ALLIED COURSE -I

For B.Sc. Physics / Chemistry /Industrial Electronics / Geology -Students (Applicable to the candidates admitted from the academic year 2026-2027 onwards)

Year: I **Semester: I**

CALCULUS, TRIGONOMETRY AND LAPLACE TRANSFORMS

Code: **(THEORY)** **Credit: 4**

COURSE OBJECTIVES:

- To develop the ability to perform successive differentiation and apply higher-order derivatives in solving mathematical problems.
- To provide knowledge of integration techniques, definite integrals, and reduction formulas for evaluating standard integrals.
- To strengthen understanding of trigonometric expansions and series representations of trigonometric functions.
- To understand the definition, standard transforms, and basic theorems of Laplace transforms.
- To apply inverse Laplace, transform techniques for solving mathematical problems.

UNIT – I

Successive Differentiation – *n*-th derivative of standard functions (Derivation not needed) simple problems only- (proof not needed) and its applications- Curvature and radius of curvature in Cartesian only (proof not needed).

UNIT – II

Integration by parts method-General properties and evaluation of definite integrals - Reduction formula for $\int_0^{\frac{\pi}{2}} \sin^n x\, dx$, $\int_0^{\frac{\pi}{2}} \cos^n x\, dx$, $\int_0^{\infty} e^{-x}\, dx$, $\int x^n e^{ax} dx$ -simple problems.

UNIT – III

Expansion of $\sin n\theta$, $\cos n\theta$, $\tan n\theta$, (*n* being a positive integer) - Expansion of $\sin^n \theta$, $\cos^n \theta$, $\sin^n \theta \cos^m \theta$ in a series of sines & cosines of multiples of θ (θ - given in radians) - Expansion of sinθ ,cosθ ,tanθ in terms of powers of θ (only problems in all the above).

UNIT-IV

Laplace Transform -Definition- L (e^{at}) , L(cos(at)), L (sin (at)), L (t^n), where n is a positive integer. Basic theorems in Laplace Transforms (formula only)- L [e^{at} cosbt], L [e^{at} sinbt], L [f (t)], L [f' (t)], L [f " (t)].

UNIT – V:

Inverse Laplace Transforms related to the above (unit 4) standard forms (Simple problems only).

RECOMMENDED BOOK:

1.T.K. Manickavasagam Pillai & others, Calculus, Volume I, S.V Publications, Reprint 2018 (Unit I).
2.T.K. Manickavasagam Pillai & others, Calculus, Volume II, S.V Publications, Reprint 2017 (Units II).
3.S. Arumugam, Isaac and Somasundaram, Trigonometry & Fourier Series, New Gamma Publishers, Hosur, 1999 (Unit III).
4.S. Narayanan & T.K. Manicavachagam Pillay Differential Equation and its Applications, S. Viswanathan Publishers, 2015 (Unit IV& V)

REFERENCE BOOK:

1. S.G. Venkatachalapathi, Allied Mathematics, Margham publication Chennai Reprint 2011.
2. M.L. Khanna, Differential Calculus, Jaiprakashnath and Co., Meerut-2004.

COURSE OUTCOME

On completion of the course, students should be able to

CO1: Apply successive differentiation techniques and determine curvature and radius of curvature for Cartesian curves.

CO2: Evaluate definite integrals and apply reduction formulae using integration by parts method.

CO3: Expand trigonometric functions and express them in series of sines, cosines
and powers of angles.

CO4: Apply Laplace transform techniques and standard theorems to solve mathematical problems.

CO5: Determine inverse Laplace transforms of standard functions and solve simple applications.

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	1	3	3	3	2	1	1	3	1	2
CO2	1	3	3	3	2	1	2	3	2	2
CO3	1	3	3	3	2	1	2	3	2	2
CO4	1	3	3	3	2	1	2	3	2	2
CO5	1	3	3	3	2	1	2	3	2	3

ALLIED COURSE PRACTICAL - I

for B.Sc. Physics / Chemistry / Electronics / Geology Programmers

Semester: I, II

Year: I

NUMERICAL METHODS AND PROBABILITY

Code: (PRACTICAL) Credit: 4

COURSE OBJECTIVES:

- To study numerical methods for solving equations and interpolation problems.
- To understand numerical integration techniques and iterative methods for solving linear systems.
- To develop skills in obtaining numerical solutions of ordinary differential equations.
- To understand descriptive statistical measures and probability concepts used in data analysis.
- To analyse relationships among variables through correlation and regression methods.

UNIT – I

Algebraic & Transcendental equations: Bisection Method, Newton Raphson Method, Iteration method – Newton 's forward & Backward difference interpolation formulae – Lagrange 's interpolating polynomial.

UNIT – II

Numerical Integration: Numerical Integration using Trapezoidal rule and Simpson's first & second rules (proof not needed) - Solutions to Linear Systems – Gaussian Elimination Method – Jacobi & Gauss Siedel iterative methods.

UNIT – III

Numerical solution of ODE: Solution by Taylor Series Method, Euler 's Method, Runge - Kutta 2nd order method- Adam 's Predictor Corrector Method.

UNIT – IV

Arithmetic Mean – Geometric Mean - Median, Mode, Standard Deviation - Quartile Deviation –Expectation – Variance.

UNIT – V

Correlation and Regression – Karl Pearson's Co-efficient of correlation-Lines of regression-Regression Co-efficient.

RECOMMENDED BOOKS:

1.Dr.P. Kandasamy, K. Thilagavathy, K. Gunavathy, NUMERICALMETHODS, S. Chand & co; 2010 - (UNIT -I, II, III.)

2. Gupta. S.C & Kapoor, V.K, Fundamentals of Mathematical Statistics, Sultan Chand & Sons, New Delhi -2021. (Units 4 & 5)

REFERENCES BOOK:

1. M.K. Jain, S.R.K. Iyengar and R.K. Jain, Numerical Methods for Scientific and Engineering Computation, New Age International Private Limited, 1999.

2 C.E. Froberg, Introduction to Numerical Analysis, II Edn., Addison Wesley, 1979.

COURSE OUTCOME

On completion of the course, students should be able to

CO1: Apply numerical methods such as Bisection, Newton–Raphson, Iteration and interpolation techniques to solve algebraic and transcendental equations.

CO2: Evaluate definite integrals numerically and solve systems of linear equations using direct and iterative methods.

CO3: Solve ordinary differential equations numerically using Taylor series, Euler, Runge–Kutta and Adam's predictor-corrector methods.

CO4: Compute statistical measures such as mean, median, mode, standard deviation, expectation and variance.

CO5: Analyse correlation and regression using Karl Pearson's coefficient, regression lines and regression coefficients.

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	1	3	3	3	3	1	2	3	2	2
CO2	1	3	3	3	3	1	2	3	3	2
CO3	1	3	3	3	3	2	2	3	3	2
CO4	1	3	3	3	2	1	2	3	2	2
CO5	2	3	3	3	3	2	2	3	3	3

ALLIED COURSE II

for B.Sc. Physics / Chemistry / Electronics / Geology Programs

Year: I **Semester: II**

ALGEBRA, PDE, FOURIER SERIES AND VECTOR CALCULUS

Code: **(THEORY)** **Credits: 4**

COURSE OBJECTIVE:

- To study various types of matrices and their algebraic properties.
- To understand characteristic equations, eigenvalues, eigenvectors, and the verification and applications of the Cayley–Hamilton theorem.
- To formulate and solve first-order partial differential equations using standard methods and Lagrange's technique.
- To develop the ability to determine Fourier coefficients and construct Fourier series, including half-range expansions.
- To understand gradient, divergence, curl, and related vector operators used in mathematical and physical applications.

UNIT - I

MATRICES: Singular matrices-non-singular matrices, Symmetric matrices, Skew symmetric, Orthogonal matrices, Hermitian, Skew Hermitian and Unitary matrices.

UNIT - II

MATRICES: Characteristic equation, Eigen values, Eigen vectors – Cayley - Hamilton 's Theorem (proof not needed) –Verification of Cayley - Hamilton 's Theorem.

UNIT - III

PDE:Formation of Partial differential equations by eliminating constants and by elimination of arbitrary functions — definition of general, particular & complete solutions — Singular integral (geometrical meaning not required) — Solutions of first order equations in the standard forms- f(p,q)=0, f(x,p,q) =0, f(y,p,q=0), f(z,p,q)=0- Lagrange's method (Simple problems only).

UNIT - IV

Fourier Series-Definition of Fourier Series – Finding Fourier Coefficients for a given periodic function with period 2π - Use of Odd & Even functions in evaluating Fourier Coefficients - Half range sine & cosine series.

UNIT - V

Divergence and Curl of Vector point functions:
Gradient of a vector — directional derivative — unit normal vector tangent plane — Divergence-Curl — solenoidal & irrotational vectors — Double operators Properties connecting grad., div., and curl of a vector.

RECOMMENDED BOOKS:

1. T.K. Manickavasagam Pillai & others, Algebra, Volume II, S.V Publications,
   a. Reprint 2018 (Unit I, II).
2. S. Narayanan & T.K. Manicavachagam Pillay Differential Equation and its Applications, S. Viswanathan Publishers, 2015 (Units III)
3. S. Arumugam, Isaac and Somasundaram, Trigonometry & Fourier Series, New Gamma Publishers, Hosur, 1999. (Unit IV).
4. M.L. Khanna Vector Calculus, Jai Prakash Nath and Co January 1997. (Unit V).

REFERENCE BOOK:

1. S.G. Venkatachalapathi, Allied Mathematics, Margham publication, Chennai-17, Reprint 2011.

e-book:

http://nptel.com

COURSE OUTCOME

On completion of the course, students should be able to

CO1: Understand different types of matrices and their properties including symmetric, orthogonal, Hermitian and unitary matrices.

CO2: Determine characteristic equations, eigen values and eigen vectors and verify Cayley–Hamilton theorem.

CO3: Form and solve partial differential equations using standard methods and Lagrange's methods.

CO4: Expand periodic functions into Fourier series and determine half-range sine
and cosine series.

CO5: Apply vector calculus concepts such as gradient, divergence, curl and double
operators in vector fields.

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	1	3	2	3	2	1	1	3	1	2
CO2	1	3	3	3	2	1	2	3	2	2
CO3	1	3	3	3	2	1	2	3	2	2
CO4	1	3	3	3	2	1	2	3	2	2
CO5	1	3	3	3	3	1	2	3	2	3

Year: I **Semester: I**

ALGEBRA, TRIGONOMETRY AND LAPLACE TRANSFORMS

Code: **Credit: 4**

COURSE OBJECTIVES:

- TO study algebraic equations, transformations of roots, and fundamental theorems related to polynomial equations.
- To understand matrix operations, rank, consistency of systems, eigen values, eigenvectors, and the Cayley–Hamilton theorem.
- To develop proficiency in trigonometric expansions and series representations of trigonometric functions.
- To understand the definition, properties, and standard forms of Laplace transforms.
- To apply inverse Laplace, transform techniques for solving mathematical and engineering problems.

UNIT – I

Theory of Equations: Relation between roots & coefficients – Transformations of Equations – Diminishing, Increasing & multiplying the roots by a constant- Forming equations with the given roots –Rolle 's Theorem, Descartes rule of Signs (statement only) – simple problems.

UNIT – II

Matrices: Singular matrices – Inverse of a non-singular matrix using adjoint method - Rank of a Matrix – Consistency - Characteristic equation, Eigen values, Eigen vectors – Cayley Hamilton 's Theorem (proof not needed) –Simple applications only

UNIT –III

Trigonometry: Expansion of $\sin n\theta$, $\cos n\theta$,$\tan n\theta$, (n being a positive integer) - Expansion of $\sin^n \theta$, $\cos^n \theta$, $\sin^n \theta \cos^m \theta$ in a series of sines & cosines of multiples of θ (θ - given in radians) - Expansion of sinθ ,cosθ ,tanθ in terms of powers of θ (only problems in all the above).

UNIT – IV

Laplace Transform -Definition- L (e^{at}) , L(cos(at)), L (sin (at)), L (t^n), where n is a positive integer. Basic theorems in Laplace Transforms (formula only)- L [e^{at} cosbt] L [e^{at} sinbt], L [f (t)], L [f' (t)], L [f " (t)].

UNIT-V

Inverse Laplace Transforms related to the above (unit 4) standard forms (Simple problems only).

UNIT – VI

CURRENT CONTOURS (For Continuous Internal Assessment Only):

An introduction to SAGEMATH.

e-book:

http://nptel.com

REFERENCE:

1. T.K. Manickavasagam Pillai & others, Algebra, Volume I, S.V Publications, 2018 Revised Edition (Units I)
2. T.K. Manickavasagam Pillai & others, Algebra, Volume II, S.V Publications, 2018 Revised Edition (UnitsII)
3. S. Arumugam, Isaac and Somasundaram, Trigonometry & Fourier Series, New Gamma Publishers, Hosur, 2012 edition (Unit III).
4. S. Narayanan & T.K. Manicavachagam Pillay Differential Equation and its Applications, S. Viswanathan Publishers, 2015 (Unit IV& V)

COURSE OUTCOMES:

After completing this course, the students will be able to

CO1: Apply theory of equations concepts including transformations, formation of equations and Rolle's theorem in algebraic problem solving.

CO2: Analyse matrices, determine rank, consistency, eigen values and eigen vectors and apply Cayley–Hamilton theorem.

CO3: Expand trigonometric functions and express them in terms of multiple angles and powers of θ.

CO4: Apply Laplace transform techniques and standard transform theorems in solving mathematical problems.

CO5: Determine inverse Laplace transforms of standard forms and solve simple applications.

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	1	3	3	3	2	1	1	3	1	2
CO2	1	3	3	3	2	1	2	3	2	2
CO3	1	3	3	3	2	1	2	3	2	2
CO4	1	3	3	3	2	1	2	3	2	2
CO5	1	3	3	3	2	1	2	3	2	3

ALLIED COURSE PRACTICAL I

for B.C.A., B.Sc. ARTIFICIAL INTELLIGENCE & MACHINE LEARNING, B.Sc. COMPUTER SCIENCE, B.Sc. CYBER SECURITY, B.Sc. INFORMATION TECHNOLOGY & B.Sc. SOFTWARE DEVELOPMENT PROGRAMMES

Year: I **Semester: I, II**

NUMERICAL METHODS AND PROBABILITY

Code: **(PRACTICAL)** **Credit: 4**

COURSE OBJECTIVES:

- To understand and apply numerical methods such as Bisection, Newton-Raphson, Iteration, and Interpolation techniques for solving algebraic and transcendental equations.
- To develop the ability to perform numerical integration and solve systems of linear equations using Gaussian Elimination, Jacobi, and Gauss-Seidel methods.
- To learn and apply numerical methods for obtaining approximate solutions to ordinary differential equations.
- To understand the fundamental concepts of probability and descriptive statistics, including measures of central tendency and dispersion.
- To analyse statistical relationships between variables using correlation and regression techniques and interpret the results effectively.

UNIT-I

Algebraic & Transcendental equations: Bisection Method, Newton Raphson Method, Iteration method – Newton ‘s forward & Backward difference interpolation formulae – Lagrange ‘s interpolating polynomial.

UNIT-II

Numerical Integration: Numerical Integration using Trapezoidal rule and Simpson ‘s first & second rules (proof not needed) - Solutions to Linear Systems – Gaussian Elimination Method – Jacobi & Gauss Siedel iterative methods.

UNIT-III

Numerical solution of ODE: Solution by Taylor Series Method, Euler ‘s Method, Runge - Kutta 2nd order method- Adam ‘s Predictor Corrector Method.

UNIT – IV

PROBABILITY Arithmetic Mean – Geometric Mean - Median, Mode, Standard Deviation - Quartile Deviation –Expectation – Variance.

UNIT-V

Correlation and Regression –Karl Pearson’s Co-efficient of correlation-Lines of

regression-Regression Co-efficient.

BOOKS RECOMMENDED:

1. P. Kandasamy, K. Thilagavathy, K. Gunavathy, NUMERICALMETHODS, S. Chand & Co; 2010- (UNIT -I, II, III.)
2. Gupta. S.C & Kapoor, V.K, Fundamentals of Mathematical Statistics, Sultan Chand & Sons, New Delhi -2021 (Units IV&V).

REFERENCES:

1. S.S. Sastry, "Introductory Methods of Numerical Analysis", Fifth Edition, Prentice Hall of India private limited, NewDelhi,2013.
2. M.K. Jain, S.R.K. Iyengar and R.K. Jain, Numerical Methods for Scientific and Engineering Computation, New Age International Private Limited, 1999.
3. C.E. Froberg, Introduction to Numerical Analysis, II Edn., Addison Wesley, 1979.

e-book:

https://nptel.ac.in

COURSE OUTCOME

On completion of the course, students should be able to

CO1: Apply numerical methods such as Bisection, Newton–Raphson, Iteration and interpolation techniques to solve algebraic and transcendental equations.

CO2: Evaluate numerical integration problems and solve systems of linear equations using direct and iterative methods.

CO3: Solve ordinary differential equations numerically using Taylor series, Euler, Runge–Kutta and Adam's predictor-corrector methods.

CO4: Compute statistical measures such as mean, median, mode, standard deviation, expectation and variance.

CO5: Analyse correlation and regression using Karl Pearson's coefficient, regression lines and regression coefficients.

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	1	3	3	3	3	1	2	3	2	2
CO2	1	3	3	3	3	1	2	3	3	2
CO3	1	3	3	3	3	2	2	3	3	2
CO4	1	3	3	3	2	1	2	3	2	2
CO5	2	3	3	3	3	2	2	3	3	3

ALLIED COURSE II

for B.C.A./ B.Sc. ARTIFICIAL INTELLIGENCE & MACHINE LEARNING/ B.Sc. COMPUTER SCIENCE/ B.Sc. CYBER SECURITY/ B.Sc. INFORMATION TECHNOLOGY & B.Sc. SOFTWARE DEVELOPMENT PROGRAMMES

Year: I **Semester: II**

OPERATIONS RESEARCH

Code: **(Theory)** **Credit: 4**

COURSE OBJECTIVES:

- To understand the concepts of Operations Research and formulate Linear Programming Problems.
- To solve Linear Programming Problems using the Simplex Method and Big-M (Penalty) Method.
- To analyse and solve transportation and assignment problems for optimal resource utilization.
- To apply sequencing techniques for scheduling jobs on machines and minimizing processing time.

Unit - I

Operations Research: Introduction - Basics of OR – OR & decision making – Role of Computers in OR - Linear programming formulations & graphical solution of two variables – Canonical & standard forms of LPP.

Unit - II

Simplex Method: Simplex Method for constraints, <, =, >Charne's method of penalties.

Unit - III

Transportation problem: Transportation algorithm –Degeneracy algorithm – Degeneracy in Transportation Problem, Unbalanced transportation problem- Assignment algorithm –Unbalanced Assignment problems.

Unit - IV

Sequencing problem: Processing of n jobs through two machines – Processing of n jobs through 3 machines – processing of two jobs through m machines.

Unit - V

Scheduling by PERT and CPM: Networks: Network – Fulkerson 's rule - measure of activity – PERT computation – CPM computation - Resource scheduling.

UNIT - VI

CURRENT CONTOURS (For Continuous Internal Assessment Only): Integer and Dynamic programming.

BOOKS RECOMMENDED:

1. Kanti Swarup., Gupta, P.K. and Man Mohan. Operations Research**.** [Seventeenth Edition]. Sultan Chand and Sons, New Delhi.2020.

REFERENCES:

1. Sundaresan, V., Ganapathy Subramanian, K.S. and Ganesan, Resource Management Techniques. [Seventh Edition]. AR Publication, Chennai.2013
2. Gupta, P.K. and Hira. Operations Research**.** [Eighth Edition]. Sultan Chand and Company, New Delhi .2020.
3. Kalavathy.S. Operations Research [Fourth Edition], Vikas Publishing House, Chennai.2012.

e-book:

https://nptel.ac.in

COURSE OUTCOMES

On completion of the course, students should be able to

CO1: Understand the fundamentals of Operations Research, decision making and formulate Linear Programming Problems.

CO2: Apply simplex method and Charne's penalty method to solve Linear Programming Problems with different constraints.

CO3: Solve transportation and assignment problems including balanced, unbalanced and degenerate cases.

CO4: Analyse sequencing problems involving multiple jobs and machines for optimal scheduling.

CO5: Apply PERT and CPM techniques for project planning, network analysis and resource scheduling.

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	1	3	3	3	2	1	1	3	2	2
CO2	1	3	3	3	3	1	2	3	2	2
CO3	1	3	3	3	3	1	2	3	3	2
CO4	1	3	3	3	2	1	2	3	2	2
CO5	2	3	3	3	3	2	2	3	3	3

ALLIED MATHEMATICS
(for Statistics Programmers)
(Applicable to the candidates admitted from the academic year 2026-27 onwards)

Year: I	**ALLIED COURSE I**	**Semester: I**
	CALCULUS AND FOURIER SERIES	
Code:	**(Theory)**	**Credit: 4**

COURSE OBJECTIVES:

- To study differential calculus concepts and their applications in optimization and multivariable functions.
- To understand techniques of integration and properties of definite integrals.
- To develop skills in evaluating double and triple integrals and changing the order of integration.
- To apply Laplace transforms and inverse Laplace transforms for solving differential equations.
- To understand Fourier series representations and compute Fourier coefficients for periodic functions**.**

UNIT – I
DIFFERENTIATION: Maxima & Minima – Concavity, Convexity – Points of inflexion – Partial differentiation – Euler 's Theorem - Total differential coefficients (proof not needed) – Simple problems only.

UNIT – II
INTEGRATION:Evaluation of integrals using Integration by parts- General properties of definite integrals-Evaluation of definite integrals- Simple problems only.

UNIT – III
Evaluation of Double and Triple integrals in simple cases -Changing the order and evaluation of the double integration.

UNIT – IV
Laplace Transforms – Inverse Laplace Transforms –Application of Laplace Transform into Solving Second Ordinary differential equation with constant Co-efficient.

UNIT – V
Fourier Series Definition of Fourier Series – Fourier Coefficients for a given periodic function with period 2π - Use of Odd & Even functions in evaluating Fourier Coefficients– Half range sine & cosine series.

UNIT – VI
CURRENT CONTOURS: For Continuous Internal Assessment Only):
Convolution Integrals

RECOMMENDED BOOKS:

1. S. Narayanan, T.K. Manichavasagam Pillai, Calculus, Vol. I, S. Viswanathan Pvt Limited, 2018.
2. S. Narayanan, T.K. Manichavasagam Pillai, Calculus, Vol. II, S. Viswanathan Pvt Limited, 2017.
3. S. Narayanan, T.K. Manicavachagam Pillai, Calculus, Vol. III, S. Viswanathan Pvt Limited, and Vijay Nicole Imprints Pvt Ltd, 2018

COURSE OUTCOMES:

After completing this course, the students will be able to

CO1: Apply differentiation techniques including maxima, minima, partial differentiation and Euler's theorem in solving mathematical problems.

CO2: Evaluate definite integrals using integration by parts and properties of definite integrals.

CO3: Compute double and triple integrals and apply change of order of integration in simple cases.

CO4: Apply Laplace and inverse Laplace transforms to solve second order ordinary differential equations with constant coefficients.

CO5: Expand periodic functions into Fourier series and determine half-range sine and cosine series.

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	1	3	3	3	2	1	1	3	1	2
CO2	1	3	3	3	2	1	2	3	2	2
CO3	1	3	3	3	2	1	2	3	2	2
CO4	1	3	3	3	3	1	2	3	2	2
CO5	1	3	3	3	2	1	2	3	2	3

Year: I **ALLIED COURSE PRACTICAL I** **Semester: I, II**

NUMERICAL METHODS

(PRACTICAL)

Code: **Credit: 4**

COURSE OBJECTIVES:

- To Introduce Numerical techniques to solve algebraic and transcendental equations.
- To solve numerical problems using interpolation.
- To know about numerical differentiation and integration.
- To solve differential equations using the method of successive approximations
- To develop skills in solving problems using numerical techniques.

UNIT - I

Algebraic and Transcendental Equations: Introduction - Iteration method - Bisection method – Regula-Falsi Method - Newton-Raphson method.

UNIT - II

Finite differences: Introduction-Difference Operators (up to fundamental theorem for finite differences)-Interpolation-Introduction – Newton's interpolation Formulae - Central Difference Interpolation Formulae - Gauss Forward Interpolation Formula - Gauss Backward Interpolation Formula - Lagrange's interpolation formula.

UNIT - III

Numerical differentiation and Integration: Introduction - Derivatives using Newton's forward difference formula - Derivatives using Newton's backward difference formula - Numerical Integration - Trapezoidal rule - Simpson's one third rule - Simpson's 3/8 rule. (Errors in these rules are not included).

UNIT - IV

Numerical solution of Ordinary Differential Equations: Introduction - Taylor's series method - Picard's method of successive approximations - Euler Method - Modified Euler method.

UNIT - V

Numerical solution of Ordinary Differential Equations (Continued): Runge -Kutta methods (First order, second order, third order, fourth order) - Predictor corrector methods - Milne's method.

UNIT - VI

CURRENT COUNTOURS (For continuous Internal Assessment Only):

Questions related to the above topics, from various competitive examinations UPSC / TNPSC / others to be solved. (Is a part of internal component only, not to be included in the External Examination question paper).

RECOMMENDED BOOKS:

1. S. Arumugam, A. Thangapandi Isaac, A. Somasundaram, "Numerical Methods", Second Edition, SciTech Publications (India) Pvt. Ltd., Chennai, 2010.
   Unit I: Chapter 3 - § 3.0, 3.2-3.5.
   Unit II: Chapter 6 - § 6.0, 6.1(up to fundamental theorem for finite Differences: pages160-166),
   Chapter 7 - § 7.0, 7.1, 7.2 (i, ii), 7.3.
   Unit III: Chapter 8 - § 8.0 - 8.2, 8.5 (3 Methods only).
   Unit IV: Chapter10 - § 10.0 -10.3.
   Unit V: Chapter10 - §10.4 - 10.6.

REFERENCE:

1. S.S. Sastry, "Introductory Methods of Numerical Analysis", Fifth Edition, Prentice Hall of India private limited, NewDelhi,2013.
2. M.K. Venkatraman, "Numerical methods in Science and Engineering", National Publisher Company, Fifth Edition, 2001.

e-book:

1. https://www.pdfdrive.com
2. https://nptel.com.

COURSE OUTCOMES: The students will be able to

CO1: Apply numerical methods such as Iteration, Bisection, Regula-Falsi and Newton–Raphson methods to solve algebraic and transcendental equations.

CO2: Understand finite differences and apply interpolation techniques including Newton's, Gauss and Lagrange interpolation formulae.

CO3: Evaluate numerical differentiation and numerical integration problems using Trapezoidal and Simpson's rules.

CO4: Solve ordinary differential equations numerically using Taylor's series, Picard's method, Euler and Modified Euler methods.

CO5: Apply Runge–Kutta and predictor-corrector methods including Milne's method for solving ordinary differential equations.

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	1	3	3	3	3	1	2	3	2	2
CO2	1	3	3	3	2	1	2	3	2	2
CO3	1	3	3	3	3	1	2	3	3	2
CO4	1	3	3	3	3	2	2	3	3	2
CO5	1	3	3	3	3	2	2	3	3	3

Year: I **ALLIED COURSE II** **Semester: II**

ANALYSIS AND THEORY OF EQUATIONS

Code: **(Theory)** **Credits: 4**

COURSE OBJECTIVES:

- To study algebraic equations, their roots, and transformations of equations.
- To understand the real number system and the concept of limits of functions.
- To analyse sequences and determine their convergence properties.
- To investigate the convergence and divergence of infinite series using standard convergence tests.
- To understand continuity, uniform continuity, and fundamental theorems leading to Taylor and Maclaurin expansions.

UNIT – I

Theory of equations-formation of equations- irrational and imaginary roots – relation between Roots & coefficients –Reciprocal equations –Reducing roots by a number multiplying roots by a number.

UNIT – II

Real Number system – Absolute value of a real number – definition of supremum (LUB) and Infimum (GLB) – Limit of a function.

UNIT – III

Definition of a sequence – Convergence and divergence of a sequence – Bounded sequences –Monotonic sequence –Algebra of sequences.

UNIT – IV

Convergence and divergence of a series –Geometric series –simple tests for convergence of a Series (Comparison tests, ratio test, root test, Leibnitz test) – conditional convergence and absolute convergence of alternating series – Simple problems.

UNIT – V

Continuous function and its properties – (Simple theorems only) – Uniform Continuity – Rolle 's Theorem – Mean Value Theorem – Taylor 's Theorem – Maclaurin Series.

UNIT – VI

CURRENT CONTOURS: (For Continuous Internal Assessment Only):

Systems of polynomial equations

RECOMMENDED BOOKS:

1. T.K. Manicavachagam Pillai, Analysis, S.V. Publications, Chennai, 1985
2. Malik S.C, Mathematical Analysis, Wiley Eastern, New Delhi, 1984.

COURSE OUTCOME:

After completing this course, the students will be able to

CO1: Apply theory of equations concepts including formation of equations, reciprocal equations and transformations of roots.

CO2: Understand the real number system, absolute value, supremum, infimum and limits of functions.

CO3: Analyse sequences for convergence, divergence, boundedness and monotonicity using algebra of sequences.

CO4: Examine convergence and divergence of series using comparison, ratio, root and Leibnitz tests.

CO5: Apply continuity concepts, Rolle's theorem, Mean Value theorem and Taylor–Maclaurin series in mathematical analysis.

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	1	3	3	3	2	1	1	3	1	2
CO2	1	3	2	3	1	1	1	3	1	2
CO3	1	3	3	3	2	1	2	3	2	2
CO4	1	3	3	3	2	1	2	3	2	2
CO5	1	3	3	3	2	1	2	3	2	3

Allied Mathematics for B.Sc. MATHEMATICS Programms

(Applicable to the candidates admitted from the academic year 2026-27 onwards)

Year: I	**ALLIED COURSE I**	**Semester: I**
	MATHEMATICAL STATISTICS I	
Code:	**(Theory)**	**Credits: 4**

COURSE OBJECTIVES:

- To understand statistical data representation and measures of central tendency.
- To study measures of dispersion, skewness, and kurtosis for data interpretation.
- To develop knowledge of probability concepts, random variables, and probability distributions.
- To understand mathematical expectation and generating functions used in probability theory.
- To apply Binomial and Poisson distributions and perform distribution fitting for statistical analysis**.**

UNIT – I

Statistical data – Primary data and Secondary data (definitions only) -Formation of frequency distribution, various measures of central tendency – mean, median, mode, geometric mean harmonic mean – simple problems – properties of above measures.

UNIT – II

Measures of dispersion – Range, quartile deviation mean deviation, standard deviation – their coefficients- merits and demerits (simple problems) – Skewness and kurtosis -Karl Pearson's coefficients- Bowley 's coefficients- simple problems.

UNIT – III

Probability- Definition, axiomatic approach to probability - Additive and Multiplicative laws of Probability (two variables only) and Conditional probability - simple problems- Concept of random variables – discrete and continuous random variables - Distribution function, p.m.f and pdf and their properties- simple problems.

UNIT – IV

Mathematical Expectation – addition and multiplication theorems (two variables only) – Moment generating and characteristics functions, theirproperties – Conditional expectation and conditional variance (simple problems).

UNIT – V

Binomial and Poisson distributions – moments, moment generating function cumulant generating function (Simple problems)- fitting of binomial and Poissondistribution.

UNIT – VI

CURRENT CONTOURS (For Continuous Internal Assessment Only):
An introduction to SPSS software

RECOMMENDED BOOK:

1. Gupta S.C. and Kapoor V.K., Fundamentals of Mathematical Statistics, Sultan
2.S.P. Gupta, Statistical Methods (Revised edition 2001)
3.Gupta S.C. and Kapoor V.K., Fundamentals of Applied Statistics, Sultan Chand &Sons.
4. R.S.N. Pillai and Bagavathi, Practical statistics, Second edition (2013).

COURSE OUTCOMES: After completing this course, the students will be able to

CO1: Understand statistical data, frequency distributions and measures of central tendency including mean, median and mode.

CO2: Apply measures of dispersion, skewness and kurtosis in statistical data analysis.

CO3: Analyse probability concepts, conditional probability and random variables using additive and multiplicative laws.

CO4: Compute mathematical expectation, moment generating functions and conditional expectation for random variables.

CO5: Apply Binomial and Poisson distributions, moments and fitting techniques in statistical problem solving.

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	1	3	2	3	2	1	1	3	1	2
CO2	1	3	3	3	2	1	2	3	2	2
CO3	1	3	3	3	3	1	2	3	2	2
CO4	1	3	3	3	3	1	2	3	3	2
CO5	1	3	3	3	3	2	2	3	3	3

Year: I	**ALLIED COURSE PRACTICAL I MATHEMATICAL STATISTICS II**	**Semester: I, II**
Code:	**(PRACTICAL)**	**Credits: 4**

COURSE OBJECTIVES:

- **To provide** a comprehensive understanding of measures of central tendency, dispersion, skewness, and moments for statistical data analysis.
- **To introduce** bivariate discrete probability distributions and develop skills in computing marginal, conditional, and expectation-based measures.
- **To enable** students to fit and analyse standard probability distributions such as Binomial, Poisson, and Normal distributions.
- **To develop** the ability to analyse relationships between variables using correlation and regression techniques.
- **To familiarize** students with large-sample and small-sample statistical tests for hypothesis testing and decision making.

UNIT – I

Moments of central tendency- A.M, median, G.M and H.M- Measures of Dispersion- quartile deviation, standard deviation and co-efficient of variation measures of skewness - calculations of first four moments, Central moments.

UNIT – II

Bivariate discrete probability distribution- marginal distribution and conditionaldistribution – Calculation of mean, variance, covariance, correlation coefficient, expectation - conditional expectations and conditional variance.

UNIT – III

Fitting of binomial, Poisson and normal distributions (area method only).

UNIT – IV

Calculation of Karl Pearson's coefficient of correlation, Spearman 's rank correlation and regression equations.

UNIT – V

Large sample tests- Test of single mean- Difference between means – single proportion and Difference between propositions. Exact simple test-t test for single mean, Difference between means, paired t - test - chi square test for goodness of fit and independence of attributes.

UNIT – VI

CURRENT CONTOURS (For Continuous Internal Assessment Only):
An introduction to R package

BOOKS RECOMMENDED:

1. Gupta S.C. and Kapoor V.K., Fundamentals of Mathematical Statistics, Sultan Chand & Sons 2020 (with reprints running through 2022)

2. S.P. Gupta, Statistical Methods (Revised edition 2021).
3. R.S.N. Pillai and Bagavathi, Practical statistics, edition (2013)

COURSE OUTCOMES:

After completing this course, the students will be able to

CO1: Compute measures of central tendency, dispersion, skewness and moments for statistical data analysis.

CO2: Analyse bivariate discrete probability distributions and calculate covariance, correlation and conditional expectations.

CO3: Apply fitting techniques for binomial, Poisson and normal distributions using statistical methods.

CO4: Determine Karl Pearson's correlation coefficient, Spearman's rank correlation and regression equations.

CO5: Perform large and small sample hypothesis tests including t-tests and chi-square tests for statistical inference.

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	1	3	3	3	2	1	2	3	2	2
CO2	1	3	3	3	3	1	2	3	3	2
CO3	1	3	3	3	3	1	2	3	3	2
CO4	2	3	3	3	3	2	2	3	3	3
CO5	2	3	3	3	3	2	2	3	3	3

Year: I **ALLIED COURSE II** **Semester: II**

MATHEMATICAL STATISTICS III

Code: **(Theory)** **Credits: 4**

COURSE OBJECTIVES:

- To introduce the concepts and properties of normal probability distributions and their applications in statistical analysis.
- To develop an understanding of continuous probability distributions and sampling distributions used in inferential statistics.
- To provide knowledge of correlation and regression techniques for analyzing relationships between variables.
- To familiarize students with the principles of statistical hypothesis testing and large-sample significance tests.
- To equip students with the skills required to perform small-sample statistical tests, including Chi-square and t-tests, for data-driven decision making.

UNIT – I

Normal distribution – Distributions of normal from binomial- chief characteristics – M.G.F & C.G.F of normal distributions – area property – fitting of normal distributions-Simple problems.

UNIT – II

Continuous distributions – Rectangular, Gamma distributions - sampling distributions - Chi-square and t distributions- Simple problems.

UNIT – III

Correlation – Rank correlation- Karl Pearson 's correlation co-efficient and its properties- Linear regression and its properties- simple problems.

UNIT – IV

Test of significance – Definition of null hypothesis, alternative hypothesis, sampling distribution, standard error and critical region. Type I and Type II errors, one tailed and two tailed tests. Large sample test for single proportions, Difference between proportions, single means and difference between means.

UNIT – V

Small sample tests – Chi- square test for goodness of fitness and independence of attributes. t- test for single mean. Difference between means. Paired t-test.

UNIT – VI

CURRENT CONTOURS (For Continuous Internal Assessment Only):

An introduction to Data Science.

BOOKS RECOMMENDED:

1. Gupta S.C. and Kapoor V.K., Fundamentals of Mathematical Statistics, Sultan Chand & Sons. 2020 (with reprints running through 2022
2. S.P. Gupta, Statistical Methods (Revised edition 2021).

REFERENCE:

1. R.S.N. Pillai and Bagavathi, Practical statistics, Revised edition.2013

COURSE OUTCOME:

After completing this course, the students will be able to

CO1: Understand normal distribution, its properties, M.G.F, C.G.F and fitting techniques for statistical analysis.

CO2: Analyse continuous distributions, sampling distributions and apply Chi-square and t distributions in problem solving.

CO3: Compute correlation coefficients and regression equations using statistical methods.

CO4: Apply large sample tests and concepts of hypothesis testing including Type I and Type II errors.

CO5: Perform small sample tests such as Chi-square tests and t-tests for statistical inference.

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	1	3	3	3	2	1	2	3	2	2
CO2	1	3	3	3	3	1	2	3	3	2
CO3	2	3	3	3	3	2	2	3	3	3
CO4	2	3	3	3	3	2	2	3	3	3
CO5	2	3	3	3	3	2	2	3	3	3

ALLIED COURSE I
(for B.Sc. Data Science Programmers)
(Applicable to the candidates admitted from the academic year 2026-27 Onwards)

Year: I	**ALLIED COURSE I**	**SEMESTER: I**
Code:	**MATHEMATICS I (Theory)**	**Credit: 4**

COURSE OBJECTIVES:

- To develop a strong foundation in limits, continuity, differentiability, and integration of single-variable functions and understand the Fundamental Theorem of Calculus.
- To introduce the concepts of infinite sequences and series, convergence tests, and power series expansions such as Taylor and Maclaurin series.
- To enable students to analyse functions of two variables, partial derivatives, optimization techniques, and constrained extrema using Lagrange multipliers.
- To provide knowledge of ordinary differential equations and equip students with analytical techniques for solving first-order and higher-order differential equations arising in engineering and scientific applications.
- To familiarize students with distance and similarity measures, including Euclidean, Cosine, Jaccard, Mahala Nobis, and Edit distances, and their applications in data analysis, machine learning, and pattern recognition.

UNIT – I
LIMITS AND CONTINUITY: Function of single variable – Definition, limit, continuity, piecewise continuity, periodic, differentiable, integrable, fundamental theorem of Calculus.

UNIT – II
SEQUENCES AND SERIES: Infinite Sequences – convergence, divergence, limit, Sandwich theorem, continuous function theorem, increasing, decreasing, bounded, function limit properties– power series, Taylor series and Maclaurin series.

UNIT – III
FUNCTIONS OF TWO VARIABLES: Models, partial derivative and geometrical interpretation. Stationary points – maxima, minima and saddles. Taylor series about a point. Constrained maxima and minima – Lagrange multipliers method.

UNIT – IV
ORDINARY DIFFERENTIAL EQUATIONS: Linear Differential Equations of first order - Euler's equation with variable coefficients - Simultaneous equations - Method of variation of parameters. Modelling simple systems.

UNIT – V

Distances and their Relatives- Mahala Nobis Distance-Cosine and Angular Distance-Jaccard Distance-Edit Distance-Angular distance-Euclidean distance- Bag of words Vectors-k grams-Normed similarities-set similarities.

Unit – VI

Current Contours (for Continuous Internal Assessment Only): Contemporary Developments Related to the Course during the Semester Concerned.

B00KS RECOMMENDED:

1. Hass M. D. J., Giordano Weir F.R., Thomas Calculus, Pearson Education, 2013.
   Unit 1: Chapter 1,
   Unit II: Chapter 10,
   Unit III: Chapter14,
   Unit IV: Chapter 9
2. Jeff M. Phillips, ―Mathematical Foundations for Data Analysis‖, Decem er 2018.
   Unit V: Chapter 4.1 - 4.5
3. Erwin Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons, 2011.
4. Lian, Hungerford, and Holcom ―Mathematics with Applications, Addison Wesley, 2010.
5. Riley K. F., Hobson M. P. and Bence S. J., "Mathematical Methods for Physics and Engineering", Cambridge University Press, 2006.
6. Michael D. Green erg, ―Advanced Engineering Mathematics, Pearson Education, 2014.
7. https://towardsdatascience.com/4-mathematical-numbers-and-set-concept for-data-scientist-b3587611070f 8.
   https://www.cs.utah.edu/~jeffp/M4D/M4D-v0.4.pdf

COURSE OUTCOMES:

Upon successful completion of this course the students would be able to:

CO1: Understand limits, continuity, differentiability, integrability and apply the fundamental theorem of calculus to functions of a single variable.

CO2: Analyse convergence and divergence of sequences and series using standard convergence tests and series expansions.

CO3: Apply partial derivatives, Taylor series and Lagrange multipliers to solve optimization problems involving functions of two variables.

CO4: Solve ordinary differential equations using exact equations, integrating factors, variation of parameters and higher order methods.

CO5: Analyse and apply various distance and similarity measures such as Euclidean, Jaccard, Cosine and Edit distance in computational applications.

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	1	3	3	3	2	1	1	3	1	2
CO2	1	3	3	3	2	1	2	3	2	2
CO3	1	3	3	3	3	1	2	3	2	2
CO4	1	3	3	3	3	2	2	3	3	2
CO5	2	3	3	3	3	2	2	3	3	1

Year: I **ALLIED COURSE PRACTICAL I**

Semester: I, II

Code: **DATA ANALYTICS USING SPREAD SHEETS** **Credits: 4**

COURSE OBJECTIVES:

- To Impart Practical Training in Spread Sheets
- To demonstrate descriptive statistics using spread sheets
- To describe data analysis toolpak in spread sheet.

1. Demonstrate the usage of the following built-in-functions in a spreadsheet. MAX, SUM, AVERAGE, CONCATENATE, LEN, LOWER, UPPER and TRIM
2. Demonstrate the usage of the following logical functions in spreadsheet. AND, OR, NOT, IF and IFERROR
3. Demonstrate the usage of the following built-in-functions in spreadsheet. SUMIFS, AVERAGEIFS, COUNTIFS, COUNTA,
4. Demonstrate any 10 math and trigonometric functions in spreadsheet.
5. Create and demonstrate the usage of a pivot table in spreadsheet
6. Display the transpose of a given matrix using spreadsheet.
7. Add the Data Analysis Toolpak in the spreadsheet.
8. Demonstrate the descriptive statistics in spreadsheet.
9. Find the Correlation between two variables in spreadsheet.
10. Preform Regression analysis in spreadsheet.
11. Demonstrate the usage of the following Data Analysis built-in-functions in spreadsheet. VLOOKUP, HLOOKUP, FIND, SEARCH, LEFT, RIGHT, RANK
12. Demonstrate the usage of Data Cleaning – Text Functions in spread sheet DATA CLEANING USING TEXT TO COLUMN CONDITIONAL FORMATTING
13. Perform SORTING with single and multiple columns in spread sheet.
14. Demonstrate the usage of FILTERING in spread sheet
15. Construct various Line, Bar and Pie charts in spread sheet.
16. Construct Scatterplots for the data in spread sheet.
17. Generate a Histogram for the data in spreadsheet
18. Implement Student's T-test in spreadsheet.
19. Demonstrate the usage of what-if Analysis in spreadsheet.
20. Implement table group in insert tab to analyse data in spread sheet

COURSE OUTCOMES:

Upon successful completion of this course the students would be able to:

CO1: Apply spreadsheet built-in functions, logical functions and mathematical functions for data processing and computation.

CO2: Perform data organization, cleaning, sorting, filtering and transformation using spreadsheet tools and text functions.

CO3: Analyse data using pivot tables, descriptive statistics, correlation and regression analysis in spreadsheets.

CO4: Construct charts, scatterplots and histograms for effective data visualization and interpretation.

CO5: Apply statistical and analytical tools such as Student's t-test, what-if analysis and table analysis in spreadsheets.

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	2	3	3	3	3	1	2	3	2	2
CO2	2	3	3	3	3	2	2	3	2	3
CO3	2	3	3	3	3	2	2	3	3	3
CO4	2	3	3	3	2	2	2	3	2	3
CO5	2	3	3	3	3	2	2	3	3	3

Year: I	**ALLIED COURSE II**	**Semester: II**
Code:	**MATHEMATICS II (THEORY)**	**Credits: 4**

COURSE OBJECTIVES:

- To develop a strong foundation in matrices and systems of linear equations and apply matrix methods to solve engineering and scientific problems.
- To understand the concepts of vector spaces, linear dependence, linear independence, rank, and dimension, and their significance in linear algebra.
- To introduce inner product spaces, orthogonality, orthonormal bases, Gram–Schmidt process, QR decomposition, and least-squares approximation techniques.
- To study linear transformations, their matrix representations, kernel, range, geometric interpretations, and change of basic concepts.
- To familiarize students with eigen values, eigenvectors, matrix diagonalization, singular value decomposition, quadratic forms, and their applications in engineering, science, and differential equations**.**

UNIT – I

SYSTEM OF LINEAR EQUATIONS AND MATRICES: System of linear equations, Gauss – elimination, Elementary matrices and a method for finding inverse of a matrix.

UNIT – II

VECTOR SPACES: Introduction to vector spaces – Addition and Multiplication-properties of vector spaces; Linear dependence; Linear independence – rank/dimension for vector space using gaussian elimination.

UNIT – III

INNER PRODUCT SAPCES: Inner product, Length, angle and orthogonality – Orthogonal sets – Orthogonal projections – Inner product spaces – Orthonormal basis: Gram-Schmidt process – QR Decomposition- Best Approximation, least squares.

UNIT – IV

LINEAR TRANSFORMATION: Introduction to linear transformations – General Linear Transformations – Kernel and range – Matrices of general linear transformation-Geometry linear operators-Change of basis.

UNIT – V

EIGEN VALUES AND EIGEN VECTORS: Introduction to Eigen values- Diagonalizing a matrix- Orthogonal diagonalization-, Applications to differential equations- Positive

definite matrices- Similar matrices –Quadratic forms Quadratic surfaces Singular value decomposition.

Unit – VI

Current Contours (for Continuous Internal Assessment Only): Contemporary Developments Related to the Course during the Semester Concerned.

BOOKS RECOMMENDED:

1. Howard Anton and Chris Rorres, Elementary Algebra, Wiley, 2011. (Unit I: Chapter 1, Unit III: Chapter 6, Unit V: Chapter 7)
2. Jeff M. Phillips, Mathematical Foundations for Data Analysis, December 2018 (Unit II: Chapter 3)
3. Gilbert Strang, Linear Algebra and its applications, Thomson Learning, 2009
4. Steven J. Leon, Linear Algebra and its Applications, Prentice Hall, 2006.
5. David C. Lay, Linear Algebra and its applications", Pearson Education, 2011
6. https://www.kdnuggets.com/2018/09/essential-math-data-science.html
7. https://www.cs.utah.edu/~jeffp/M4D/M4D-v0.4.pdf

COURSE OUTCOMES:

Upon successful completion of this course the students would be able to:

CO1: Solve systems of linear equations using Gaussian elimination and determine inverses of matrices using elementary matrix methods.

CO2: Understand vector spaces, linear dependence, linear independence and determine rank and dimension using Gaussian elimination.

CO3: Apply concepts of inner product spaces, orthogonality, Gram–Schmidt process, QR decomposition and least squares approximation.

CO4: Analyse linear transformations, kernels, ranges, matrix representations and change of basis in vector spaces.

CO5: Determine eigen values, eigen vectors, diagonalization, singular value decomposition and applications to differential equations and quadratic forms.

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	1	3	3	3	3	1	2	3	2	2
CO2	1	3	3	3	2	1	2	3	2	2
CO3	1	3	3	3	3	1	2	3	3	2
CO4	1	3	3	3	3	2	2	3	3	2
CO5	1	3	3	3	3	2	2	3	3	3