With effect from: 2023-24 (R-23)

VASAVI COLLEGE OF ENGINEERING (AUTONOMOUS)

Accredited by NAAC with A++ Grade

9-5-81, Ibrahimbagh, Hyderbad-500031, Telangana State

DEPARTMENT OF MATHEMATICS

MATRICES & CALCULUS for B.E., I- Sem., (CBCS)
(Common to Civil, EEE, ECE and Mech)

Instruction : 3 +1 Hours per week	Sem. End Exam Marks:60	Subject Reference Code:**U23BS110MA**
Credits: 3	Sessional Marks:40	Duration of Semester End Exam : 3 Hrs

COURSE OBJECTIVES	COURSE OUTCOMES
The course will enable the students to:	***At the end of the course students should be able to:***
1. Study the concepts of rank of a matrix, System of linear equations and LU-Decomposition method. **2. Learn** the concepts of Eigen values and Eigen vectors, Diagonalization of a matrix **3. Understand** the concepts of curvature, radius of curvature, evolutes and to expand functions using Taylor's series. **4. Acquire** the knowledge of partial derivatives and expand functions of two real variables using Taylor's series and maxima - minima. **5. Identify** the nature of an infinite series using various tests.	**1. Find** the rank of a given matrix and solution of a system by LU-Decomposition method. **2. Apply** the similarity transformation to diagonalize a matrix. **3. Compute** the radius of curvature, evolute of a given curve and to expand given function using Taylor's series. **4. Expand** the given function in terms of Taylor's series and find the maxima and minima of functions of several variables also using Lagrange's method of multipliers. **5. Apply** an appropriate test to check the nature of an infinite series.

UNIT- I (10 classes)

MATRICES-I

Rank of a Matrix- Echelon form - Normal Form - Linearly Dependence and Independence of Vectors– Consistency and Inconsistency of Homogeneous and Non-Homogenous system of linear equations – LU-Decomposition method.

UNIT –II (10 classes)

MATRICES-II

Characteristic equation- -Eigen values and Eigenvectors - Cayley - Hamilton Theorem (without proof) - Diagonalization using Similarity Transformation-Reduction of Quadratic from to Canonical form.

UNIT – III(08classes)

DIFFERENTIAL CALCULUS

Taylor's Series – Maclaurin's Series - Curvature - Radius of Curvature – Centre of Curvature – Evolutes (Cartesian and Parametric forms of the curves).

UNIT – IV (12 classes)

MULTIVARIBLE CALCULUS

Limits- Continuity (Concepts) - Partial Derivatives - Higher Order Partial Derivatives - Total Derivates - Derivatives of Composite and implicit functions - Taylor's series of functions of two variables - Maxima and Minima of functions of two variables - Lagrange's Method of multipliers.

UNIT-V (08 classes)

INFINITE SERIES

Definition of Sequence, Convergence of sequence. Series – Convergence and Divergence- Series of positive terms-Geometric series- P-series test - Comparison tests – Limit comparison test-D'Alemberts Ratio Test – Cauchy's root test - Alternating Series – Leibnitz test – Absolute and Conditional convergence.

Text Books:

1 Advanced Engineering Mathematics, Third Edition, R. K. Jain and S. R. K. Iyengar, Narosa Publishing House.
2 Higher Engineering Mathematics, B. S. Grewal 40th. Edition, Khanna Publishers.

Reference Books:

1 Advanced Engineering Mathematics 8th Edition by Erwin Kreyszig , John Wiley & Sons.
2 Differential Calculus by Shanti Narayan S. Chand & Co
3 Vector Calculus – Schaum's outline series.

Online Resources :

1 **http://mathworld.wolfram.com/topics**
2 **http://www.nptel.ac.in/course.php**
3 **https://www.coursera.org/in**

The break-up of CIE : Internal Tests + Assignments + Quizzes

1	No. of Internal Tests	: 2	Max. Marks for each Internal Tests	:	30
2	No. of Assignments	: 3	Max. Marks for each Assignment	:	5
3	No. of Quizzes	: 3	Max. Marks for each Quiz Test	:	5
	Duration of Internal Tests	: 90 Minutes			

Prof.N.Kishan
(OU Nominee)

Prof.M.A.Srinivas
(Subject Expert-JNTU-H)

Dr.T.Sudhakar Rao
(Chairman, BOS)

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DEPARTMENT OF MATHEMATICS

CALCULUS & LINEAR ALGEBRA for B.E., I- Sem., (CBCS)
(Common to CSE, CSE-AIML & IT)

Instruction: 3 +1 Hours per week	**Sem. End Exam Marks** : 60	**Subject Reference Code:U23BS120MA**
Credits : 3	**Sessional Marks:** 40	**Duration of Semester End Exam** : 3 Hrs

COURSE OBJECTIVES	**COURSE OUTCOMES**
The course will enable the students to:	***At the end of the course students should be able to:***
1. Understand the concepts of curvature, radius of curvature, evolutes and to expand functions using Taylor's series.	**1. Compute** the radius of curvature, evolute of a given curve and expand given function using Taylor's series.
2. Acquire the knowledge of partial derivatives and expand functions of two real variables using Taylor's series and maxima - minima.	**2. Expand** the given function in terms of Taylor's series and find maxima and minima of functions of several variables also using Lagrange's method of multipliers.
3. Study the concept of Vector Spaces, Subspaces, Linear Span, Linear Dependence and Independence of vectors.	**3. Solve** the problems on Vector Spaces and Linear Dependence and Independence of vectors. Also determine the Basis and Dimension of a Vector Space and find the Co-ordinates.
4. Understand the meaning of Linear transformation, range and Kernel, Rank-Nullity and Matrix of Linear Transformation.	**4. Determine** Linear Transformation, Range and Kernel and Matrix of Linear Transformation.
5. Study the concepts of matrices, Eigen values and Eigen vectors, Diagonalization and learn Inner Product Spaces, Orthonormal sets, Gram-Schmidt's Orothonormalization process.	**5. Find** the rank of a given matrix, diagonalizable a matrix also determine distance using Inner product space and construct Orthonormal basis using Gram-Schmidt's Orothonormalization process

UNIT- I (08 classes)

DIFFERENTIAL CALCULUS

Taylor's Series – Maclaurin's Series – Curvature - Radius of Curvature – Centre of Curvature – Evolutes. (Cartesian and Parametric co-ordinates)

UNIT –II (12classes)

MULTIVARIABLE CALCULUS

Limits- Continuity (Concepts) - Partial Derivatives - Higher Order Partial Derivatives - Total Derivates - Derivatives of Composite and implicit functions - Taylor's series of functions of two variables - Maxima and Minima of functions of two variables - Lagrange's Method of multipliers.

UNIT-III: (12 classes)

VECTOR SPACES

Definition of Vector Space - Vector Subspaces –Linear Dependence and Independence of vectors- Span of a set of vectors-The null space and column space of a matrix-Basis of a Vector Space –Dimension of a Vector Space –Co-ordinates.

UNIT-IV (12 classes)

LINEAR TRANSFORMATIONS

Introduction to Linear Transformations- The null space and range of a linear map – Dimension of null space and range space - Rank -Nullity theorem (without proof)-Matrix of a linear transformation.

UNIT-V (08 classes)

MATRICES AND INNER PRODUCT SPACES

Rank of a Matrix- Characteristic equation- -Eigen values and Eigenvectors- Similarity Transformation -Diagonalization using Similarity Transformation- Inner Product Space-Gram-Schmidt's Orthonormalization process.

Text Books:

1. Advanced Engineering Mathematics, Third Edition, R. K. Jain and S. R. K. Iyengar, Narosa Publishing House.
2. Higher Engineering Mathematics, B. S. Grewal 40th. Edition, Khanna Publishers.
3. Introduction to linear algebra with applications, Jim DeFranza, Daniel Gagliardi, Tata McGraw-Hill
4. Operational Mathematics by R.V. Churchill, Mc Graw-Hill Book Company, INC.

Reference Books:

1. Advanced Engineering Mathematics 8th Edition by Erwin Kreyszig , John Wiley & Sons.
2. Differential Calculus by Shanti Narayan S. Chand & Co
3. Elementary Linear algebra, Anton and Rorres, Wiley India Edition
5. An introduction to Linear Algebra, V.P Mainra, J.L Arora, Affiliated to East-West Press Pvt Ltd

Online Resources :

1. **http://mathworld.wolfram.com/topics**
2. **http://www.nptel.ac.in/course.php**
3. **https://www.coursera.org/in**
4. **https://codingthematrix.com**

The break-up of CIE : Internal Tests + Assignments + Quizzes

1	No. of Internal Tests	:	2	Max. Marks for each Internal Tests	:	30
2	No. of Assignments	:	3	Max. Marks for each Assignment	:	5
3	No. of Quizzes	:	3	Max. Marks for each Quiz Test	:	5
	Duration of Internal Tests	:	90 Minutes			

24-06-23

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DEPARTMENT OF MATHEMATICS

DIFFERENTIAL EQUATIONS & VECTOR CALCULUS for B.E., II- Sem., (CBCS)
(Common to Civil, EEE, ECE, Mech)

Instruction:3+1 Hours per week	Semester End Exam Marks:60	Subject Reference Code: **U23BS210MA**
Credits : 3	Sessional Marks: 40	Duration of Semester End Exam : 3 Hrs

COURSE OBJECTIVES	COURSE OUTCOMES
The course will enable the students to :	***At the end of the course students should be able to:***
1. Study the concepts of vector differentiation.	**1. Find** the gradient of a scalar point function, divergence and curl of vector field and its applications.
2. Learn how to evaluate double and triple integrals and Study the concepts of vector integration.	**2. Apply** the concepts of multiple integrals to evaluate area, volume and vector integral theorems
3. Learn to Solve the first order differential equations and its applications.	**3. Solve** the first order differential equations, model the real time engineering problems viz., RC& LR Circuits into differential equations.
4. Learn to Solve the various higher order homogeneous and non-homogeneous linear differential equations with constant coefficients and its applications.	**4. Solve** the higher order Linear Differential equations; model the real time engineering problems.
5. Understand the concepts of Beta, Gamma functions and Error function	**5. Evaluate** Improper integrals using Beta, Gamma functions

UNIT – I (10 classes)

ORDINARY DIFFERENTIAL EQUATIONS OF FIRST ORDER

Exact first order differential equations - Integrating factors - Clairaut's equation - Applications: Orthogonal trajectories (Cartesian families), LR and RC Circuits

UNIT – II (12 classes)

HIGHER ORDER LINEAR DIFFERENTIAL EQUATIONS

Solutions of Homogeneous and Non-Homogeneous linear equations with constant coefficients: Complimentary function & Particular Integral-Method of Variation of Parameters. LCR circuits

UNIT – III (10 classes)

SPECIAL FUNCTIONS

Definition of Improper Integrals. Beta function , Gamma function , Relations between Beta & Gamma function ,Properties of Beta and Gamma functions.

UNIT – IV (10 classes)

MULTIPLE INTEGRALS

Double and Triple integrals (Cartesian) - Change of order of integration (Cartesian Coordinates)- Jacobian for two variables - Change of the Variables (Cartesian to polar Coordinates).

UNIT – V (12 classes)

VECTOR CALCULUS

Scalar and Vector point function and their derivatives - Level Surface - Gradient of a scalar point function - Normal to a level surface - Directional Derivative – Divergence and Curl of a Vector Field –Solenoidal and Irrotational vectors- Line integral - Green's Theorem (Without proof) - Conservative vector field

Text Books:

1. Advanced Engineering Mathematics 3rd Edition, R.K.Jain&S.R.K.Iyengar, Narosa Publishing House.
2. Higher Engineering Mathematics 40thEdition Dr. B.S Grewal, Khanna Publishers.
3. A Text book of Engineering Mathematics, N.P.Bali& Manish Goyal, Laxmi Publications.

Reference Books:

1 Advanced Engineering Mathematics, by Wylie & Barrett, Tata Mc Graw Hill, New Delhi.
2 Advanced Engineering Mathematics, 8th Edition by Erwin Kreyszig , John Wiley & Sons, Inc.
3 Complex Variables and applications, J.W.Brown and R.V.Churchill, 7th Edition, Tata Mc Graw Hill,2004.

Online Resources :

1 **http://mathworld.wolfram.com/topics**
2 http://www.nptel.ac.in/course.php
3 https://www.coursera.org/in
4 **http://davidbau.com**

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2	No. of Assignments	: 3	Max. Marks for each Assignment	:	5
3	No. of Quizzes	: 3	Max. Marks for each Quiz Test	:	5
	Duration of Internal Tests	: 90 Minutes			

24.01.23

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DEPARTMENT OF MATHEMATICS

ADVANCED CALCULUS for B.E., II- Sem., (CBCS)

(Common to CSE, CSE-AIML & IT)

Instruction:3+1 Hours per week	Semester End Exam Marks:60	Subject Reference Code: **U23BS220MA**
Credits : 3	Sessional Marks: 40	Duration of Semester End Exam : 3 Hrs

COURSE OBJECTIVES	COURSE OUTCOMES
The course will enable the students to :	***At the end of the course students should be able to:***
1. Learn to Solve the first order differential equations and its applications. **2. Learn** to Solve the various higher order homogeneous and non-homogeneous linear differential equations with constant coefficients and its applications. **3. Study** the concepts of vector differentiation. **4. Learn** how to evaluate double and triple integrals and Study the concepts of vector integration. **5. Identify** the nature of an infinite series using various tests.	**1. Solve** the first order differential equations, model the real time engineering problems viz., RC& LR Circuits into differential equations. **2. Solve** the higher order Linear Differential equations; model the real time engineering problems. **3. Find** the gradient of a scalar point function, divergence and curl of vector field and its applications. **4. Apply** the concepts of multiple integrals to evaluate area, volume and vector integral theorems **5. Apply** an appropriate test to check the nature of an infinite series.

UNIT – I (10 classes)

ORDINARY DIFFERENTIAL EQUATIONS OF FIRST ORDER

Exact first order differential equations - Integrating factors- Clairaut's equation - Applications of First Order Differential Equations - Orthogonal trajectories (Cartesian families) – LR and RC Circuits.

UNIT – II (12 classes)

HIGHER ORDER LINEAR DIFFERENTIAL EQUATIONS

Solutions of Homogeneous and Non-Homogeneous linear equations with constant coefficients - Method of Variation of Parameters – Applications of linear differential equations to LCR circuits.

UNIT – III(08classes)

VECTOR CALCULUS

Scalar and Vector point functions -Vector Differentiation - Level Surfaces - Gradient of a scalar point function - Normal to a level surface - Directional Derivative – Divergence and Curl of a Vector Field - Solenoidal and Irrotational vectors- Conservative vector field.

UNIT – IV (12 classes)

MULTIPLE INTEGRALS: Double and Triple integrals (Cartesian) - Change of order of integration (Cartesian Coordinates)- Jacobian for two variables - Change of the Variables (Cartesian to polar Coordinates)

VECTOR INTEGRATION: Line, Surface and Volume integrals - Green's Theorem – Gauss Divergence theorem - Stokes's Theorem (All theorems without proof) -

UNIT – V (08 classes)

INFINITE SERIES

Definition of Sequence, Convergence of Sequence- Series – Convergence and Divergence- Series of positive terms-Geometric series- p-series test - Comparison tests - Limit comparison test- D'Alemberts Ratio Test – Cauchy's root test - Alternating Series – Leibnitz test – Absolute and Conditional convergence.

Text Books:

1. Higher Engineering Mathematics 40thEdition Dr. B.S Grewal, Khanna Publishers.
2. Advanced Engineering Mathematics 3rd Edition, R.K.Jain&S.R.K.Iyengar, Narosa Publishing House.
3. A Text book of Engineering Mathematics, N.P.Bali& Manish Goyal, Laxmi Publications.

Reference Books:

1. Advanced Engineering Mathematics, by Wylie & Barrett, Tata Mc Graw Hill, New Delhi.
2. Advanced Engineering Mathematics, 8th Edition by Erwin Kreyszig, John Wiley & Sons, Inc.

Online Resources:

1. **http://tutorial.math.lamar.edu/Classes/DE/DE.aspx**
2. **http://mathworld.wolfram.com/topics**
3. **http://www.nptel.ac.in/course.php**
4. **https://www.coursera.org/in**

The break-up of CIE : Internal Tests + Assignments + Quizzes

1	No. of Internal Tests	:	2	Max. Marks for each Internal Tests	:	30
2	No. of Assignments	:	3	Max. Marks for each Assignment	:	5
3	No. of Quizzes	:	3	Max. Marks for each Quiz Test	:	5
	Duration of Internal Tests	:	90 Minutes			

24-06-25

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DEPARTMENT OF MATHEMATICS

LINEAR ALGEBRA

(OPEN ELECTIVE-I for Civil,EEE,ECE,Mech of 2/4 B.E III-Sem)

L:T:P (Hrs./week):2:0:0	SEE Marks :60	Course Code: **U220E310MA**
Credits : 2	CIE Marks: 40	Duration of SEE: 3 Hrs

COURSE OBJECTIVES	**COURSE OUTCOMES**
The course will enable the students to:	***At the end of the course students will be able to:***
1. Study the concept of Vector Spaces and understand the meaning of Basis and Dimension of a vector Space and Co-ordinates.	***1.*** **Solve** the problems on Vector Spaces and determine the Basis and Dimension of a Vector Space and find the Co-ordinates.
2. Understand the meaning of Linear transformation, properties.	***2.*** **Determine** the Linear Transformation, Range and Kernel and Matrix of Linear Transformation.
3. Understand the Range and Kernel, Rank-Nullity and Matrix of Linear Transformation.	***3.*** **Determine** the Range and Kernel, Rank-Nullity and Matrix of Linear Transformation.
4. Understand theInner Product Spaces, Orthonormal sets, Gram-Schmidt's Orthogonalization process.	***4.*** **Determine the** distance, orthogonal, orthonormal sets and construct orthonormal basis based on Gram-Schmidt's Orthogonalization process.

UNIT – I (8 classes)

Vector Spaces-Definition of a Vector Space, Subspaces, Basis and Dimension, Coordinates and Change of Basis.

UNIT – II (6 classes)

Linear Transformation -I

Definition of Linear Transformation- Properties of Linear Transformations – Product of Linear Transformations – Algebra of Linear Operators- Linear sum- Scalar multiple- Composition of maps.

UNIT – III (6 classes)

Linear Transformation -II

Range and kernel of a linear map – Dimension of Range and Kernel - Rank and nullity – Inverse of linear transformation - Rank nullity theorem (without Proof)- Matrix of Linear Transformation.

UNIT – IV (8 classes)
Inner Product Spaces-The Dot Product on R and Inner Product Spaces, Orthonormal Bases, Orthogonal Complements- Gram-Schmidt's Orthonormolization process.

Learning Resources:

1. Introduction to Linear Algebra with Application, Author : Jim Defranza, Daniel Gagliardi, Publisher : Tata McGraw-Hill

2. An Introduction to Linear Algebra, V.Krishna Murthy, V.P Mainra, J.L Arora, Affiliated to East-West Press Pvt Ltd

Reference Books:

1 Elementary Linear Algebra, Author: Anton and Rorres, Publisher: Wiley India Edition.
2 Advanced Engineering Mathematics, Author : Erwin Kreysig, Publisher : Wiley Publication
3 Elementary Linear Algebra, Author : Ron Larson, Publisher : Cengage Learning

Online Resources :

1 **http://mathworld.wolfram.com/topics**
2 **http://www.nptel.ac.in/course.php**

The break-up of CIE: Internal Tests + Assignments + Quizzes

1	No. of Internal Tests	:	2	Max. Marks for each Internal Tests	:	30
2	No. of Assignments	:	2	Max. Marks for each Assignment	:	5
3	No. of Quizzes	:	2	Max. Marks for each Quiz Test	:	5

Duration of Internal Tests : 90 Minutes

24.06.23

Prof.N.Kishan (OU Nominee)

Prof.M.A.Srinivas (Subject Expert-JNTU-H)

Dr.T.Sudhakar Rao Chairman, BOS)

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DEPARTMENT OF MATHEMATICS

COMPLEX VARIABLES
(OPEN ELECTIVE-I for CSE,CSE-AIML & IT of 2/4 B.E III-Sem)

L:T:P (Hrs./week):2:0:0	SEE Marks :60	Course Code: **U220E320MA**
Credits : 2	CIE Marks: 40	Duration of SEE: 3 Hrs

COURSE OBJECTIVES	COURSE OUTCOMES
The course will enable the students to :	***At the end of the course students should be able to:***
1. Understand the Analytic functions, conditions and harmonic functions.	1. **Apply** the condition(s) for a complex variable function to be analytic and/or harmonic and to construct an Analytic function.
2. Evaluate the line integral of a function of a complex variable using Cauchy's integral formula, and how to	**2. Evaluate** the complex integrals by Cauchy's theorem and Cauchy's Integral formula.
3. Understand the concept of Taylor's and Laurent Series.	3. **Identify** the singularities of a function and to expand a given function as a Taylor's / Laurent's series.
4. Understand the Cauchy's residue theorem.	**4. Evaluate**the complex integrals by Cauchy's Residue theorem

UNIT – I(8 classes)
DIFFERENTIATION OF COMPLEX FUNCTION

Introduction to complex function-Limits and Continuity of function - Differentiability and Analyticity - Necessary & Sufficient Condition for a Function to be Analytic(Cartesian) - Milne-Thompson's method -Harmonic Functions.

UNIT – II(6 classes)
INTEGRATION OF COMPLEX FUNCTION

Complex Integration- Cauchy's Theorem(with proof) - Cauchy's Integral Formula(with proof) - Evaluation of integrals by Cauchy's Integral formula.

UNIT – III(6 classes)
SERIES OF COMPLEX FUNCTIONS

Power series - Taylor's Series - Laurent's Series (without proofs) –Zero and singularities of complex function.

UNIT – IV(8 classes)
RESIDUES

Introduction to Residues- Residues at singularities-Cauchy's Residue theorem (without proof) –Evaluation of integrals by Cauchy's Residue theorem.

Learning Resources:

1 Advanced Engineering Mathematics 3rd Edition, R.K.Jain&S.R.K.Iyengar, Narosa Publishing House.

2 Higher Engineering Mathematics 40thEdition Dr. B.S Grewal, Khanna Publishers.

3 A Text book of Engineering Mathematics, N.P.Bali& Manish Goyal, Laxmi Publications.

Online Resources :

1. **http://mathworld.wolfram.com/topics**
2. **http://www.nptel.ac.in/course.php**;

The break-up of CIE : Internal Tests + Assignments + Quizzes

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3	No. of Quizzes	:	2	Max. Marks for each Quiz Test	:	5
	Duration of Internal Tests	:	90 Minutes			

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DEPARTMENT OF MATHEMATICS

NUMERICAL METHODS

(Open Elective)

For B.E., IV - Semester – CBCS

(*for CSE, AIML& IT only)*

Instruction: 3 Hours per week	**Sem. End Exam Marks: 60**	**Subject Reference Code : U22OE410MA**
Credits : 3	**Sessional Marks: 40**	**Duration of Semester End Exam : 3 Hours**

COURSE OBJECTIVES	COURSE OUTCOMES
The course will enable the students to:	***At the end of the course students will be able to:***
1. Study the various numerical methods to solve Algebraic and Transcendental equations. **2. Understand** the methods to solve linear system of equations. **3. Understand** the numerical methods in interpolation and extrapolation. **4. Understand** the numerical methods in interpolation using central differences. **5. Understand** the numerical methods in solving ordinary differential equations.	**1. Apply** the numerical methods to solve Algebraic and Transcendental equations which cannot be solved by traditional algebraic methods **2. Solve** the linear system of equations using direct and iteration methods. **3. Use** the various numerical methods in interpolation and extrapolation. **4. Use** the various numerical methods in interpolation using central differences. **5. Find** the numerical solutions of ordinary differential equations.

Unit – I: (8Hours)

Solution of Algebraic and Transcendental equations:

Intermediate value property of equations-Solution of Algebraic and Transcendental equations: Bisection method, Newton-Raphson method Regula-Falsi method.

Unit – II: (8Hours)

Solution of linear system of equations:

Direct methods- Gauss elimination method- Factorization method- Iterative methods: Jacobi's Iteration method- Gauss - Seidel Iteration method-Ill-conditioned system of equations.

Unit – III: (8Hours)

Numerical differences-I

Introduction to finite differences - Interpolation- Newton's Forward and Backward Interpolation Formulae – Interpolation with unequal intervals – Lagrange's Interpolation Formula – Divided differences- Newton's divided difference formula.

Unit – IV: (8Hours)

Numerical differences-II

Central differences interpolation-Gauss's forwards and backward difference formulae- Stiriling's formula- Bessel's formula.

Unit – V: (8Hours)

Numerical Solutions of Ordinary Differential Equations

Numerical Solutions of Ordinary Differential Equations: Taylor's Series Method - Euler's Method - Modified Euler's Method – Runge-Kutta of 4th order (without proofs).

Text Books:

1. Numerical methods in engineering and science by B.S.Grewal, Khanna publishers
2. Advanced Engineering Mathematics by R.K.Jain&S.R.K.Iyengar, Narosa publishing house.

Reference Books:

1. Numerical Analysis by S.S.Sastry, PHI Ltd.

Online Resources :

3 **http://mathworld.wolfram.com/topics**
4 **http://www.nptel.ac.in/course.php**

The break-up of CIE : Internal Tests + Assignments + Quizzes

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3	No. of Quizzes	:	3	Max. Marks for each Quiz Test	:	5
	Duration of Internal Tests	:	90 Minutes			

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DEPARTMENT OF MATHEMATICS

MATRIX THEORY & VECTOR CALCULUS

BRIDGE COURSE B.E. III-SEMESTER (CBCS)

(For CSE, EEE, ECE & IT)

Instruction:	2 hours/Week	SEE Marks	: 50	Subject Reference Code	**UB22BS300MA**
Credits:	-	CIE Marks	: -	Duration of SEE	3 Hrs

UNIT-I: (4 Hours)
DIFFERENTIATION & INTEGRATION

Differentiation of standard functions(Formulae) - Partial Derivatives – Derivative of Composite functions and Implicit functions - Chain Rule - Total Derivative
Integration - Elementary Integration – Integration of standard functions- Methods of Integration- Integration by substitution- Integration by parts.

UNIT – II (6 Hours)
VECTOR DIFFERENTIATION

Scalar and Vector point functions -Vector Differentiation-Level Surfaces-Gradient of a scalar point function- Normal to a level surface - Directional Derivative – Divergence and Curl of a Vector field - Conservative vector field.

UNIT – III (6 Hours)

MULTIPLE INTEGRALS: Double and Triple integrals (Cartesian) - Change of order of integration (Cartesian Coordinates).

VECTOR INTEGRATION: Line integral and Green's Theorem (without proof)

UNIT- IV (8 Hours)

MATRIX THEORY
Rank of matrix- Echelon form - -System of Linear Equations- Consistency of Homogeneous and Non-homogeneous system of equations- Eigen values and Eigen Vectors.

Suggested Books:

1. B.S. Grewal, Higher Engineering Mathematics
2. Advanced Engineering Mathematics, Third Edition, R. K. Jain and S. R. K. Iyengar, Narosa Publishing House

Prof.N.Kishan	**Prof.M.A.Srinivas**	**Dr.T.Sudhakar Rao**
(OU Nominee)	**(Subject Expert-JNTU-H)**	**(Chairman, BOS)**

With effect from: 2023-24 (R-22)

VASAVI COLLEGE OF ENGINEERING (AUTONOMOUS)

Accredited by NAAC with A++ Grade

9-5-81, Ibrahimbagh, Hyderbad-500031, Telangana State

DEPARTMENT OF MATHEMATICS

TRANSFORM TECHNIQUES & PARTIAL DIFFERENTIAL EQUATIONS
for B.E., III- Sem., (CBCS)
(Civil, EEE & Mechanical only)

Instruction :3 +1Hours per week	**Semester End Exam Marks : 60**	**Subject Reference Code : U22BS310MA**
Credits :3	**Sessional Marks: 40**	**Duration of Semester End Exam : 3 Hrs.**

COURSE OBJECTIVES	**COURSE OUTCOMES**
The course will enable the students to:	***At the end of the course students will be able to:***
1. Understand the Definition of Laplace and its Properties. **2. Understand** the Definition of inverse Laplace Transforms- Properties and it's applications. **3 Study** the Fourier series, conditions for expansion of function and half range series. **4 Formulate** and understand linear and nonlinear partial differential equations. **5 Study** the applications of Partial Differential equations	**1. Evaluate** Laplace transforms of functions. Apply Laplace transforms to evaluate integrals. **2. Evaluate** Inverse Laplace transforms of functions. Apply transforms to solve ordinary differential equations arising in engineering problems. **3 Expand** any function which is continuous, Discontinuous, even or odd in terms of its Fourier series. **4 Formulate t**he Partial differential equations by eliminating arbitrary constants and functions and solving linear, nonlinear Partial differential equations. **5 Solve the** one-dimensional wave (Vibrations of a string), heat equations and two-dimensional heat equations.

UNIT-I (10Hours)

Laplace Transforms: Introduction to Laplace transforms - Sufficient Condition for Existence of Laplace Transform –Properties of Laplace Transform-First shifting theorem- Second shifting theorem -Change of scale property- Differentiation of Laplace transform – Integration of Laplace Transform – Laplace Transform of Derivatives - Laplace Transform of Integrals Evaluation of Integrals by Laplace Transforms.

UNIT-II (10Hours)

Inverse Laplace Transforms: Introduction to Inverse Laplace transforms - Properties of Inverse Laplace Transform-First shifting theorem - Second Shifting theorem -Change of scale theorem - Multiplication with s^n - Division by s –Convolution Theorem (without proof)- Application of Laplace transforms to higher order linear differential equation with Constant Coefficient

UNIT –III (10Hours)

Fourier series: Introduction to Fourier series – Conditions for a Fourier expansion – Functions having points of discontinuity – Change of Interval - Fourier series expansions of even and odd functions - Fourier Expansion of Half- range Sine and Cosine series.

UNIT –IV (10 Hours)

Partial Differential Equations: Formation of first and second order Partial Differential Equations - Solution of First Order Equations – Linear Equation - Lagrange's Equation - Non-linear first order equations – Standard Forms.

UNIT-V (8 Hours)

Applications of Partial Differential Equations: Method of Separation of Variables - One Dimensional Wave Equation- One Dimensional Heat Equation – Two-Dimensional Heat equation (steady state condition).

Text Books:

1. R.K. Jain & S.R.K. lyengar, Advanced Engineering Mathematics, Third Edition, Narosa Publications, 2007.
2. Higher Engineering Mathematics, Dr.B.S Grewal 40th Edition, Khanna Publishers.

Reference Books:

1. Advanced Engineering Mathematics, Kreyszig E, 8 th Edition, John Wiley & Sons Ltd, 2006.
2. A text book of Engineering Mathematics by N.P.Bali& Manish Goyal, Laxmi Publication.

Online Resources :

1. **http://mathworld.wolfram.com/topics**
2. **http://www.nptel.ac.in/course.php**

The break-up of CIE : Internal Tests + Assignments + Quizzes

1	No. of Internal Tests	:	2	Max. Marks for each Internal Tests	:	30
2	No. of Assignments	:	3	Max. Marks for each Assignment	:	5
3	No. of Quizzes	:	3	Max. Marks for each Quiz Test	:	5
	Duration of Internal Tests	:	90 Minutes			

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DEPARTMENT OF MATHEMATICS

PDE &NUMERICAL METHODS
for B.E., III- Sem., (CBCS)
(For ECE only)

Instruction :3 +1 Hours per week	**Semester End Exam Marks : 60**	**Subject Reference Code : U22BS320MA**
Credits :3	**Sessional Marks: 40**	**Duration of Semester End Exam : 3 Hrs.**

COURSE OBJECTIVES	**COURSE OUTCOMES**
The course will enable the students to:	***At the end of the course students will be able to:***
1 **Formulate** and understand linear and nonlinear partial differential equations. **2** **Study** the applications of Partial Differential equations. 3 **Study t**he methods of interpolation, apply numerical methods to interpolate. 4 **Understand** numerical differentiation and solve differential equations using numerical methods. 5 **Study** the method to fit different curves to a given data and measuring the Correlation between variables.	**1** **Formulate t**he Partial differential equations by eliminating arbitrary constants and functions and solve linear, nonlinear Partial differential equations. **2** **Solve** the one-dimensional wave (Vibrations of a string), heat equations and two-dimensional heat equations. **3** **Apply** numerical methods to interpolate. **4** **Solve** problems using numerical differentiation using interpolation approach and differential equations using numerical methods. **5** **Solve** problems to fit various curves to the given data using curve fitting, and also to find co-efficient of correlation between the variables

UNIT –I (10 Hours)
Partial Differential Equations:
Formation of first and second order Partial Differential Equations - Solution of First Order Equations – Linear Equation - Lagrange's Equation- Non-linear first order equations - Standard Forms.

UNIT-II (10 Hours)
Applications of Partial Differential Equations:
Method of Separation of Variables - One Dimensional Wave Equation- One Dimensional Heat Equation – Two-Dimensional Heat equation (Steady state condition).

UNIT-III (10Hours)
Interpolation:
Finite Differences- Interpolation- Newton's Forward and Backward Interpolation Formulae – Interpolation with unequal intervals – Lagrange's Interpolation Formula – Divided differences- Newton's Divided difference formula.

UNIT –IV (12Hours)
Numerical solutions of ODE:
Numerical Differentiation -Interpolation approach- Numerical Solutions of Ordinary Differential Equations of first order - Taylor's Series Method - Euler's Method - Runge-Kutta of 4th order (without proofs).

UNIT-V (10Hours)
Curve Fitting:
Curve fitting by the Method of Least Squares - Fitting of Straight Line-Second order curve (parabola) - Exponential curves- Correlation – Karl Pearson's Co-efficient of Correlation.

Text Books:

1. R.K. Jain & S.R.K. lyengar, Advanced Engineering Mathematics, Third Edition, Narosa Publications, 2007.
2. Higher Engineering Mathematics, Dr.B.S Grewal 40th Edition, Khanna Publishers.

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Online Resources:

1. **http://mathworld.wolfram.com/topics**
2. **http://www.nptel.ac.in/course.php**

The break-up of CIE : Internal Tests + Assignments + Quizzes

1	No. of Internal Tests	:	2	Max. Marks for each Internal Tests	:	30
2	No. of Assignments	:	3	Max. Marks for each Assignment	:	5
3	No. of Quizzes	:	3	Max. Marks for each Quiz Test	:	5
	Duration of Internal Tests	:	90 Minutes			

24.06.23

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DEPARTMENT OF MATHEMATICS

DISCRETE MATHEMATICS
for B.E., III- Sem., (CBCS)
(For IT only)

Instruction :3 +1 Hours per week	**Semester End Exam Marks : 60**	**Subject Reference Code :U22BS330MA**
Credits :3	**Sessional Marks: 40**	**Duration of Semester End Exam : 3 Hrs.**

COURSE OBJECTIVES	COURSE OUTCOMES
The course will enable the students to:	***At the end of the course students will be able to:***
1. Understand the Propositions and their equivalences, predicates and quantifiers and learn various proof strategies.	1. **Use** logical notation to define and reason about fundamental mathematical concepts and *synthesize* induction hypothesis and simple *Induction* proofs.
2. Study the concepts of number theory such Modular Arithmetic, Congruence's and basic cryptography etc.,	2. **Prove** elementary properties of modular arithmetic and basic cryptography and apply in computer science.
3. Understand the basics of counting, combinatory, and various methods of solving Recurrence relations.	3. **Calculate** number of possible outcomes of elementary combinatorial processes such as permutations and combinations Model and analyse computational processes using analytic and Combinatorial methods.
4. Understand the Relations, Equivalence relations, Posets and Hasse diagrams.	4. **Prove** whether a given relation is an equivalence relation/poset and will be able to draw a Hasse diagram.
5. Understand the concepts of Graphs and their various properties.	5. **Apply** graph theory models of data structures and to solve problems of connectivity.

UNIT – I (10 Hours)

Logic: Logic- Logical connectives- Propositional equivalences– Predicates and quantifiers – Nested quantifiers.

Mathematical Reasoning, Induction: Proof Strategy- Methods of Proofs- Mathematical Induction- Second Principle of Mathematical Induction.

UNIT – II (10 Hours)

Number Theory: The Integers and Division- Division Algorithm- Fundamental Theorem of Arithmetic –Modular Arithmetic-Integers and Algorithms- Euclidean Algorithm. Applications of Number Theory-Linear Congruences- The Chinese Remainder Theorem (without Proof)- Fermat's Little Theorem- Public key cryptography- RSA Encryption and Decryption.

UNIT – III (12 Hours)

Counting: Basics of counting- Pigeonholeprinciple- Permutations and combinations – Pascal's Identity- Vandermonde's Identity- Generalized Permutations and combinations.

Advanced Counting Techniques: Recurrence relations: Solving Recurrence Relations- Linear Homogeneous and Non-Homogeneous Recurrence relations.

UNIT – IV (10 Hours)

Relations: Relations – Properties -Representing relations - Equivalence Relations - Partial Orderings- Poset- Hasse diagrams – Maximal & Minimal Elements.

UNIT –V (10 Hours)

Graph Theory: Introduction- Types of graphs- Graph terminology- Basic theorems- Representing Graphs and Graph Isomorphism - Connectivity- Euler and Hamiltonian paths - Planar graphs- Euler's Formula- Graph coloring- Basic Definitions.

Text Books:

1. Kenneth H.Rosen – Discrete Mathematics and its application – 5th edition, Mc Graw – Hill, 2003.
2. Joel. Mott. Abraham Kandel, T.P.Baker, Discrete Mathematics for Computer Scientist &Mathematicans, Prentiee Hail N.J., 2nd edn, 1986.

Reference Books:

1. Discrete and Combinatorial Mathematics by Ralph P. Grimaldi , Pearson International
2. J.P.Trembly, R.Manohar, Discrete Mathematical Structure with Application to Computer Science, Mc Graw- Hill – 1997.
3. R.K. Bisht, H.S.Dhami - Discrete Mathematics, Oxford University Press, 2015.

Online Resources :

1 **http://mathworld.wolfram.com/topics**
2 **http://www.nptel.ac.in/course.php**

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2	No. of Assignments	:	3	Max. Marks for each Assignment	:	5
3	No. of Quizzes	:	3	Max. Marks for each Quiz Test	:	5
	Duration of Internal Tests	:	90 Minutes			

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DEPARTMENT OF MATHEMATICS

TRANSFORM TECHNIQUES, PROBABILITY &STATISTICS
for B.E., III- Sem., (CBCS)
(For CSE & CSE-AIML)

Instruction :3 +1 Hours per week	**Semester End Exam Marks : 60**	**Subject Reference Code :U22BS340MA**
Credits : 3	**Sessional Marks: 40**	**Duration of Semester End Exam : 3 Hrs.**

COURSE OBJECTIVES	**COURSE OUTCOMES**
The course will enable the students to:	***At the end of the course students will be able to:***
1 **Study** the Fourier series, conditions for expansion of function and half range series. **2** **Learn** the concept of Fourier, Sine, Cosine and inverse Fourier Transform Sine and Cosine transform of a function and various properties. **3** **Understand** random variables and probability distributions. **4** **Study** the standard statistical tests employed for small samples. **5** **Study** the method to fit different curves to a given data and measuring the Correlation between variables	***1.*** **Expand** any function which is continuous, Discontinuous, even or odd in terms of its Fourier series. ***2.*** **Determine** Fourier transform, Fourier sine and cosine transform and inverse Fourier Sine and Cosine transform of a function. ***3.*** **Apply** various probability distributions to solve practical problems. ***4.*** **Estimate** unknown parameters of populations and apply the tests of hypothesis for small samples ***5.*** **Solve** problems to fit various curves to the given data using curve fitting, and also to find co-efficient of correlation between the variables.

UNIT –I (10Hours)

Fourier series: Introduction to Fourier series – Conditions for a Fourier expansion – Functions having points of discontinuity – Change of Interval - Fourier series expansions of even and odd functions - Fourier Expansion of Half- range Sine and Cosine series.

UNIT-II (10Hours)

Fourier Transforms: Fourier Integral Theorem (without Proof) - Fourier Transforms – Inverse Fourier Transform - Properties of Fourier Transform –Fourier Cosine & Sine Transforms.

UNIT-III (10 Hours)

Probability Distribution:
Random Variables - Discrete and Continuous Random variables-Properties- Distribution functions and densities - Normal Distribution-Properties-Standard Normal variate.

UNIT-IV(12 Hours)

Test of Hypothesis
Introduction -Testing of Hypothesis- Null and Alternative Hypothesis -Errors- -Level of Significance-Confidence Intervals -Tests of Significance for small samples - t-test for single mean - F- test for comparison of variances - Chi-square test for goodness of fit..

UNIT-V (10Hours)

Curve Fitting:
Curve fitting by the Method of Least Squares - Fitting of Straight Line-Second order curve (parabola) - Exponential curves- Correlation – Karl Pearson's Co-efficient of Correlation.

Text Books:

1. R.K. Jain & S.R.K. lyengar, Advanced Engineering Mathematics, Third Edition, Narosa Publications, 2007.
2. Higher Engineering Mathematics, Dr.B.S Grewal 40th Edition, Khanna Publishers.

Reference Books:

1. Advanced Engineering Mathematics, Kreyszig E, 8 th Edition, John Wiley & Sons Ltd, 2006.
2. A text book of Engineering Mathematics by N.P.Bali& Manish Goyal, Laxmi Publication.
3. Fundamentals of Mathematical Statistics, Gupta & Kapoor, Sultan chand& sons, New Delhi.

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2 **http://www.nptel.ac.in/course.php**

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	Duration of Internal Tests	:	90 Minutes			

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DEPARTMENT OF MATHEMATICS

Integral Transforms (Open Elective)

For B.E., V - Semester – CBCS

(*For CSE, AIML & IT only)*

Instruction :3	**Semester End Exam Marks : 60**	**Subject Reference Code : U21OE510MA**
Credits : 3	**Sessional Marks : 40**	**Duration of Semester End Exam : 3 Hrs.**

COURSE OBJECTIVES	**COURSE OUTCOMES**
The course will enable the students to:	***At the end of the course students will be able to:***
1. **Understand** the Definition of Laplace and its Properties. **2.** **Understand** the Definition of inverse Laplace Transforms- Properties **3** **Understand** the applications of Laplace Transforms. **4** **Study** the Definition of Z- Transforms and its properties **5** **Understand** the applications of Z-Transforms	**1.** **Evaluate** Laplace transforms of functions. **2.** **Evaluate** Inverse Laplace transforms of functions. **3.** **Apply** Laplace transforms to evaluate integrals and to solve ordinary differential equations arising in engineering problems. **4.** **Evaluate** Z- transforms of Sequences **5.** **Apply** Z-transforms to solve ordinary difference equations arising in engineering problems.

UNIT-I (10 Hours)

Laplace Transforms

Introduction to Laplace transforms - Sufficient Condition for Existence of Laplace Transform – Properties of Laplace Transform - First shifting theorem - Second shifting theorem - Change of scale property – Differentiation of Laplace transform – Integration of Laplace Transform – Laplace Transform of Derivatives - Laplace Transform of Integrals

UNIT-II (10 Hours)

Inverse Laplace Transforms

Introduction to Inverse Laplace transforms - Properties of Inverse Laplace Transform - First shifting theorem - Second shifting theorem - Change of scale property - Multiplication with s^n - Division by s – Convolution Theorem (without proof).

UNIT –III (10 Hours)

Applications of Laplace Transforms

Application of Laplace transforms to solve Initial Value Problems with constant coefficients and with variable coefficients – Laplace transform of periodic functions – Triangular wave – Square wave – Saw tooth wave.

UNIT –IV (10 Hours)

Z-Transforms

Introduction - Z-transforms of Standard sequences - Linearity Property – Scaling Property - Shifting Properties - Initial value theorem - Final value theorem – Differentiation of Z-transform.

UNIT-V (8 Hours)

Inverse Z-Transforms

Introduction – Inverse Z-transforms of Standard functions - Convolution Theorem – Application of Z-Transforms to solve Difference Equations.

Text Books:

1. R.K. Jain & S.R.K. lyengar, Advanced Engineering Mathematics, Third Edition, Narosa Publications, 2007.
2. Higher Engineering Mathematics, Dr.B.S Grewal 40th Edition, Khanna Publishers.

Reference Books:

1. Advanced Engineering Mathematics, Kreyszig E, 8 th Edition, John Wiley & Sons Ltd, 2006.
2. A text book of Engineering Mathematics by N.P.Bali & Manish Goyal, Laxmi Publication.

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2	No. of Assignments	:	3	Max. Marks for each Assignment	:	5
3	No. of Quizzes	:	3	Max. Marks for each Quiz Test	:	5
	Duration of Internal Tests	:	90 Minutes			

24/5/23

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