

VASAVI COLLEGE OF ENGINEERING (AUTONOMOUS)

Accredited by NAAC with A++ Grade

DEPARTMENT OF MATHEMATICS

Summary of the BoS meeting conducted on 11.05.2026

Date: 11.05.2026

Submitted to Principal

The Department of Mathematics has conducted BoS meeting to review and revise the syllabi of 20 courses on 11.05.2026 at 10.30 am and the meeting ended at 1.30 pm. The following were the Chairman, Subject experts, Nominees and Members of the BOS meeting:

Chairman : Dr.T.Sudhakar Rao

University nominee : Prof.N.Kishan (O.U) (Attended Through Online)

Subject experts : 1. Prof.M.A.Srinivas (JNTU-H)
2. Dr.J Jagan Mohan (BITS, Hyderabad)
3. Dr.T. Ramalingeswarara Rao (Industry Expert) (Not Attended)

Members : 1. Dr. P. Hemagiri Rao
2. Dr.N. Phani Kumar
3. Dr.N.Vasudha
4. Dr.T.Ramprasad
5. Dr. B. S. N Murthy
6. Dr.R.Hari Kishore
7. Dr.Ch.N.Anuradha
8. Dr.M.Venkateswara Rao
9. Mr.Y.Bhanu Prakash
10. Dr.Ch. Chaitanya

The following are the suggestions/resolutions taken in the BoS meeting:

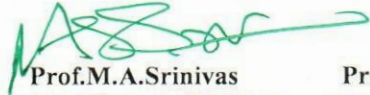
S.NO	Course title with Code	Suggestions
1	Matrices & Calculus (U26BS110MA)	➤ Prof. N. Kishan, Prof.M.A.Srinivas & Dr.J.Jagan Mohan suggested that orthogonal transformations are very useful and decided to have it as it is.
2	Matrix Theory and Differential calculus (U26BS120MA)	➤ Prof.M.A.Srinivas & Dr.J.Jagan Mohan suggested to have LU-decomposition method in Unit-I instead of having it in Unit-II also ➤ Include conditional convergence in unit-V ➤ Also the experts suggested to add real matrices in the starting of Unit-II
3	Calculus & linear algebra (U26BS130MA)	➤ Prof. N. Kishan & Dr.J.Jagan Mohan suggested the appropriate title of Unit-I is "Beta-Gamma functions" instead of special functions ➤ It is also suggested to have the latest text books 1) Advanced Engineering Mathematics, 4 th edition by R.K.Jain 2) Higher Engineering Mathematics, 44 th edition by B.S.Grewal

4	Differential Equations & Vector Calculus (U26BS210MA)	<ul style="list-style-type: none"> ➤ Experts suggested the name of Unit-V as “Beta-Gamma functions” instead of Special functions ➤ It is also suggested to have a reference book “Vector Calculus”, by Schaum’s outline series
5	Differential Equations & Multivariable Calculus (U26BS220MA)	<ul style="list-style-type: none"> ➤ In unit-I suggested to have Applications of first order differential equations- resisted motion ,resisted vertical motion, velocity of escape from earth(without derivation) ➤ In unit-II suggested to have Applications of higher order differential equations- Spring-Mass system, Simple harmonic motion (without derivation) ➤ In unit-III Jacobian of Two variable functions and problems are be included ➤ In Unit-V along with conservative vector field add scalar potential function ➤ It is also suggested to have a reference book “Vector Calculus”, by Schaum’s outline series
6	Advanced Calculus (U26BS230MA)	<ul style="list-style-type: none"> ➤ Prof.M.A.Srinivas suggested that In unit-V Include conditional convergence ➤ It is also suggested to have the latest text books <ol style="list-style-type: none"> 1) Advanced Engineering Mathematics, 4th edition by R.K.Jain 2) Higher engineering mathematics, 44th edition by B.S.Grewal
7	TT&PDE (U25BS310MA)	➤ Prof.M.A.Srinivas & Dr.J.Jagan Mohan have suggested that no changes are required
8	PDE&NM (U25BS320MA)	➤ All experts suggested that the appropriate name of Unit-V as “Curve fitting & Correlation” instead of Curve fitting
9	Probability & Statistics (U25BS330MA)	➤ Dr.J.Jagan Mohan have accepted to have it in the 3 rd semester from 4 th semester
10	TT&PS (U25BS340MA)	➤ Prof. N. Kishan & Prof.M.A.Srinivas suggested to include binomial distribution in unit-III
11	PDIT (U25BS350MA)	➤ All experts have suggested that no changes are required
12	NMPS (U25BS410MA)	➤ Prof. N. Kishan & Dr.J.Jagan Mohan have suggested that no changes are required
13	Discrete Mathematics (U25BS420MA)	➤ Prof.M.A.Srinivas & Dr.J.Jagan Mohan have accepted to have it in the 4 th semester from 3 rd semester
14	NTBA(O.E) (U25OE310MA)	➤ All experts have suggested that no changes are required
15	Numerical Methods(O.E) (U25OE420MA)	➤ Prof.M.A.Srinivas have suggested that no changes are required
16	ETSI (U25OE410MA)	➤ All experts have accepted to have it in the 4 th semester from 5 th semester
17	Transform Techniques(O.E) (U24OE510MA)	➤ All experts have suggested that no changes are required


18	Applied statistical Methods (U25OE510MA)	➤ Prof.M.A. Srinivas & Dr.J.Jagan Mohan that the appropriate title of this course is “Applied statistical Methods” instead of Advanced Probability & Statistical Methods
19	Applied algebra for Computing (U25OE610MA)	All BoS members suggested that the appropriate title of this course is “Applied algebra for Computing” instead of Algebraic structures
20	All experts suggested that the stream based OE name as “Advanced Mathematical & Statistical Methods”	



Prof.N.Kishan
(OU Nominee)



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



Prof. J.Jagan Mohan
(Subject Expert, BITS-HYD)

Dr.T.Ramalingeshwaro Rao
(TCS-HYD)



Dr.T.Sudhakar Rao
(Chairman,BOS)

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9-5-81, Ibrahimbagh, Hyderabad-500031, Telangana State
DEPARTMENT OF MATHEMATICS

MATRIX THEORY AND DIFFERENTIAL CALCULUS
For B.E., I- Sem., (CBCS)
(Civil and Mechanical Engineering)

Instruction: 3 +1 Hours per week	Sem. End Exam Marks:60	Subject Reference Code: U26BS120MA
Credits: 3	Sessional Marks:40	Duration of Semester End Exam: 3 Hours

COURSE OBJECTIVES	COURSE OUTCOMES
<i>The course will enable the students to:</i>	<i>At the end of the course students should be able to:</i>
1. Study the concepts of rank of a matrix, System of linear equations.	1. Compute the rank of a given matrix and solution of a system by rank method
2. Learn the concepts of eigen values, eigen vectors and diagonalization.	2. Find the characteristic equation, eigen values, and eigen vectors and to diagonalize a square matrix using orthogonal transformation.
3. Study the concept of Quadratic form, orthogonal transformation and LU decomposition.	3. Apply orthogonal transformation to reduce the quadratic form into canonical form.
4. 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.	4. Apply the concepts of Taylor's series and Maclaurin's series to approximate functions and to find the curvature, radius, centre of curvature and evolutes of curves.
5. Understand the fundamental concepts of infinite series and various tests for convergence.	5. Identify an appropriate test and determine nature of a series.

UNIT-I (08 classes):

MATRICES-I:

Rank of a Matrix- Echelon form - Linear Dependence and Independence of Vectors– Consistency and Inconsistency of Homogeneous and Non-Homogenous system of linear equations. Solving system of linear equations using LU Decomposition.

UNIT-II (08 classes):

MATRICES-II:

For real matrices - Characteristic equation -Eigen values and Eigen vectors- properties of Eigen values and Eigen vectors (without proof) - Cayley - Hamilton Theorem (without proof) – Computation of powers and inverse of a matrix by using Cayley - Hamilton Theorem.

UNIT-III (08 classes):

MATRICES-III: Diagonalization using Orthogonal Transformation-Quadratic form – Reduction of Quadratic form to canonical form by Orthogonal Transformation

UNIT-IV(08 classes):

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

UNIT-V(08 classes):

INFINITE SERIES

Introduction to Infinite Series - Nature of the Series – Series of positive terms - Geometric series- p-series test - Comparison tests – Limit form of comparison test - D'Alembert's Ratio Test – Cauchy's n^{th} root test - Alternating Series – Leibnitz test – Absolute Convergence – Conditional convergence

Text Books:

1. Advanced Engineering Mathematics, Fourth Edition, R. K. Jain and S. R. K. Iyengar, Narosa Publishing House.
2. Higher Engineering Mathematics, B. S. Grewal 44th 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


Online Resources:


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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


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
4	Duration of Internal Tests	:	90 Minutes			


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DEPARTMENT OF MATHEMATICS

CALCULUS & LINEAR ALGEBRA

For B.E., I- Sem., (CBCS)

(Common to CSE, AIML & IT Branches)

Instruction: 3 +1 Hours per week	Sem. End Exam Marks: 60	Subject Reference Code: U26BS130MA
Credits: 3	Sessional Marks: 40	Duration of Semester End Exam: 3 Hours
COURSE OBJECTIVES		COURSE OUTCOMES
<i>The course will enable the students to:</i>		<i>At the end of the course students should be able to:</i>
<p>1. Develop a deep understanding of the concepts of Improper integrals Beta, Gamma functions and their properties.</p> <p>2. Learn the concepts of limits, continuity, partial derivatives of functions of several variables and derivative of composite functions, Taylor's series for functions of two variables, and maxima and minima of functions of several variables.</p> <p>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.</p> <p>4. Understand the fundamental concepts of Linear transformation and their properties.</p> <p>5. Understand of linear algebra concepts, including the rank of a matrix, characteristic equation, eigen values and eigenvectors, Diagonalization using Similarity Transformation.</p>		<p>1. Evaluate Improper integrals using Beta, Gamma functions.</p> <p>2. Find partial derivatives of functions of several variables and apply Taylor's series for functions of two variables and to find maxima and minima of a function of several variables.</p> <p>3. Analyze vector spaces and their subspaces, determine linear dependence and independence of vectors, determine basis of a vector space and compute the dimension of a vector space.</p> <p>4. Determine Linear transformations, their Null space and Range Space, calculating the dimension of these spaces, understanding the Rank and Nullity of a linear transformation, and representing a Linear transformation using a matrix.</p> <p>5. Find the rank of a matrix, eigen values and eigen vectors and to Diagonalize a matrix using similarity transformation to real-world problems.</p>

UNIT- I (08 classes)

BETA-GAMMA FUNCTIONS

Definition of Improper Integrals- Gamma function -properties-Beta function - properties - Relations between Beta & Gamma function.

UNIT –II (08 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 of functions of two variables and related problems 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 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- Echelon form - Characteristic equation - Eigen values and Eigenvectors – Diagonalization using Orthogonal Transformation - Quadratic form - Reduction of Quadratic form to Canonical form using orthogonal transformation.

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

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:

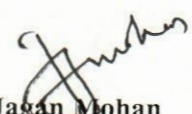
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The break-up of CIE: Internal Tests + Assignments + Quizzes

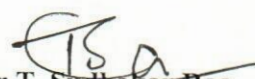
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DEPARTMENT OF MATHEMATICS

MATRICES & CALCULUS
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Instruction: 3 +1 Hours per week	Sem. End Exam Marks:60	Subject Reference Code: U26BS110MA
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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 to find the curvature, radius, centre of curvature and evolutes of curves.
4. Learn the techniques for finding partial derivatives of functions of several variables, Taylor's series for functions of two variables and 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 infinite series and various tests for convergence.	5. Identify an appropriate test and determine nature of a series.

UNIT- I (08 classes)

MATRICES-I

Rank of a Matrix- Echelon form - Linear Dependence and Independence of Vectors- Consistency and Inconsistency of Homogeneous and Non-Homogenous system of linear equations.

UNIT -II (08 classes)

MATRICES-II

For real matrices - Characteristic equation -Eigen values and Eigen vectors, - properties of Eigen values and Eigen vectors (without proof) - Cayley - Hamilton Theorem (without proof) -Computation of higher powers and Inverse of a matrix by using Cayley - Hamilton Theorem- Diagonalization using orthogonal Transformation-Quadratic form- Reduction of Quadratic form to Canonical form by orthogonal transformation.

UNIT – III (08 classes)

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 (08 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 of functions of two variables and related problems- Maxima and Minima of functions of two variables - Lagrange's Method of multipliers.

UNIT-V (08 classes)

INFINITE SERIES

Introduction to Infinite Series - Nature of the Series – Series of positive terms - Geometric series- p-series test - Comparison tests – Limit form of comparison test - D'Alembert's Ratio Test – Cauchy's n^{th} root test - Alternating Series – Leibnitz test – Absolute Convergence – Conditional convergence

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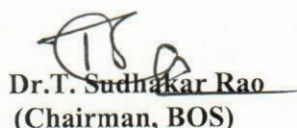


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DEPARTMENT OF MATHEMATICS

ADVANCED CALCULUS

For B.E., II- Sem., (CBCS)

(Common to CSE, CSE-AIML & IT Branches)

Instruction: 3+1 Hours per week	Semester End Exam Marks: 60	Subject Reference Code: U26BS230MA
Credits: 3	Sessional Marks: 40	Duration of Semester End Exam: 3 Hours

COURSE OBJECTIVES	COURSE OUTCOMES
<i>The course will enable the students to :</i>	<i>At the end of the course students should be able to:</i>
1. Understand the fundamental concepts and solution 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 circuit and find orthogonal trajectories of Cartesian curves.
2. Develop the ability to solve homogeneous and non-homogeneous Linear differential equations with constant coefficients, and their applications to LCR circuits.	2. Solve homogeneous and non-homogeneous Linear differential equations with constant coefficients, including those arising in LCR circuits.
3. Learn the concepts of evaluation of double integrals and changing the order of integration.	3. Evaluate the double integrals and also evaluate the double integrals by changing the order of integration and by change of variables.
4. Study the concepts of vector differentiation, Directional derivative, Divergence and Curl of a vector point function.	4. Find the gradient of a scalar point function, divergence and curl of vector field and its applications.
5. Understand the fundamental concepts of infinite series and various tests for convergence.	5. Identify an appropriate test and determine nature of a series.

UNIT – I (08 classes)

ORDINARY DIFFERENTIAL EQUATIONS OF FIRST ORDER

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

UNIT – II (08 classes)

HIGHER ORDER LINEAR DIFFERENTIAL EQUATIONS

Solutions of Homogeneous and Non-Homogeneous linear equations of the form $f(D)y = r(x)$ with constant coefficients [Where $r(x) = e^{ax}$, $\sin(ax + b)$ (or) $\cos(ax + b)$, x^k , $e^{ax}V(x)$] - Method of Variation of Parameters – Applications of Linear Differential Equations to LCR circuits.

UNIT – III (08classes)

DOUBLE INTEGRALS

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

UNIT – IV (08 classes)

DIFFERENTIAL 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-scalar potential.

UNIT – V (08 classes)

INFINITE SERIES

Introduction to Infinite Series – Nature of the Series- Series of positive terms-Geometric series- p-series test - Comparison tests – Limit form of comparison test- D’Alembert’s Ratio Test – Cauchy’s n^{th} root test - Alternating Series – Leibnitz test-Absolute Convergence - Conditional convergence.

Text Books:

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2. Higher Engineering Mathematics 44th Edition Dr. B.S Grewal, Khanna Publishers.
3. A Text book of Engineering Mathematics, N.P. Bali & Manish Goyal, Laxmi Publications.

Reference Books:

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2. Advanced Engineering Mathematics, 8th Edition by Erwin Kreyszig, John Wiley & Sons, Inc.

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DEPARTMENT OF MATHEMATICS

DIFFERENTIAL EQUATIONS & MULTI VARIABLE CALCULUS

For B.E., II- Sem., (CBCS)

(Common to Civil, Mechanical Branches)

Instruction:3+1 Hours per week	Semester End Exam Marks:60	Subject Reference Code: U26BS220MA
Credits: 3	Sessional Marks: 40	Duration of Semester End Exam: 3 Hours

COURSE OBJECTIVES	COURSE OUTCOMES
<i>The course will enable the students to :</i>	<i>At the end of the course students should be able to:</i>
<p>1. Understand the fundamental concepts and solution of first-order Differential Equations, as well as their applications in modeling real-world phenomena.</p> <p>2. Develop the ability to solve homogeneous and non-homogeneous Linear differential equations with constant coefficients, and their applications to LCR circuits.</p> <p>3. Learn the concepts of limits, continuity, partial derivatives of functions of several variables and derivative of composite functions, Taylor's series for functions of two variables, and maxima and minima of functions of several variables.</p> <p>4. Learn the concepts of evaluation of double integrals and changing the order of integration.</p> <p>5. Study the concepts of vector differentiation, Directional derivative, Divergence and Curl of a vector point function.</p>	<p>1. Solve various types of first-order Differential Equations, model and analyze physical systems such as LR circuit and find orthogonal trajectories of Cartesian curves.</p> <p>2. Solve homogeneous and non-homogeneous Linear differential equations with constant coefficients, including those arising in LCR circuits.</p> <p>3. Find partial derivatives of functions of several variables and apply Taylor's series for functions of two variables and to find maxima and minima of a function of several variables.</p> <p>4. Evaluate the double integrals and also evaluate the double integrals by changing the order of integration and by change of variables.</p> <p>5. Find the gradient of a scalar point function, divergence and curl of vector field and its applications</p>

UNIT – I (08 classes)

ORDINARY DIFFERENTIAL EQUATIONS OF FIRST ORDER

Exact differential equations - Integrating factors - Clairaut's equation – Applications of First-Order Differential Equations: Orthogonal trajectories (Cartesian families) –Resisted motion, resisted vertical motion, velocity of escape from Earth.

UNIT – II (08 classes)

HIGHER ORDER LINEAR DIFFERENTIAL EQUATIONS

Solutions of Homogeneous and Non-Homogeneous linear equations of the form $f(D)y = r(x)$ with constant coefficients [Where $r(x) = e^{ax}$, $\sin(ax + b)$ (or) $\cos(ax + b)$, x^k , $e^{ax}V(x)$] - Method of Variation of Parameters Applications: Deflection of Beams- (End freely supported, End fixed horizontally). Simple Harmonic Motion: Mass Spring Mechanical Systems: free undamped oscillations, free damped oscillations, forced oscillations (without derivations)

UNIT – III (08 classes)

MULTIVARIABLE CALCULUS

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

UNIT – IV (08 classes)

DOUBLE INTEGRALS

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

UNIT-V (08 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-scalar potential.

Text Books:

1. Advanced Engineering Mathematics 4th Edition, R.K. Jain & S.R.K.Iyengar, Narosa Publishing House.
2. Higher Engineering Mathematics 44th Edition 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. Vector calculus, Schaum's outline series.

Online Resources:

1. https://onlinecourses.swayam2.ac.in/cec24_ma09/preview
2. https://onlinecourses.nptel.ac.in/noc24_ma03/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
4	Duration of Internal Tests	:	90 Minutes			



Prof.N.Kishan
(OU Nominee)

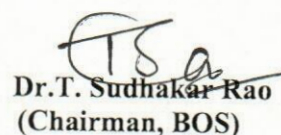


Prof.M.A.Srinivas
(Subject Expert-JNTUH(Retd.))



Dr.J Jagan Mohan
(Subject Expert-BITS, Hyd)

Dr.T. Ramalingeswarara Rao
(Industry Expert)



Dr.T. Sudhakar Rao
(Chairman, BOS)

With effect from the Academic Year 2026-27

VASAVI COLLEGE OF ENGINEERING (AUTONOMOUS)

Accredited by NAAC with A++ Grade
9-5-81, Ibrahimbagh, Hyderabad-500031, Telangana State
DEPARTMENT OF MATHEMATICS

DIFFERENTIAL EQUATIONS & VECTOR CALCULUS

For B.E., II- Sem., (CBCS)
(Common to EEE, ECE Branches)

Instruction: 3+1 Hours per week	Semester End Exam Marks: 60	Subject Reference Code: U26BS210MA
Credits: 3	Sessional Marks: 40	Duration of Semester End Exam: 3 Hours

COURSE OBJECTIVES	COURSE OUTCOMES
<i>The course will enable the students to :</i>	<i>At the end of the course students should be able to:</i>
1. Understand the fundamental concepts and solution 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 circuit and find orthogonal trajectories of Cartesian curves.
2. Develop the ability to solve homogeneous and non-homogeneous Linear differential equations with constant coefficients, and their applications to 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, Directional derivative, Divergence and Curl of a vector point function.	3. Find the gradient of a scalar point function, divergence and curl of vector field and its applications.
4. Learn the concepts of evaluation of double integrals and changing the order of integration.	4. Evaluate the double integrals and also evaluate the double integrals by changing the order of integration and by change of variables.
5. Understand the concepts Improper integrals Beta, Gamma functions and their properties.	5. Evaluate Improper integrals using Beta, Gamma functions.

UNIT – I (08 classes)

ORDINARY DIFFERENTIAL EQUATIONS OF FIRST ORDER

Exact differential equations - Integrating factors - Clairaut's equation - Applications: Orthogonal trajectories (Cartesian families) - LR Circuit.

UNIT – II (08 classes)

HIGHER ORDER LINEAR DIFFERENTIAL EQUATIONS

Solutions of Homogeneous and Non-Homogeneous linear equations of the form $f(D)y = r(x)$ with constant coefficients [Where $r(x) = e^{ax}$, $\sin(ax + b)$ (or) $\cos(ax + b)$, x^k , $e^{ax}V(x)$] - Method of Variation of Parameters- LCR circuits.

UNIT – III (08 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.

UNIT – IV (08 classes)

DOUBLE INTEGRALS

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

UNIT – V (08 classes)

BETA-GAMMA FUNCTIONS

Definition of Improper Integrals- Gamma function -properties-Beta function - properties - Relations between Beta & Gamma function.

Text Books:

1. Advanced Engineering Mathematics 4th Edition, R.K.Jain & S.R.K.Iyengar, Narosa Publishing House.
2. Higher Engineering Mathematics 44th Edition Dr. B.S Grewal, Khanna Publishers.
3. A Text book of Engineering Mathematics, N.P. Bali& Manish Goyal, Laxmi Publications.

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3. Vector calculus, Schaum's outline series.

Online Resources:

1. https://onlinecourses.swayam2.ac.in/cec24_ma09/preview
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The break-up of CIE: Internal Tests + Assignments + Quizzes

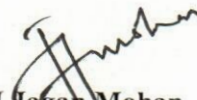
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2	No. of Assignments	:	3	Max. Marks for each Assignment	:	5
3	No. of Quizzes	:	3	Max. Marks for each Quiz Test	:	5
4	Duration of Internal Tests	:	90 Minutes			



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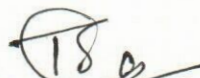


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VASAVI COLLEGE OF ENGINEERING (AUTONOMOUS)

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9-5-81, Ibrahimbagh, Hyderabad-500031

DEPARTMENT OF MATHEMATICS

PROBABILITY & STATISTICS

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

(For IT Branch only)

Instruction : 3 +1 Hours per week	Sem. End Exam Marks: 60	Subject Reference Code: U25BS330MA
Credits: 3	Sessional Marks:40	Duration of Semester End Exam : 3 Hours

COURSE OBJECTIVES	COURSE OUTCOMES
<i>The course will enable the students to :</i>	<i>At the end of the course students should be able to:</i>
1. <i>Study</i> the fundamental concepts of probability theory.	1. <i>Define</i> probability and compute probabilities of events and apply Baye's Theorem to update probabilities based on new information.
2. <i>Understand</i> random variables and its probability distributions.	2. <i>Differentiate</i> between discrete and continuous random variables and its distributions.
3. <i>Learn</i> various probability distributions, and their related applications.	3. <i>Apply</i> various theoretical probability distributions to solve related problems in various applications.
4. <i>Study</i> the concept of hypothesis testing employed for large samples.	4. <i>Formulate</i> Null and Alternative Hypotheses and apply the tests of hypothesis for large samples.
5. <i>Study</i> the various methods of testing small samples.	5. <i>Apply</i> 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 (08 Hours)

RANDOM VARIABLES AND DISTRIBUTIONS:

Random Variables - Discrete and Continuous Random Variables – Mass and density functions – Cumulative distribution functions - Definitions of Mean, Median, Mode and Variance of Probability distributions.

UNIT-III (08 Hours)

THEORETICAL DISTRIBUTIONS: Binomial & Poisson distributions & Normal Distribution- Properties-related problems

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.

UNIT - V (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.
- 3 Probability & Statistics and Random Process, Third edition, T Veerarajan, Tata McGraw-Hill publishing limited.

Reference Books:

1. Miller & Freund's Probability And Statistics For Engineers, Ninth Edition, Richard A. Johnson, Pearson publishers.
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.
4. Probability & Statistics for Engineers, Antony J. Hayter, CENGAGE Learning.

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
4	Duration of Internal Tests	: 90 Minutes		



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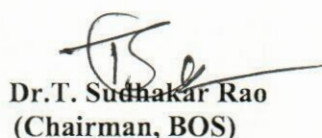


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DEPARTMENT OF MATHEMATICS

TRANSFORM TECHNIQUES & PARTIAL DIFFERENTIAL EQUATIONS

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

(Common to Civil, EEE & Mechanical Branches only)

Instruction :3 +1Hours per week	Semester End Exam Marks: 60	Subject Reference Code: U25BS310MA
Credits: 3	Sessional Marks: 40	Duration of Semester End Exam: 3 Hours
COURSE OBJECTIVES		COURSE OUTCOMES
<i>The course will enable the students to :</i>		<i>At the end of the course students should be able to:</i>
1. Understand the definition and properties of the Laplace transforms.		1. Evaluate Laplace transform of functions and apply Laplace transforms to evaluate integrals.
2. Understand the definition and properties of the inverse Laplace transforms and its applications to Initial Value Problems.		2. Find Inverse Laplace transforms of functions and apply the Laplace transform to solve linear differential equations.
3. Study the concept of Fourier series and its applications.		3. Compute Fourier coefficients and find Fourier series of a function.
4. Learn the formation Partial Differential Equations and solution of linear and non-linear first order partial differential equations.		4. Formulate the Partial differential equations and solve the linear and non-linear first order Partial differential equations.
5. Study the applications of Partial Differential equations.		5. Solve the one-dimensional wave equation, one-dimensional heat equation.

UNIT-I (8 Hours)

LAPLACE TRANSFORMS:

Introduction to Laplace transforms - 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 (9 Hours)

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 - Division by s -Convolution Theorem (without proof)- Applications- Solving Linear Ordinary Differential Equations with constant coefficients upto 2nd order.

UNIT –III (8 Hours)

FOURIER SERIES:

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

UNIT –IV (8 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 (7 Hours)

APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATIONS:

Method of Separation of Variables - One Dimensional Wave Equation- One Dimensional Heat Equation (Homogeneous 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			
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
4	Duration of Internal Tests	: 90 Minutes	



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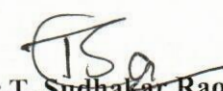


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DEPARTMENT OF MATHEMATICS

PDE & NUMERICAL METHODS

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

(For ECE Branch only)

Instruction :3 +1 Hours per week	Semester End Exam Marks: 60	Subject Reference Code: U25BS320MA
Credits: 3	Sessional Marks: 40	Duration of Semester End Exam: 3 Hours

COURSE OBJECTIVES	COURSE OUTCOMES
<i>The course will enable the students to :</i>	<i>At the end of the course students should be able to:</i>
1. Learn the formation of 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.
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 solving first-order ordinary differential equations.	4. Use Numerical techniques to 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 (Homogeneous)

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

UNIT-V (08 Hours)

CURVE FITTING AND CORRELATION:

Curve fitting by the Method of Least Squares - Fitting of Straight Line - Second order curve (Parabola) - Exponential curve ($y = ab^x$) - Correlation – Karl Pearson's Co-efficient of Correlation.

Text Books:

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

Reference Books:

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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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DEPARTMENT OF MATHEMATICS

TRANSFORM TECHNIQUES, PROBABILITY & STATISTICS

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

(For CSE Branch only)

Instruction: 3+1 Hours per week	Semester End Exam Marks: 60	Subject Reference Code: U25BS340MA
Credits: 3	Sessional Marks: 40	Duration of Semester End Exam: 3 Hours

COURSE OBJECTIVES	COURSE OUTCOMES
<i>The course will enable the students to :</i>	<i>At the end of the course students should be able to:</i>
<ol style="list-style-type: none">Study the conditions for expansion of function as a Fourier series and expansion of a function as a Fourier series.Understand the concept of Fourier and inverse Fourier Transform, Fourier Sine and Cosine transform of a function and various properties.Learn the properties of Discrete and Continuous Random variables and Normal Distribution.Analyze standard statistical tests employed for small samplesUnderstand the Method of least squares for fitting of a straight line and second order curves to a given data and also about Correlation between variables.	<ol style="list-style-type: none">Expand a function as a Fourier series in an interval and also expressing even and odd functions as a Fourier series.Determine Fourier transform, Fourier sine and cosine transform and inverse Fourier, Sine and Cosine transform of a function.Differentiate between discrete and continuous random variables and solve the problems on Normal Distribution.Formulate Null and Alternative Hypotheses and apply the tests of hypothesis for small samples.Apply the Method of least squares for fitting of straight line and second order curves to the given data and also to find co-efficient of correlation and their application problems.

UNIT –I (8 Hours)

FOURIER SERIES

Introduction to Fourier series – Conditions for existence of Fourier expansion – Functions having points of discontinuity – Change of Interval - Fourier series expansions of even and odd functions

UNIT-II (8 Hours)

FOURIER TRANSFORMS

Fourier Transform – Inverse Fourier Transform - Properties of Fourier Transform –Fourier Cosine & Sine Transforms.

UNIT-III (8 Hours)

PROBABILITY DISTRIBUTIONS

Random Variables - Discrete and Continuous Random variables - Mass and density functions- Cumulative distribution function – Definitions of Mean, Median, Mode and Variance of Probability distributions -Binomial distribution – Normal Distribution – Properties.

UNIT-IV (8 Hours)

TESTS 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 (8 Hours)

CURVE FITTING & CORRELATION

The Method of Least Squares - Fitting of Straight line- Second order curve (Parabola)-Exponential curve- Correlation – Karl Pearson's Co-efficient of Correlation

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3. Fundamentals of Mathematical Statistics, Gupta & Kapoor, Sultan chand & sons, New Delhi.

Online resources:

1. <https://nptel.ac.in/courses/111106046>
2. <https://nptel.ac.in/courses/111104519>
3. <https://ocw.mit.edu/courses/18-440-probability-and-random-variables-spring-2014/>

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



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DEPARTMENT OF MATHEMATICS

PROBABILITY DISTRIBUTIONS AND INFERENCE THEORY

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

(For AIML Branch only)

Instruction:3+1 Hours per week	Semester End Exam Marks:60	Subject Reference Code: U25BS350MA
Credits: 3	Sessional Marks: 40	Duration of Semester End Exam: 3 Hours
COURSE OBJECTIVES		COURSE OUTCOMES
<i>The course will enable the students to :</i>		<i>At the end of the course students should be able to:</i>
1. <i>Study</i> the fundamental concepts of probability theory.	1. <i>Define</i> probability and compute probabilities of events and apply Bayes' Theorem to update probabilities based on new information.	
2. <i>Understand</i> random variables and its probability distributions.	2. <i>Differentiate</i> between discrete and continuous random variables and its distributions.	
3. <i>Learn</i> various probability distributions and their related applications.	3. <i>Apply</i> various theoretical probability distributions to solve related problems in various applications.	
4. <i>Study</i> the concept of hypothesis testing employed for large samples.	4. <i>Formulate</i> Null and Alternative Hypotheses and apply the tests of hypothesis for large samples.	
5. <i>Study</i> the various methods of testing small samples.	5. <i>Apply</i> 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- related problems.

UNIT –II (08 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 of Probability distributions.

UNIT-III (08 Hours)

THEORETICAL DISTRIBUTIONS

Binomial & Poisson distributions & Normal Distribution- Properties-related problems

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.

UNIT -V (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.

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3. Fundamentals of Mathematical Statistics, Gupta & Kapoor, Sultan chand & sons, New Delhi.
4. Probability & Statistics for Engineers, Antony J. Hayter, CENGAGE Learning.

Online Resources:

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DEPARTMENT OF MATHEMATICS

FOUNDATION TO ENGINEERING MATHEMATICS

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

(Common to all branches)

Instruction: 2 Hours per week	Semester End Exam Marks: 50	Subject Reference Code: UB25BS300MA
Credits: Nil	Sessional Marks: Nil	Duration of Semester End Exam: 3 Hours

COURSE OBJECTIVES	COURSE OUTCOMES
<i>The course will enable the students to:</i>	<i>At the end of the course students will be able to:</i>
1. Study the concepts of vector differentiation, Directional derivative, Divergence and Curl of a vector point function.	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. Understand the concepts of Descriptive Statistics.	2. Apply the concepts of Descriptive Statistics to calculate Mean, Median, Mode, Measures of Dispersion, Mean Deviation and Standard Deviation.
3. Learn the basics of Set theory, Permutations and Combinations and Probability.	3. Solve the problems on Permutations, Combinations and Probability.
4. Understand the concept of Rank of a matrix, Echelon form, System of Linear Equations and Eigen Values and Eigen Vectors.	4. Compute the Rank of a matrix and Eigen values and Eigen vectors of a matrix.

UNIT – I: (8 Hours)

CALCULUS

Differentiation of standard functions (Formulae) - Partial Derivatives – 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

UNIT – II: (6 Hours)

DESCRIPTIVE STATISTICS

Mean-Median-Mode-Measures of Dispersion: Range-Mean Deviation-Standard Deviation

UNIT –III: (6 Hours)

BASICS OF PROBABILITY

Basics concepts of set theory - Permutations & Combinations - Random event & Experiment-Sample space - Classical definition of Probability - Axioms of probability

UNIT – IV: (8 Hours)

MATRICES

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

TEXT BOOKS:

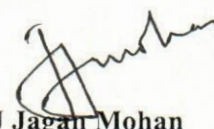
- 1 Advanced Engineering Mathematics, Third Edition, R. K. Jain and S. R. K. Iyengar, Narosa Publishing House.
- 2 Higher Engineering Mathematics, Dr.B.S. S Grewal 40th Edition, Khanna Publishers.
- 3 Fundamentals of Mathematical Statistics, S. C. Gupta, V.K. Kapoor, S Chand & Sons



Prof.N.Kishan
(OU Nominee)

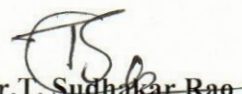


Prof.M.A.Spinivas
(Subject Expert-JNTUH(Retd.))



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(Subject Expert-BITS, Hyd)

Dr.T. Ramalingeswarara Rao
(Industry Expert)



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(Chairman, BOS)

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VASAVI COLLEGE OF ENGINEERING (AUTONOMOUS)

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9-5-81, Ibrahimbagh, Hyderabad-500031

DEPARTMENT OF MATHEMATICS

NUMERICAL METHODS, PROBABILITY & STATISTICS

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

(Common to Civil, EEE & Mechanical Branches)

Instruction: 3+1 Hours per week	Semester End Exam Marks: 60	Subject Reference Code: U25BS410MA
Credits: 3	Sessional Marks: 40	Duration of Semester End Exam: 3 Hours

COURSE OBJECTIVES	COURSE OUTCOMES
<i>The course will enable the students to :</i>	<i>At the end of the course students should be able to:</i>
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 solving first-order ordinary differential equations.	2. Use Numerical techniques to 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 Solutions of Ordinary Differential Equations of first order - Taylor's Series Method - Euler's Method – Modified Euler's Method - Runge-Kutta of 4th order (without proofs)

UNIT-III (08 Hours)

PROBABILITY DISTRIBUTIONS

Random Variables - Discrete and Continuous Random Variables – Mass and density functions – Cumulative distribution functions - Definitions of Mean, Median, Mode and Variance of Probability distributions - Normal Distribution – Properties.

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.

UNIT-V (08 Hours)

CURVE FITTING & CORRELATION

Curve fitting by the Method of Least Squares - Fitting of Straight line-Second order curve (parabola)--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

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
4	Duration of Internal Tests	:	90 Minutes			



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DEPARTMENT OF MATHEMATICS

DISCRETE MATHEMATICS

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

(For IT Branch only)

Instruction :3+1 Hours per week	Semester End Exam Marks: 60	Subject Reference Code: U25BS420MA
Credits: 3	Sessional Marks: 40	Duration of Semester End Exam: 3 Hours

COURSE OBJECTIVES	COURSE OUTCOMES
<i>The course will enable the students to :</i>	<i>At the end of the course students should be able to:</i>
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, combinatorics 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.

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.

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, Prentice Hall N.J., 2ndedn, 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:

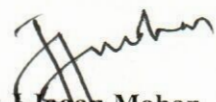
1. https://onlinecourses.nptel.ac.in/noc24_cs58/preview
2. https://onlinecourses.swayam2.ac.in/cec24_ma18/preview

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

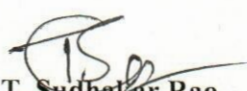
1	No. of Internal Tests	:	2	Max. Marks for each Internal Tests	:	30
2	No. of Assignments	:	3	Max. Marks for each Assignment	:	5
3	No. of Quizzes	:	3	Max. Marks for each Quiz Test	:	5
4	Duration of Internal Tests	:	90 Minutes			


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DEPARTMENT OF MATHEMATICS

NUMBER THEORY & BOOLEAN ALGEBRA

(OPEN ELECTIVE)

For B.E., III - Semester – CBCS

(Common to CSE, AIML & IT Branches)

Instruction :3 Hours per week	Semester End Exam Marks: 40	Subject Reference Code: U250E310MA
Credits: 2	Sessional Marks: 60	Duration of Semester End Exam: 3 Hours

COURSE OBJECTIVES	COURSE OUTCOMES
<i>The course will enable the students to :</i>	<i>At the end of the course students should be able to:</i>
<ol style="list-style-type: none"><i>Study</i> Fundamental Theorem of Arithmetic and GCD using Euclidean Algorithm and also Linear Diophantine Equations and their solutions.<i>Understand</i> the concepts of number theory such Congruences and proof of Chinese Remainder theorem.<i>Identify</i> Primitive roots for primes and their existence and also to outline the Euler's theorem and Lagrange's theorem.<i>Familiarize</i> with properties of Boolean algebra and to understand Normal Forms.	<ol style="list-style-type: none"><i>Calculate</i> GCD using Euclidean algorithm and also solve Linear Diophantine Equations in order to implement in RSA encryption.<i>Apply</i> Chinese Remainder theorem for optimizing cryptographic processes, such as accelerating RSA decryption and the Pollard Rho method to assess and demonstrate the factorization of composite numbers used in cryptographic keys.<i>Use</i> Fermat's Theorem & Wilson's theorem to prove that RSA works accurately and also in discrete log cipher of Cryptography. Also primitive roots in the Diffie-Hellman key exchange protocol of Cryptography<i>Design</i> secure hash functions, encryption schemes, and authentication protocols using Boolean functions which are the building blocks of symmetric cryptographic systems.

UNIT – I (6 Hours)

THEORY OF NUMBERS: The Integers and Division- Prime and Composite Numbers -Division Algorithm- Fundamental Theorem of Arithmetic(without proof) –GCD and their properties- Euclidean Algorithm- Linear Diophantine Equations and their solutions.

UNIT – II (8 Hours)

CONGRUENCES: Modular Arithmetic- Introduction to Congruences, Linear Congruence. Chinese Remainder Theorem - System of Linear Congruences in two variables- The Pollard Rho Factoring Method.

UNIT – III (5 Hours)

SOME SPECIAL CONGRUENCES: Fermat's Little Theorem- Wilsons Theorem and its converse Euler's phi-function - Euler's theorem -The order of an integer modulo n , Primitive roots for primes.

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 Addison 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. Discrete Mathematics, R.K.Bisht and H.S.Dhami, Oxford Higher Education.

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. Basic Number Theory by S.B. Malik, S. Chand publishers
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

ESTIMATION THEORY AND STATISTICAL INFERENCE

(OPEN ELECTIVE)

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

(Common to CSE, AIML & IT Branches)

Instruction: 3 Hours per week	Sem. End Exam Marks: 60	Subject Reference Code: U25OE410MA
Credits: 3	Sessional Marks: 40	Duration of Semester End Exam: 3 Hours

COURSE OBJECTIVES	COURSE OUTCOMES
<i>The course will enable the students to :</i>	<i>At the end of the course students should be able to:</i>
<ol style="list-style-type: none"><i>1. Study</i> the concepts and application of sampling distribution<i>2. Describe</i> the role of the point estimation, interval estimation and Bayesian estimation about a parameter.<i>3. Study</i> various methods of testing large samples.<i>4. Analyze</i> standard statistical tests employed for small samples.<i>5. Study</i> the difference between non-parametric and parametric tests.	<ol style="list-style-type: none"><i>1. Apply</i> Central Limit Theorem to the real-world problems and calculate and interpret, in testing one sample mean (σ known).<i>2. Apply</i> various estimators for estimating the parameters of standard distributions.<i>3. Infer</i> properties of population conducting tests on samples<i>4. Interpret</i> planned and unplanned comparisons for the one-way ANOVA.<i>5. Solve</i> 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 and its applications.

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. Iyengar, 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:

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

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

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



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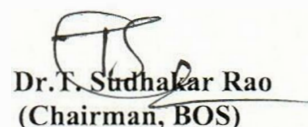


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DEPARTMENT OF MATHEMATICS

NUMERICAL METHODS

(OPEN ELECTIVE)

For B.E., IV - Semester – CBCS

(Common to CSE, CSE-AIML & IT Branches)

Instruction : 3 Hours per week	Sem. End Exam Marks : 60	Subject Reference Code : U25OE420MA
Credits : 3	Sessional Marks : 40	Duration of Semester End Exam : 3 Hours

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

UNIT – I: (8 Hours)

SOLUTION OF ALGEBRAIC AND TRANSCENDENTAL EQUATIONS:

Algebraic and Transcendental equations: Bisection method - Newton-Raphson method - Regula-Falsi method.

UNIT – II: (8 Hours)

SOLUTION OF SYSTEM OF LINEAR 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 - Stirling'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:

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

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1	No. of Internal Tests	: 2	Max. Marks for each Internal Tests	: 30
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DEPARTMENT OF MATHEMATICS

APPLIED STATISTICAL METHODS

(OPEN ELECTIVE)

For B.E., V - Semester – CBCS

(Common to CSE, AIML & IT Branches)

Instruction: 3 Hours per week	Semester End Exam Marks: 60	Subject Reference Code: U25OE510MA
Credits:3	Sessional Marks: 40	Duration of Semester End Exam: 3 Hours

COURSE OBJECTIVES	COURSE OUTCOMES
<i>The course will enable the students to:</i>	<i>At the end of the course students will be able to:</i>
1. Understand fitting of a straight line to a given data and measuring Correlation between variables.	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. Study the concepts and application of Time series.	2. Apply concept of Time series to solve the real time problems.
3. Distinguish the various methods of Designs of Experiments	3. Apply the methods of Designs of Experiments
4. Provide the knowledge to the students about Prediction and control by statistical methods Regression and SQC.	4. Evaluate the performance measures of the systems in networks, transportation systems, production lines.
5. Learn the concept of pure birth and death models of Queuing theory.	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 Hours)

CORRELATION AND REGRESSION ANALYSIS

Correlation – Scatter diagrams-Spearman’s Rank of Correlation-Curve fitting by the Method of Least Squares - Fitting of Straight line - Parabola - Exponential curves: $y = a e^{bx}$ & $y = a b^x$ - Regression - Lines of Regression - Multiple Regression - Curvilinear regression.

UNIT – II: (8 Hours)

TIME SERIES

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

UNIT – III: (8 Hours)

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 Hours)

QUEUEING 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/1: N/FIFO)-Model.

UNIT – V: (8 Hours)

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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DEPARTMENT OF MATHEMATICS

TRANSFORM TECHNIQUES

(OPEN ELECTIVE)

For B.E., V - Semester – CBCS

(Common to CSE, AIML & IT Branches)

Instruction: 3 Hours per week	Semester End Exam Marks: 60	Subject Reference Code: U24OE510MA
Credits:3	Sessional Marks: 40	Duration of Semester End Exam: 3 Hours
COURSE OBJECTIVES		COURSE OUTCOMES
<i>The course will enable the students to:</i>		<i>At the end of the course students will be able to:</i>
1. <i>Understand</i> the Definition of Laplace and its Properties.		1. <i>Evaluate</i> Laplace transforms of functions.
2. <i>Understand</i> the Definition of inverse Laplace Transforms- Properties		2. <i>Evaluate</i> Inverse Laplace transforms of functions.
3. <i>Understand</i> the applications of Laplace Transforms.		3. <i>Apply</i> Laplace transforms to evaluate integrals and to solve ordinary differential equations arising in engineering problems.
4. <i>Study</i> the Definition of Z- Transforms and its properties		4. <i>Evaluate</i> Z- transforms of Sequences
5. <i>Understand</i> the applications of Z- Transforms		5. <i>Apply</i> Z-transforms to solve ordinary difference equations arising in engineering problems.

UNIT – I: (8 Hours)

LAPLACE TRANSFORMS

Introduction to Laplace transforms - 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: (8 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 - Division by s – Convolution Theorem (without proof).

UNIT – III: (8 Hours)

APPLICATIONS OF LAPLACE TRANSFORMS

Applications of Laplace transforms to Initial and Boundary Value Problems upto second order – Laplace transform of periodic functions – Triangular wave – Square wave – Saw tooth wave.

UNIT – IV: (8 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. 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:

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
4	Duration of Internal Tests	: 90 Minutes		



Prof.N.Kishan
(OU Nominee)



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(Industry Expert)



Dr.T. Sudhakar Rao
(Chairman, BOS)

With effect from the Academic Year 2027-28

VASAVI COLLEGE OF ENGINEERING (AUTONOMOUS)

Accredited by NAAC with A++ Grade

9-5-81, Ibrahimbagh, Hyderabad-500031

DEPARTMENT OF MATHEMATICS

APPLIED ALGEBRA FOR COMPUTING

(OPEN ELECTIVE)

For B.E., VI- Sem.,

(Common to CSE, AIML & IT Branches)

Instruction : 3 Hours per week	Sem. End Exam Marks : 60	Subject Reference Code : U250E610MA
Credits : 3	Sessional Marks : 40	Duration of Semester End Exam : 3 Hrs

COURSE OBJECTIVES	COURSE OUTCOMES
<i>The course will enable the students to :</i>	<i>At the end of the course students should be able to:</i>
<ol style="list-style-type: none"><i>Understand</i> binary operations and algebraic structures such as semigroups, monoids, and groups with suitable examples.<i>Study</i> the concepts of subgroups, order of groups and elements, and cyclic groups, and to develop the ability to analyze group structures.<i>Acquire</i> the knowledge of cosets, index of subgroups, and Lagrange's theorem<i>Understand</i> homomorphisms and isomorphisms of groups along with their basic properties and kernels, normal subgroups, and factor groups.<i>Develop</i> foundational knowledge algebraic structures called rings and their related systems such as subrings, integral domains, fields, and polynomial rings.	<ol style="list-style-type: none"><i>Apply</i> the concepts of groups, subgroups, cyclic groups, and finite groups them in Modular arithmetic in computing systems and symmetry operations in computer graphics etc.,<i>Implement</i> the concepts of subgroups and cyclic groups in periodic patterns in computing systems, Structure analysis in discrete systems (state machines) modular-based computations in cryptography.<i>Apply</i> the concepts of cosets and Lagrange's theorem to analyze group structures, partitioning of sets, and constraints in discrete systems such as computing and cryptographic frameworks.<i>Relate</i> these concepts to analyze structure-preserving transformations in discrete systems such as automata theory, compiler design, cryptography, and data structure mappings.<i>Identify</i> ring structures, subrings, integral domains, fields, and polynomial rings, and examine their significance in computational domains such as cryptographic systems, coding theory, and symbolic computation.

UNIT – I: (8 Hours)

GROUPS

Binary operations - Algebraic systems - Groups – Elementary properties of groups (without proofs) –Additive and Multiplicative group of integers *modulo* n – Finite Groups.

UNIT – II: (8 Hours)

SUBGROUPS & CYCLIC GROUPS

Subgroups- Basic properties without proofs - Order of a group and Order of an element of a group.

Cyclic Groups – Basic Properties of Cyclic Groups – Examples with emphasis on integer *modulo* n - Fundamental theorem of Cyclic Groups- Statement (without proof).

UNIT – III: (8 Hours)

COSETS & LAGRANGE'S THEOREM

Cosets- Definition and examples –Index of a subgroup - Definition and examples – Basic Properties of Cosets (without proofs) - Lagrange's theorem – Statement and interpretation (without proof)- Applications.

UNIT – IV: (8 Hours)

HOMOMORPHISM & ISOMORPHISM OF GROUPS

Homomorphism – Basic Properties (without proofs) – Kernel of Homomorphism - Normal Subgroups via Kernel of Homomorphism - Factor Groups – Isomorphism – Basic Properties (without proofs).

UNIT – V: (8 Hours)

RINGS

Rings – Examples with emphasis on integer *modulo* n – Basic properties of Rings (without proofs) – Subrings - Integral domains and Fields –Polynomial Rings – Division Algorithm.

Text Books:

1. Advanced Course Modern Algebra, Goyal and Gupta, Pragathi Prakashan
2. Contemporary Abstract Algebra, Joseph A. Gallian, CRC Press
3. Discrete Mathematical Structures, Rm.Somasundaram, Prentice Hall of India
4. Discrete Mathematics, P.K.Mittal, Cyber Tech Publications

Reference Books:

1. A First Course in Abstract Algebra, John B. Fraleigh, Pearson Education Limited.
2. Abstract Algebra Theory and Applications Thomas W. Judson Stephen F. Austin State University.
3. Abstract Algebra: Structure and Application, David W. Finston, Patrick J. Morandi, John Wiley & Sons.
4. A Book of Abstract Algebra – Charles C. Pinter, Dover Publications, Inc., Mineola, New York

Online Resources :


1. https://onlinecourses.nptel.ac.in/noc19_cs78/preview
2. <http://abstractalgebra.altervista.org/aafmt.pdf>
3. <https://ocw.mit.edu/courses/18-703-modern-algebra-spring-2013/>

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