With effect from: 2024-25 (R-24)

VASAVI COLLEGE OF ENGINEERING (AUTONOMOUS)

Accredited by NAAC with A++ Grade

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

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: U24BS120MA**
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 should be able to:***
1. Develop a deep understanding of the concepts and applications of Taylor's series, Maclaurin's series, curvature, radius of curvature, centre of curvature, and evolutes.	**1. Apply** the concepts of Taylor's series and Maclaurin's series to approximate functions and calculate the curvature, radius, centre of curvature of curves, and evolutes.
2. Learn the techniques for finding limits, continuity, partial derivatives of functions of several variables and Taylor's series for functions of two variables, methods for finding maxima and minima of functions of several variables.	**2. Calculate** limits, continuity, partial derivatives of functions of several variables and apply Taylor's series for functions of two variables, analyze functions to find maxima and minima.
3. Study the fundamental concepts of vector spaces, vector subspaces, linear dependence and independence of vectors, span, basis of a vector space, dimension of a vector space, and coordinates.	**3. Analyze** vector spaces and their subspaces, determine linear dependence and independence of vectors, identify bases of vector spaces, and compute the dimension of vector spaces.
4. Understand the fundamental concepts of linear transformations and their properties.	**4. Determine** linear transformations, their null space and range, calculating the dimension of these spaces, understanding the rank and nullity of a linear transformation, and representing a linear transformation using a matrix.
5. Understand of linear algebra concepts, including the rank of a matrix, characteristic equation, eigenvalues and eigenvectors, LU decomposition, and single value decomposition.	**5. Find** the rank of a matrix, eigenvalues and eigenvectors, performing LU decomposition, and applying single value decomposition to real-world problems.

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 (10 classes)

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 – Jacobian - Maxima and Minima of functions of two variables - Lagrange's Method of multipliers.

UNIT-III: (08 classes)

VECTOR SPACES

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

UNIT-IV (08 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

Rank of a Matrix - Characteristic equation - Eigen values and Eigenvectors – LU Decomposition - Single Value Decomposition.

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
4. An introduction to Linear Algebra, V.P Mainra, J.L Arora, Affiliated to East-West Press Pvt Ltd

Online Resources:

1. https://onlinecourses.swayam2.ac.in/cec24_ma10/preview
2. https://onlinecourses.nptel.ac.in/noc24_ma31/preview

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	**Prof.M.A.Srinivas**	**Dr.M.Raghavendra Sharma**	**Dr.B.Srivastsa**
(OU Nominee)	**(Subject Expert-JNTUH)**	**(Subject Expert)**	**(Industry Expert)**

Dr.T. Sudhakar Rao
(Chairman, BOS)

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VASAVI COLLEGE OF ENGINEERING (AUTONOMOUS)

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9-5-81, Ibrahimbagh, Hyderbad-500031

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: **U24BS220MA**
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 should be able to:*
1. Understand the fundamental concepts and techniques of first-order differential equations, as well as their applications in modeling real-world phenomena.	**1. Solve** various types of first-order differential equations, model and analyze physical systems such as LR and RC circuits and sketch orthogonal trajectories of Cartesian families of curves.
2. Develop the ability to solve homogeneous and non-homogeneous linear differential equations with constant coefficients, and the techniques to analyze LCR circuits.	**2. Solve** homogeneous and non-homogeneous linear differential equations with constant coefficients, including those arising in LCR circuits.
3. Study the concepts of vector differentiation.	**3. Differentiate** scalar and vector point functions.
4. Understand the concept of double and triple integrals. as well as the line integral.	**4. Solve** the problems involving double, triple integrals and apply Green's Theorem to evaluate line integrals.
5. Learn the fundamental concepts of sequences and series, including convergence criteria.	**5. Identify** an appropriate test and determine convergence of the series.

UNIT – I (08 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 (08 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)

MULTIPLE INTEGRALS

Double integrals (Cartesian) - Change of order of integration (Cartesian Coordinates)- Change of the Variables (Cartesian to polar Coordinates in two dimensions) - Triple integrals (Cartesian).

UNIT – IV (10 classes)

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 - Line integrals - Green's Theorem (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'Alembert's Ratio Test – Cauchy's n^{th} root test - Alternating Series – Leibnitz test – Absolute and Conditional convergence.

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.

Online Resources:

1. https://onlinecourses.swayam2.ac.in/cec24_ma09/preview
2. https://onlinecourses.nptel.ac.in/noc24_ma03/preview

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	Duration of Internal Tests	:	90 Minutes			

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VASAVI COLLEGE OF ENGINEERING (AUTONOMOUS)
9-5-81, Ibrahimbagh, Hyderbad-500031, Telangana State
DEPARTMENT OF INFORMATION TECHNOLOGY
(B.E. Semester - II)

Mathematics Lab (Calculus, Linear Algebra & Differential equations)

Instruction: 2 Hours / week	SEE Marks :50	Course Code:
Credits : 1	CIE Marks: 30	Duration of SEE : 3 Hrs

Course Objectives	Course Outcomes
The course will enable the students to:	**At the end of the course student will be able to:**
Demonstrate the linear algebra, calculus and differential equation concepts using Scilab.	1. Demonstrate the knowledge of Scilab basics for numerical analysis and visualization. 2. Apply Matrix basic operations and its analysis. 3. Demonstrate the use of matrix decompositions and solving of linear equations. 4. Apply calculus theorems to examine extreme values of a function. 5. Demonstrate the knowledge of solving Differential equations.

1. Introduction to Scilab and evaluating elementary functions.
2. Basic operations on Matrix & Vector.
3. Matrix analysis: Rank, Determinant, Trace, Orthogonal basis & Inverse of matrices.
4. Eigen values and Eigenvectors of Matrix.
5. Matrix decompositions: SVD, QR, LU, Pseudo Inverse
6. Solve system of linear equations.
7. Data plotting (2D,3D) of various mathematical functions.
8. Test the convergence of infinite series i.e., power, Taylor.
9. Intro to calculus and examine minima, maxima and saddle points of a given function.
10. Application of definite integrals to area & volume calculations.
11. Solving differential equations.

Learning Resources:

1. https://www.scilab.org/tutorials\
2. Scilab - Course (swayam2.ac.in)
3. Scilab_Tutorial.pdf (iitb.ac.in)

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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: **U24BS110MA**
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 should be able to:*
1. Study the concepts of rank of a matrix, System of linear equations and LU-Decomposition method.	**1. Find** the rank of a given matrix and solution of a system by LU-Decomposition method.
2. Learn the concepts of eigen values, eigen vectors, diagonalization, and canonical forms.	**2. Compute** the characteristic equation, eigen values, eigenvectors and diagonalize a square matrix using similarity transformation.
3. Develop a deep understanding of the concepts and applications of Taylor's series, Maclaurin's series, curvature, radius of curvature, centre of curvature, and evolutes.	**3. Apply** the concepts of Taylor's series and Maclaurin's series to approximate functions and calculate the curvature, radius, centre of curvature of curves, and evolutes.
4. Learn the techniques for finding partial derivatives of functions of several variables and Taylor's series for functions of two variables, methods for finding maxima and minima of functions of several variables.	**4. Calculate** partial derivatives of functions of several variables and apply Taylor's series for functions of two variables, analyze functions to find maxima and minima.
5. Understand the fundamental concepts of sequences and series, including convergence criteria.	**5. Identify** an appropriate test and determine convergence of the series.

UNIT- I (08 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 (08 classes)

MATRICES-II

Characteristic equation- Cayley - Hamilton Theorem (without proof) -Eigen values and Eigenvectors - 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 (10 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 – Jacobian - 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'Alembert's Ratio Test – Cauchy's n^{th} root test - Alternating Series – Leibnitz test – Absolute and Conditional convergence.

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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 $40^{th.}$ Edition, Khanna Publishers.

Reference Books:

1. Advanced Engineering Mathematics 8^{th} 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. https://onlinecourses.nptel.ac.in/noc24_ma03/preview
2. https://onlinecourses.nptel.ac.in/noc24_ma31/preview
3. https://onlinecourses.swayam2.ac.in/cec24_ma10/preview

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

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	Duration of Internal Tests	:	90 Minutes			

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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: **U24BS210MA**
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 should be able to:***
1. Understand the fundamental concepts and techniques of first-order differential equations, as well as their applications in modeling real-world phenomena. **2. Develop** the ability to solve homogeneous and non-homogeneous linear differential equations with constant coefficients, and the techniques to analyze LCR circuits. **3. Understand** the concepts of Beta, Gamma functions and their properties. **4. Learn** how to evaluate double and triple integrals and study the concepts of vector integration. **5. Study** the concepts of vector differentiation.	**1. Solve** various types of first-order differential equations, model and analyze physical systems such as LR and RC circuits and sketch orthogonal trajectories of Cartesian families of curves. **2. Solve** homogeneous and non-homogeneous linear differential equations with constant coefficients, including those arising in LCR circuits. **3. Evaluate** Improper integrals using Beta, Gamma functions. **4. Apply** the concepts of multiple integrals to evaluate area, volume **5. Find** the gradient of a scalar point function, divergence and curl of vector field and its applications.

UNIT – I (08 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 (08 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 (08 classes)
SPECIAL FUNCTIONS

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

UNIT – IV (08 classes)
MULTIPLE INTEGRALS

Double integrals (Cartesian) - Change of order of integration (Cartesian Coordinates) - Change of the Variables (Cartesian to polar Coordinates in two dimensions) - Triple integrals (Cartesian).

UNIT – V (10 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 - Conservative vector field - Line integral - Green's Theorem (Without proof).

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. https://onlinecourses.swayam2.ac.in/cec24_ma09/preview
2. https://onlinecourses.nptel.ac.in/noc24_ma03/preview

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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: U23BS310MA
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. **Understand** the definition and properties of the Laplace transform. 2. **Understand** the definition and properties of the inverse Laplace transform. 3. **Study** the concept of Fourier series and its applications. 4. **Learn** the formation Partial Differential Equations and solution of linear and non-linear first order partial differential equations. 5. **Study** the applications of Partial Differential equations.	1. **Evaluate** Laplace transform of functions and apply Laplace transforms to evaluate integrals. 2. **Find** Inverse Laplace transforms of functions and apply the Laplace transform to solve linear differential equations. 3. **Compute** Fourier coefficients and find Fourier series of a function. 4. **Formulate** the Partial differential equations and solve the linear and non-linear first order Partial differential equations. 5. **Solve** the one-dimensional wave equation, one-dimensional heat equation, and two-dimensional heat equation under steady-state conditions.

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 Coefficients.

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

Reference Books:

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

Online Resources:

1. https://onlinecourses.nptel.ac.in/noc24_ma17/preview
2. https://onlinecourses.nptel.ac.in/noc24_ma37/preview

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

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	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 +1Hours per week	Semester End Exam Marks: 60	Subject Reference Code: U23BS320MA
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. **Learn** the formation Partial Differential Equations and solution of linear and non-linear first order partial differential equations.	1. **Formulate** the Partial differential equations and solve the linear and non-linear first order Partial differential equations.
2. **Study** the applications of Partial Differential equations.	2. **Solve** the one-dimensional wave equation, one-dimensional heat equation, and two-dimensional heat equation under steady-state conditions.
3. **Understand** the concepts of interpolation and to learn various methods for interpolating data points and approximating functions.	3. **Apply** numerical methods to interpolate data points with equal and unequal intervals.
4. **Learn** numerical techniques for approximating derivatives and solving first-order ordinary differential equations.	4. **Use** numerical techniques to approximate derivatives of functions at given points and solve first-order ordinary differential equations.
5. **Understand** the principles of curve fitting using the method of least squares and the concept of correlation.	5. **Apply** the method of least squares to fit various curves to the given data and Calculate Karl Pearson's coefficient of correlation.

UNIT –I (08 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 (08 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 (08 Hours)
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 (08 Hours)
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 (08 Hours)
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. Advanced Engineering Mathematics, Third Edition, R. K. Jain and S. R. K. Iyengar, Narosa Publishing House.
2. Higher Engineering Mathematics, Dr.B.S. Grewal, 40th Edition, Khanna Publishers.

Reference Books:
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2. A text book of Engineering Mathematics by N.P. Bali& Manish Goyal, Laxmi Publication.

Online Resources:
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2. https://onlinecourses.swayam2.ac.in/cec24_ma19/preview

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

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	Duration of Internal Tests	:	90 Minutes			

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

DEPARTMENT OF MATHEMATICS

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

Instruction :3 Hours per week	**Semester End Exam Marks: 60**	**Subject Reference Code: U23BS330MA**
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. **Understand** the Propositions and their equivalences, predicates and quantifiers and learn various proof strategies.	1. **Use** the logical notation to define and reason about fundamental mathematical concepts and synthesize induction hypothesis and simple Induction proofs.
2. **Learn** the basics of counting, combinatory, and various methods of solving Recurrence relations.	2. **Apply** the basic principles of counting to solve combinatorial problems and solve recurrence relations, both linear homogeneous and non-homogeneous, using various techniques.
3. **Study** the concept of relations, including their properties and representations, equivalence relations, Posets, Hasse diagrams, maximal and minimal elements	3. **Identify** various types of relations, represent relations using matrices and graphs, construct Hasse diagrams for Posets, determine maximal and minimal elements in a Poset.
4. **Understand** the fundamentals of graph theory, graph isomorphism, and connectivity.	4. **Apply** graph terminology to describe the structure of graphs and determine graph isomorphism.
5. **Understand** the advanced topics in graph theory, graph colouring, and applications of graph colouring.	5. **Determine** the existence of Eulerian and Hamiltonian paths, and the chromatic number of a graph using various techniques of graph colouring.

UNIT – I (8 Hours)

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

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

UNIT – II (10 Hours)

Counting: Basics of counting- Pigeonhole principle –Permutations & Combinations- Pascal's Identity- Vandermonde's Identity.

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

UNIT – III (8 Hours)

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

UNIT –IV (8 Hours)

Graph Theory-I: Introduction - Graph Terminology - Types of graphs - Basic theorems - Representing Graphs and Graph Isomorphism – Connectivity.

UNIT –V (8 Hours)

Graph Theory-II: Euler and Hamiltonian paths – Shortest path problems - Dijkstra's algorithm - Planar graphs- Euler's Formula – Graph Colouring – Chromatic number – Applications of graph colouring.

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 &Mathematicians, 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. https://onlinecourses.nptel.ac.in/noc24_cs58/preview
2. https://onlinecourses.swayam2.ac.in/cec24_ma18/preview

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-JNTUH)	Dr.M.Raghavendra Sharma (Subject Expert)	Dr.B.Srivastsa (Industry Expert)

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VASAVI COLLEGE OF ENGINEERING (AUTONOMOUS)

Accredited by NAAC with A++ Grade

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

DEPARTMENT OF MATHEMATICS

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

Instruction :3 +1 Hours per week	**Semester End Exam Marks: 60**	**Subject Reference Code: U23BS340MA**
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 concept of Fourier series and its applications.	1. **Compute** Fourier coefficients and find Fourier series of a function.
2. **Understand** the concepts of Fourier Transforms, Inverse Fourier Transform, and properties of Fourier Transform.	2. **Evaluate** Fourier transform, Fourier sine and cosine transform, inverse Fourier Sine and Cosine transform of a function.
3. **Understand** random variables and its probability distributions	3. **Differentiate** between discrete and continuous random variables and apply various probability distributions to solve practical problems
4. **Study** the concept of hypothesis testing employed for small samples.	4. **Formulate** Null and Alternative Hypotheses and apply the tests of hypothesis for small samples.
5. **Understand** the principles of curve fitting using the method of least squares and the concept of correlation.	5. **Apply** the method of least squares to fit various curves to the given data and Calculate Karl Pearson's coefficient of correlation.

UNIT –I (08 Hours)

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 (08 Hours)

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

UNIT-III (08 Hours)

Probability Distribution:

Random Variables - Discrete and Continuous Random Variables – Mass and density functions – Distribution functions - Definitions of Mean, Median, Mode and Variance – Continuous Distributions - Normal Distribution – Properties - Standard Normal variate.

UNIT-IV (10 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 (08 Hours)

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

Reference Books:

1. Advanced Engineering Mathematics, Kreyszig E, 8th 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.

Online Resources:

1. https://onlinecourses.nptel.ac.in/noc24_ma17/preview
2. https://onlinecourses.nptel.ac.in/noc24_ma39/preview

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

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	Duration of Internal Tests	: 90 Minutes			

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VASAVI COLLEGE OF ENGINEERING (AUTONOMOUS)

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

DEPARTMENT OF MATHEMATICS

PROBABILITY DISTRIBUTIONS & INFERENCE THEORY

for B.E., III- Sem., (CBCS)

(For CSE - AIML only)

Instruction: 3 +1 Hours per week	**Sem. End Exam Marks:** 60	**Subject Reference Code: U23BS350MA**
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 fundamental concepts of probability theory.	1. **Define** probability and compute probabilities of events and apply Bayes' Theorem to update probabilities based on new information.
2. **Understand** random variables and its probability distributions.	2. **Differentiate** between discrete and continuous random variables and its distributions.
3. **Learn** various probability distributions, and their related applications.	3. **Apply** various theoretical probability distributions to solve related problems in various applications.
4. **Study** the concept of hypothesis testing employed for large samples.	4. **Formulate** Null and Alternative Hypotheses and apply the tests of hypothesis for large samples.
5. **Study** the various methods of testing small samples.	5. **Apply** various methods for Tests of Significance for small samples.

UNIT –I (08 Hours)

Probability:

Basic terminology- Definition of Probability – Addition Law of probability- Independent events- Conditional Probability- Multiplication law of probability - Baye's Theorem.

UNIT –II (10 Hours)

Random variables and Distributions:

Random Variables - Discrete and Continuous Random Variables – Mass and density functions – Distribution functions - Definitions of Mean, Median, Mode and Variance – Binomial & Poisson distributions.

UNIT-III (08 Hours)

Continuous Distributions:

Geometric distribution - Uniform distribution - Exponential distribution & Normal Distribution - Properties

UNIT-IV (08 Hours)

Tests of Hypothesis for Large samples:

Introduction -Testing of Hypothesis- Null and Alternative Hypothesis -Errors- -Level of Significance –Confidence Intervals - One and two tailed tests - Tests of Significance for large samples – Tests for single mean- Difference of means.

UNITV (08 Hours)

Tests of Hypothesis for Small samples:

Tests of Significance for small samples - t-test for single mean and difference of means – F-test for comparison of variances - Chi-square test for goodness of fit.

Text Books:

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

Reference Books:

1. Advanced Engineering Mathematics, Kreyszig E, 8th 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.

Online Resources:

1 https://onlinecourses.nptel.ac.in/noc24_ma39/preview

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

DEPARTMENT OF MATHEMATICS

NUMERICAL METHODS, PROBABILITY & STATISTICS

for B.E., IV- Sem., (CBCS)

*(for **Civil, EEE & Mechanical only**)*

Instruction: 3 +1Hours per week	**Sem. End Exam Marks: 60**	**Subject Reference Code :U23BS410MA**
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 concepts of interpolation and to learn various methods for interpolating data points and approximating functions.	1. **Apply** numerical methods to interpolate data points with equal and unequal intervals.
2. **Learn** numerical techniques for approximating derivatives and solving first-order ordinary differential equations.	2. **Use** numerical techniques to approximate derivatives of functions at given points and solve first-order ordinary differential equations.
3. **Understand** random variables and its probability distributions	3. **Differentiate** between discrete and continuous random variables and apply various probability distributions to solve practical problems
4. **Study** the concept of hypothesis testing employed for small samples.	4. **Formulate** Null and Alternative Hypotheses and apply the tests of hypothesis for small samples.
5. **Understand** the principles of curve fitting using the method of least squares and the concept of correlation.	5. **Apply** the method of least squares to fit various curves to the given data and Calculate Karl Pearson's coefficient of correlation.

UNIT –I (08 Hours)

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 –II (08 Hours)

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 4^{th} order (without proofs)

UNIT-III (08 Hours)
Probability Distribution:
Random Variables - Discrete and Continuous Random Variables – Mass and density functions – Distribution functions - Definitions of Mean, Median, Mode and Variance – Continuous Distributions - Normal Distribution – Properties - Standard Normal variate.

UNIT-IV (10 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 (08 Hours)
Curve Fitting:
Curve fitting by the Method of Least Squares - Fitting of Straight line-Second order curve (parabola)-Exponential curve--Correlation – Karl Pearson's Co-efficient of Correlation.

Text Books:

1 Advanced Engineering Mathematics, Third Edition, R. K. Jain and S. R. K. Iyengar, Narosa Publishing House.
2 Higher Engineering Mathematics, Dr.B.S. S Grewal 40th Edition, Khanna Publishers.
3 Probability, Statistics and Random Processes, T. Veera Rajan, Tata McGraw Hill Education Private Ltd.

Reference Books:

1 Advanced Engineering Mathematics, Kreyszig E, 8th 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.

Online Resources:

1 https://onlinecourses.swayam2.ac.in/cec24_ma19/preview
2 https://onlinecourses.nptel.ac.in/noc24_ma39/preview

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

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	Duration of Internal Tests	: 90 Minutes			

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

DEPARTMENT OF MATHEMATICS

PROBABILITY & STATISTICS

for B.E., IV- Sem., (CBCS)

(For IT only)

Instruction : 3 +1 Hours per week	**Sem. End Exam Marks : 60**	**Subject Reference Code : U23BS420MA**
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 fundamental concepts of probability theory.	1. Define probability and compute probabilities of events and apply Bayes' Theorem to update probabilities based on new information.
2. **Understand** random variables and its probability distributions.	2. **Differentiate** between discrete and continuous random variables and its distributions.
3. **Learn** various probability distributions, and their related applications.	3. **Apply** various theoretical probability distributions to solve related problems in various applications.
4. **Study** the concept of hypothesis testing employed for large samples.	4. **Formulate** Null and Alternative Hypotheses and apply the tests of hypothesis for large samples.
5. **Study** the various methods of testing small samples.	5. **Apply** various methods for Tests of Significance for small samples.

UNIT –I (08 Hours)

Probability:

Basic terminology- Definition of Probability – Addition Law of probability- Independent events- Conditional Probability- Multiplication law of probability - Baye's Theorem.

UNIT –II (10 Hours)

Random variables and Distributions:

Random Variables - Discrete and Continuous Random Variables – Mass and density functions – Distribution functions - Definitions of Mean, Median, Mode and Variance – Binomial & Poisson distributions.

UNIT-III (08 Hours)

Continuous Distributions:

Geometric distribution - Uniform distribution - Exponential distribution & Normal Distribution - Properties

UNIT-IV (08 Hours)

Tests of Hypothesis for Large samples:

Introduction -Testing of Hypothesis- Null and Alternative Hypothesis -Errors- -Level of Significance –Confidence Intervals - One and two tailed tests - Tests of Significance for large samples – Tests for single mean- Difference of means.

UNITV (08 Hours)

Tests of Hypothesis for Small samples:

Tests of Significance for small samples - t-test for single mean and difference of means – F-test for comparison of variances - Chi-square test for goodness of fit.

Text Books:

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

Reference Books:

1. Advanced Engineering Mathematics, Kreyszig E, 8th 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.

Online Resources:

1 https://onlinecourses.nptel.ac.in/noc24_ma39/preview

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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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(OU Nominee)	**(Subject Expert-JNTUH)**	**(Subject Expert)**	**(Industry Expert)**

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

DEPARTMENT OF MATHEMATICS

CALCULUS & MATRIX THEORY

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

(Common to all branches)

Instruction:	2 hours/Week	SEE Marks	:50	Subject Reference Code	**UB23BS300MA**
Credits:	-	CIE Marks	:-	Duration of SEE	3 Hrs

UNIT-I: (08 Hours)

CALCULUS

Differentiation of standard functions (Formulae) - Taylor's Series – Maclaurin's Series for functions of one variable - Partial Derivatives – Total Derivative - Derivative of Composite functions and Implicit functions - Chain Rule.

UNIT –II (06 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 -Solenoidal and Irrotational vector- Conservative vector field.

UNIT – III (06 Hours)

MULTIPLE INTEGRALS: Double integrals - Change of order of integration (Cartesian Coordinates) – Change of variables (Cartesian to polar coordinates in two dimensions) - Triple integrals (Cartesian).

UNIT- IV (06 Hours)

MATRIX THEORY

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

Suggested Books:

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

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

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DEPARTMENT OF MATHEMATICS

COMPLEX VARIABLES

(Open Elective)

For B.E., III - Semester – CBCS

(For CIVIL, EEE, ECE & MECH only)

Instruction: 2 Hours per week	**Sem. End Exam Marks: 60**	**Subject Reference Code: U23OE310MA**
Credits: 2	**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 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** a line integral of a function of a complex variable using Cauchy's integral formula, and how to	2. **Evaluate** complex integrals by Cauchy's theorem and Cauchy's Integral formula
3. **Evaluate** 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** 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 40th Edition Dr. B.S Grewal, Khanna Publishers.
3. A Text book of Engineering Mathematics, N.P. Bali & Manish Goyal, Laxmi Publications.

Online Resources:

1. https://onlinecourses.nptel.ac.in/noc24_ma03/preview

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

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DEPARTMENT OF MATHEMATICS

NUMERICAL METHODS

(Open Elective)

For B.E., IV - Semester – CBCS

(for CSE, CSE-AIML & IT only)

Instruction : 3 Hours per week	**Sem. End Exam Marks : 60**	**Subject Reference Code : U23OE410MA**
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** various numerical methods to solve Algebraic and Transcendental equations.	*1.* **Apply** numerical methods to solve Algebraic and Transcendental equations which cannot be solved by traditional algebraic methods
2. **Understand** the methods to solve linear system of equations.	*2.* **Solve** linear system of equations using direct and iteration methods.
3. **Understand** the numerical methods in interpolation and extrapolation.	*3.* **Use** various numerical methods in interpolation and extrapolation.
4. **Understand** the numerical methods in interpolation using central differences.	*4.* **Use** various numerical methods in interpolation using central differences.
5. **Understand** numerical methods in solving ordinary differential equations.	*5.* **Find** numerical solutions of ordinary differential equations.

Unit – I: (8 Hours)

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: (8 Hours)

Solution of linear system of equations:

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

Unit – III: (8 Hours)

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: (8 Hours)

Numerical differences-II

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

Unit – V: (8 Hours)

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:

1 https://onlinecourses.swayam2.ac.in/cec24_ma19/preview

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

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DEPARTMENT OF MATHEMATICS

Transform Techniques (Open Elective)

For B.E., V - Semester – CBCS

(For CSE, AIML & IT only)

Instruction: 3 Hours per week	**Semester End Exam Marks: 60**	**Subject Reference Code: U22OE510MA**
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 (08 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 (08 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 (08 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 (08 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 (08 Hours)

Inverse Z-Transforms

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

Text Books:

1 Advanced Engineering Mathematics, Third Edition, R. K. Jain and S. R. K. Iyengar, Narosa Publishing House.
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. https://onlinecourses.nptel.ac.in/noc24_ma17/preview

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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with effect from :2024-25 (R-23)

VASAVI COLLEGE OF ENGINEERING (AUTONOMOUS)

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

DEPARTMENT OF MATHEMATICS

NUMBER THEORY& BOOLEAN ALGEBRA (OE) for B.E., III - Semester – CBCS

(For CSE, AIML & IT only)

Instruction :2 Hours per week	**Semester End Exam Marks: 40**	**Subject Reference Code: U23OE320MA**
Credits: 2	**Sessional Marks: 60**	**Duration of Semester End Exam: 3 Hrs.**

Course Description: This course is designed to explain the basics and applications of number theory for the students of Computer Science & Information Technology. The core courses of these branches encounter with concepts like prime factorization, modular arithmetic, Congruences, Primitive roots and Boolean function in number theory. The students will also learn how number theory is used in public key cryptography to securely transmit information over the internet.

COURSE OBJECTIVES	COURSE OUTCOMES
The course will enable the students to:	*At the end of the course students will be able to:*
1. ***Study*** Fundamental Theorem of Arithmetic and GCD using Euclidean Algorithm and also Linear Diophantine Equations and their solutions. 2. ***Understand*** the concepts of number theory such Congruences and proofs of Fermat's and Wilson's theorem. 3. ***Identify*** Primitive roots for primes and their existence and also to outline the Euler's theorem and Lagrange's theorem. 4. ***Familiarise*** with properties of Boolean algebra and to understand Normal Forms.	1. ***Calculate*** GCD using Euclidean algorithm and also solve Linear Diophantine Equations in order to implement in RSA encryption. 2. ***Use*** Fermat's Little Theorem & Wilson's theorem to prove that RSA works correctly and accurately and also in discrete log cipher of Cryptography. 3. ***Apply*** primitive roots in the Diffie-Hellman key exchange protocol and ElGamal encryption of Cryptography 4. ***Design*** secure hash functions, encryption schemes, and authentication protocols using Boolean functions which are the building blocks of symmetric cryptographic systems, which are used to design all types of digital security systems.

UNIT – I (6 Hours)

Theory of Numbers: The Integers and Division- Prime and Composite Numbers -Division Algorithm- Fundamental Theorem of Arithmetic –GCD and their properties- Euclidean Algorithm- Modular Arithmetic- Linear Diophantine Equations and their solutions.

UNIT – II (8 Hours)

Congruences: Introduction to Congruences, Linear Congruence. Chinese Remainder Theorem - Polynomial Congruences- System of Linear Congruences in two variables- The Pollard Rho Factoring Method- Fermat's Little Theorem, Wilsons Theorem and its converse

UNIT – III (5 Hours)

Primitive Roots: Euler's phi-function - Euler's theorem -The order of an integer modulo n, Primitive roots for primes - Lagrange's Theorem - Existence of Primitive roots.

UNIT – IV (6 Hours)

Boolean Algebra: Axiomatic definition of Boolean Algebra, Basic theorems and Properties of Boolean Algebra, Boolean Functions, Minterms and Maxterms, Disjunctive normal form and conjunctive normal form.

Text Books:

1. K.H. Rosen: Elementary Number Theory & its Applications, Pearson Addition Wesley
2. Elementary Number Theory | 7th Edition by David Burton, Mc Graw Hill Education
3. Discrete mathematics for computer scientists and mathematicians / by Joe L. Mott, Abraham Kandel and Theodore P. Baker, Prentice Hall Of India Pvt.Ltd., 1986.Edition: 2nd edition, New Delhi.
4. Basic Number Theory by S.B. Malik,S. Chand publishers

Reference Books:

1. N. Koblitz; A course in Number theory and Cryptography; Springer.
2. Neville Robinns, Beginning Number Theory (2nd Edition), Narosa Publishing House Pvt. Limited, Delhi, 2007.
3. Elementary Number Theory with Applications, Thomas Koshy, 2nd edition, Academic Press, An Imprint of Elsevier, USA, 2007.
4. An introduction to the theory of number, Ivan Niven, Zuckerman, Montgomery, willy India edition
5. Arnold B. H.: Logic and Boolean Algebra, Prentice Hall, 1962.

Online Resources:

1. https://www.classcentral.com/course/openlearn-science-maths-technology-introduction-number-theory-95553
2. https://www.open.edu/openlearn/science-maths-technology/introduction-number-theory/content-section-0?intro=1
3. https://ocw.mit.edu/courses/6-042j-mathematics-for-computer-science-fall-2010/resources/lecture-4-number-theory-i/

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DEPARTMENT OF MATHEMATICS

ALGEBRAIC STRUCTURES

(OPEN ELECTIVE)

for B.E., IV- Sem.,

(Common to CSE, CSE-AIML & IT)

Instruction: 3 Hours per week	**Sem. End Exam Marks: 60**	**Subject Reference Code: U23OE420MA**
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 concept of Groups, Finite Groups, Subgroups, Cyclic Groups and their properties. 2. **Understand** Isomorphism – Automorphisms of groups and their properties. 3. **Learn** group Homomorphisms and related concepts. 4. **Acquire knowledge** of Rings, Integral domains and Fields, External and Internal direct products. 5. **Identify** Ring Homomorphisms, properties and polynomial rings	1. **Solve the** problems on Groups and will be equipped to apply them in applications like robotics, computer vision, computer graphics and medical image analysis 2. **Implement** the concepts of automorphism in developing encoding and decoding tools of Cryptography 3. **Apply** homomorphisms in the study of formal languages, automata theory, and compiler design. 4. **Use the knowledge** of Rings, Integral domains and Fields in coding theory. 5. **Compute** the programming of modern computer algebra algorithms using ring homomorphisms.

Unit-I:

Groups (8 classes)

Groups – Definition, Elementary properties of Groups, Finite Groups, Subgroups, Cyclic Groups – Properties of Cyclic Groups, Classification of Subgroups of Cyclic Group.

Unit-II:

Group Isomorphisms (8 classes)

Isomorphism – Definition, Properties, Automorphisms, Cosets and Lagrange's theorem-properties of cosets, Lagrange's theorem.

Unit-III:

Group Homomorphisms (08 classes)

External Direct Products - Definition, Properties, Factor Groups and Normal Subgroups, Internal Direct Products, Group Homomorphisms – Definition, Properties.

Unit-IV:

Rings (8 classes)

Rings, Properties of Rings, Subrings, Integral Domains and Fields Ring Homomorphisms and Ideals, Prime and Maximal Ideals.

Unit-V:

Ring Homomorphisms (8 classes)

Properties of Ring Homomorphisms, Polynomials - Polynomial Rings, the Division Algorithm.

Text Books:

1. Contemporary Abstract Algebra, Joseph A. Gallian, CRC Press
2. A First Course in Abstract Algebra, John B. Fraleigh, Pearson Education Limited

Reference Books:

1. Topics in Algebra, I. N. Herstein, John Wiley & Sons
2. Basic Abstract Algebra, P. B. Bhattacharya, S. K. Jain, S. R. Nagpaul, Cambridge University Press
3. Abstract Algebra, D. S. Dummit, R. M. Foote, John Wiley & Sons, Inc.

Online Resources:

1. https://ocw.mit.edu/
2. http://www.nptel.ac.in/course.php
3. https:/www.coursera.org/in

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VASAVI COLLEGE OF ENGINEERING (AUTONOMOUS)

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

DEPARTMENT OF MATHEMATICS

THEORY OF ESTIMATION AND INFERENCE THEORY

for B.E., V- Sem., (CBCS)

(For CSE, AIML & IT only)

Instruction: 3 Hours per week	**Sem. End Exam Marks:** 60	**Subject Reference Code: U22OE520MA**
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 concepts and application of sampling distribution	1. **Apply Central** Limit Theorem to the real-world problems and calculate and interpret, in testing one sample mean (σ known).
2. **Describe** the role of the point estimation, interval estimation and Bayesian estimation about a parameter.	2. **Apply** various estimators for estimating the parameters of standard distributions.
3. **Study** various methods of testing large samples.	3. **Infer** properties of population conducting tests on samples
4. **Analyze** standard statistical tests employed for small samples.	4. **Interpret** planned and unplanned comparisons for the one-way ANOVA.
5. **Study** the difference between non-parametric and parametric tests.	5. **Solve** problems on the Sign test, Wilcoxon Signed test, Mann- Whitney U-test.

UNIT –I (8 Hours)

Sampling Distribution:

Sampling distribution of Mean (σ known)-Sampling distribution of Mean (σ unknown)-Sampling distribution of the Variance-Sampling distribution of differences and sums- Central Limit Theorem- Using the Central Limit Theorem to Calculate the Probability of paint coverage.

UNIT –II (7 Hours)

Estimation:

Introduction- Point estimation- Interval estimation- Bayesian estimation

UNIT-III (7 Hours)

Testing of Hypothesis for Large samples:

Introduction -Test of significance for single proportion-Test of significance for two proportions-Standard deviation tests for two samples.

UNIT-IV (7 Hours)

Testing of Hypothesis for Small samples:

Introduction- Paired Sample t-test- Chi- square test for independence of attributes- Analysis of Variance (ANOVA)

UNIT-V (7 Hours)

Non-Parametric Tests:

The Sign test- Wilcoxon Signed Rank test- Mann-Whitney U- test.

Text Books:

1. Miller & Freund's Probability and Statistics for Engineers.
2. Fundamentals of Mathematical Statistics, Gupta & Kapoor, Sultan chand & sons, New Delhi.
3. Applied Statistics and Probability for Engineers by Douglas C. Montgomery and George C. N Runger, International Student Version, 6th Edition, 1 January 2016.

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

Online Resources:

1 https://onlinecourses.nptel.ac.in/noc24_ma39/preview

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

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VASAVI COLLEGE OF ENGINEERING

(Autonomous)

IBRAHIMBAGH, HYDERABAD – 500 031

Department of Mathematics

Advanced Probability &Statistical Methods

(Open Elective)

For B.E., VI - Semester – CBCS

(for CSE, CSE-AIML & IT only)

L:T:P (Hrs./week): 3:0:0	SEE Marks : 60	Course Code: **U230E610MA**
Credits : 3	CIE Marks : 40	Duration of SEE : 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. **Understand** fitting of a straight line to a given data and measuring Correlation between variables. 2. **Study** the concepts and application of Time series. 3. **Distinguish** thevarious methods of Designs of Experiments 4. **Provide**the knowledge to the students about Prediction and control by statistical methods Regression and SQC. 5. **Learn** the concept of pure birth and death models of Queuing theory.	1. **Solve** problems on fitting of a straight line to the given data and also to find co-efficient of correlation and to determine regression lines and their application problems. 2. **Apply** concept of Time series to solve the real time problems. 3. **Apply** the methods of Designs of Experiments 4. **Evaluate** the performance measures of the systems in networks, transportation systems, production lines. 5. **Apply** the comprehensive levels of Queuing theory for calculating service time, traffic intensity, queue length etc. in special and general queues.

Unit-I (8 Classes)

Correlation & Regression Analysis:

Correlation –Scatter diagrams-Spearman's Rank of Correlation-Curve fitting by the Method of Least Squares - Fitting of Straight line - Second degreeparabolas – Regression - Lines of Regression - Multiple Regression-Curvilinear regression.

Unit-II (8 Classes)

Time series:

Time series and Forecasting: Introduction-Moving averages, weighted average method smoothening of curves forecasting models and Methods.

Unit-III (8 Classes)

Design of Experiments:

Introduction to Design of experiments-Aim of the Design of experiments-Randomized Block Design (R.B.D)-Latin Square Design (L.S.D)-Comparison of RBD and LSD-Related problems.

Unit-IV (8 Classes)
Queuing Theory:
Introduction, Input pattern, service pattern, queue discipline, Queue behavior, Kendal's notation, Pure Birth and Death Models, Traffic intensity; (M/M/1: ∞/FIFO)-Model: (M/M/: N/FIFO)-Model.

Unit-V (8 Classes)
Statistical Quality Control
Introduction, Methods for preparing control charts, variable charts – mean and range charts, Attribute charts- np, p and c charts.

TEXT BOOKS:

1. Probability, Statistics and Random Processes, T Veera Rajan, Tata McGraw-Hill companies (Seventh edition)
2. Probability & statistics and Random Processes; K.Murugesan & P.Gurusamy -Anuradha publishers
3. Probability & Statistics for Engineers, Miller& John E. Freund, Prentice Hall of India (Third edition)

REFERENCE BOOKS:

1. T.K.V. Iyengar et al, Probability and Statistics, S. Chand Publications, Revised edition.
2. Probability & Statistics for Engineers, Antony J. Hayter, CENGAGE Learning (India edition)

ONLINE SOURCES:

1. https://onlinecourses.nptel.ac.in/noc24_ch03
2. https://onlinecourses.nptel.ac.in/noc24_ma28

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