrix representation of a set of linear equations and to analyse the solution of the system of equations
- Find the Eigen values and Eigen vectors
- Reduce the quadratic form to canonical form using orthogonal transformations.
- Solve the applications on the mean value theorems.
- Evaluate the improper integrals using Beta and Gamma functions
- Find the extreme values of functions of two variables with/ without constraints.
- Evaluate the multiple integrals and apply the concept to find areas, volumes

**TEXT BOOKS:**

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010.
2. R.K. Jain and S.R.K. Iyengar, Advanced Engineering Mathematics, Narosa Publications, 5th Edition, 2016.

**REFERENCE BOOKS:**

1. Erwin kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
2. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson, Reprint, 2002.
3. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2008.
4. H. K. Dass and Er. Rajnish Verma, Higher Engineering Mathematics, S Chand and Company Limited, New Delhi.



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## B22MA02 ORDINARY DIFFERENTIAL EQUATIONS AND VECTOR CALCULUS

L T P C

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### Course Objectives: To learn

- Methods of solving the differential equations of first and higher order.
- Concept, properties of Laplace transforms
- Solving ordinary differential equations using Laplace transforms techniques.
- The physical quantities involved in engineering field related to vector valued functions
- The basic properties of vector valued functions and their applications to line, surface and volume integrals

### UNIT-I: First Order ODE

8 L

Exact differential equations, Equations reducible to exact differential equations, linear and Bernoulli's equations, Orthogonal Trajectories (only in Cartesian Coordinates). Applications: Newton's law of cooling, Law of natural growth and decay.

### UNIT-II: Ordinary Differential Equations of Higher Order

10 L

Second order linear differential equations with constant coefficients: Non-Homogeneous terms of the type  $e^{ax}$ ,  $\sin ax$ ,  $\cos ax$ , polynomials in  $x$ ,  $e^{ax}V(x)$  and  $xV(x)$  method of variation of parameters, Equations reducible to linear ODE with constant coefficients: Legendre's equation, Cauchy-Euler equation. Applications: Electrical Circuits (Both first and second order).

### UNIT-III: Laplace transforms

10 L

Laplace Transforms: Laplace Transform of standard functions, First shifting theorem, Second shifting theorem, Unit step function, Dirac delta function, Laplace transforms of functions when they are multiplied and divided by 't', Laplace transforms of derivatives and integrals of function, Evaluation of integrals by Laplace transforms, Laplace transform of periodic functions, Inverse Laplace transform by different methods, convolution theorem (without proof). Applications: solving differential equations with constant coefficients with given conditions by Laplace Transform method.

### UNIT-IV: Vector Differentiation

10 L

Vector point functions and scalar point functions, Gradient, Divergence and Curl, Directional derivatives, Vector Identities (without proofs) Tangent plane and normal line, Scalar potential functions, Solenoidal and Irrotational vectors.

### UNIT-V: Vector Integration

10 L

Line, Surface and Volume Integrals, Theorems of Green, Gauss and Stokes (without proofs) and their applications.

  
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**Course outcomes:** After learning the contents of this paper the student must be able to

- Identify whether the given differential equation of first order is exact or not
- Solve higher differential equation and apply the concept of differential equation to real world problems.
- Use the Laplace transforms techniques for solving ODE's.
- Extend the basic concepts of differential calculus to vector functions in a simple and natural fashion.
- Evaluate the line, surface and volume integrals and converting them from one to another ,

**TEXT BOOKS:**

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010
2. R.K. Jain and S.R.K. Iyengar, Advanced Engineering Mathematics, Narosa Publications, 5th Edition, 2016.

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1. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
2. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson, Reprint, 2002.
3. H. K. Dass and Er. Rajnish Verma, Higher Engineering Mathematics, S Chand and Company Limited, New Delhi.
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