DEPARTMENT OF MATHEMATICS
OSMANIA UNIVERSITY
HYDERABAD-500007

REVISED COMMON CORE SYLLABUS OF B.Sc., (MATHEMATICS) three year degree under
Choice Based Credit System (CBCS) frame work
with effect from AcademicYear 2025-2026

(With Learning Outcomes, Unit-wise Syllabus, References, Co-curricular Activities)
(To be implemented for candidates admitted from theAcademic Year 2025-2026)

B. Sc. (Mathematics)CourseStructure

with effect from the academic year 2025-2026

Sem	Paper	Subject	Hours/ per week: Theory	Hours/ per week: Tutorials*	Credits	Marks (IA)	Marks(ESE)	Total Marks
I	DSC 1	Differential Equations	4	1	5	20	80	100
II	DSC 2	Real Analysis	4	1	5	20	80	100
III	DSC 3	Differential & Vector Calculus	4	1	5	20	80	100
IV	DSC 4	Algebra	4	1	5	20	80	100
V	DSC 5	Linear Algebra	4	1	5	20	80	100
V	Multi - Disciplinary (MDC)	**(A)** Mathematics of Finance & Insurance **OR** **(B)** Basic Mathematics	4	–	4	20	80	100
VI	DSE	**(A)**Numerical Analysis **OR** **(B)**Integral Transforms **OR** **(C)** Analytical Solid Geometry	4	1	5	20	80	100
VI	SEC-IV	**(A)** Number Theory **OR** (B) Verbal Reasoning **OR** **(B)** Quantitative Aptitude	2	–	2	10	40	50
VI	**Project/ Internship**		4	–	4			100

***Tutorials: Problems**solvingsessionforeach20student'sin onebatch.

IA - Internal Assessment
ESE – End Semester Examination
DSC – Discipline Specific Course
DSE – Discipline Specific Elective
SEC – Skill Enhancement Course
MDC – Multi Disciplinary Course

SEMESTER- I
DIFFERENTIAL EQUATIONS

Theory: 4 hours per week and**Tutorials:** 1hour per week

DSC-I

Objectives: Introduce the fundamental concepts and methods of solving first-order and higher-order differential equations. Provide an understanding of the role of integrating factors, substitutions, and transformations in solving exact and reducible equations. Introduce higher-order linear differential equations, their solutions using operator methods, undetermined coefficients, and variation of parameters.

Outcomes: Solve first-order and first-degree differential equations using separable, homogeneous, linear, exact, and reducible forms. Apply the concepts of integrating factors and transformations to simplify and solve differential equations. Solve higher-order linear differential equations with constant coefficients, both homogeneous and non-homogeneous, using operator methods and the method of undetermined coefficients.

UNIT- I

Differential Equations of first order and first degree: Introduction- Equations in which Variables are Separable – Homogeneous Differential Equations - Differential Equations Reducible to Homogeneous Form – Linear Differential Equations - Differential Equations Reducible to Linear Form – Exact Differential Equations – Integrating Factors – Change in Variables. (Sec. 2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 2.7, 2.8, 2.9)

UNIT- II

Differential Equations of first order but not of first degree: Equations solvable for p– Equations solvable for y–Equations solvable for x–Equations that do not contain x (or y) –Equations Homogeneous in x and y – Equations of First Degree in x and y – Clairaut's equation.

Applications of first order Differential Equations: Growth and Decay – Dynamics of Tumor Growth – Radioactivity and Carbon Dating – Compound Interest – Orthogonal Trajectories.
(Sec. 3.1, 3.2, 4.1, 4.2, 4.3, 4.4, 4.20)

UNIT- III

Higher order Linear Differential Equations: Solution of Homogeneous Linear Differential Equations with constant coefficients - Solution of Non-Homogeneous Differential Equations $P(D)y = Q(x)$ with constant coefficients by means of polynomial operators when $Q(x) = be^{ax}$ / V e^{ax} /b $Sin(ax)$ /b $Cos(ax)$ /b x^k , Method of undetermined coefficients.(Sec. 5.1, 5.2, 5.3, 5.4)

UNIT- IV

Method of variation of parameters – Linear Differential Equations with non-constant coefficients – The Cauchy – Euler Equation – Legendre's Linear Equations – Miscellaneous Differential Equations –Total Differential Equations – Simultaneous Total Differential Equations – Equations of the form $\frac{dx}{P} = \frac{dy}{Q} = \frac{dz}{R}$. (Sec. 5.5, 5.6, 5.7, 5.8, 5.9 and Sec. 2.10, 2.11, 2.12)

TEXT BOOK:

1. Zafar Ahsan — *Differential Equations and Their Applications*, PHI Learning Pvt. Ltd., Third Edition, 2016.

REFERENCE BOOKS :

1. Frank Ayres Jr — *Theory and Problems of Differential Equations:* Schaum Publishing Co. (McGraw-Hill), 1952.
2. L. R. Ford — *Differential Equations:* McGraw-Hill, Second Edition, 1955
3. Daniel Murray — *Differential Equations.*
4. S. Balachandra Rao — *Differential Equations with Applications and Programs:* Sangam Books, illustrated edition, 1996.
5. Stuart P. Hastings & J. Bryce McLeod — *Classical Methods in Ordinary Differential Equations.*

SEMESTER-II

REAL ANALYSIS

Theory: 4 hours per week and**Tutorials:** 1hour per week

DSC-II

Objectives: To introduce the rigorous foundations of Real Analysis and highlight their importance in the development of modern mathematics. To develop the skill of analyzing the concepts of limits, continuity, and differentiability of real functions with precision. To familiarize students with classical theorems such as Rolle's Theorem, Mean Value Theorems, and the Fundamental Theorem of Calculus. To provide an understanding of Riemann integration and its applications in connecting differentiation and integration.

Outcomes: Distinguish between open, closed, countable, and uncountable sets, and analyze limit points. Apply the theory of sequences and series, including convergence tests, to solve mathematical problems. Compute and analyze Riemann integrals, apply Darboux's Theorem, and use the Fundamental Theorem of Calculus in solving problems.

UNIT-I

Real Numbers: Field Structure and Order Structure−Bounded and Unbounded Sets−Completeness in the Set of Real Numbers−Absolute Value of a Real Number.(**Chapter 1:** Sec. 2,3,4,5)

Open Sets, Closed Sets and Countable Sets: Limit Points of a Set−Closed Sets−Countable and Uncountable Sets. (**Chapter 2:**Sec. 2,3,4)

Real Sequences: Sequences−Limit points of a Sequence−Convergent Sequences−Non Convergent Sequences (Definitions)−Cauchy's General Principle of Convergence−Algebra of Sequences−Some Important Theorems−Monotonic Sequences. (**Chapter 3:**Sec. 1,2,4,5,6,7,8,9)

UNIT-II

Infinite Series: Positive Term Series−Comparison tests for Positive Term Series−Cauchy's Root test−D'Alembert'sRatio Test−Integral Test−Alternating Series(Leibnitz Test). (**Chapter 4:**Sec. 2,3,4,5,8,10.1, 10.2)

Functions of a Single Variable (I): Limits−Continuous Functions−Functions Continuous on Closed Intervals. (**Chapter 5:**Sec. 1,2,3)

UNIT -III

Functions of a Single Variable (II): The Derivative−Increasing and Decreasing Functions−Rolle's Theorem−Lagrange's Mean Value Theorem−Cauchy's Mean Value Theorem−Higher Order Derivatives. (**Chapter 6:**Sec. 1,3,5,6,7,8)

UNIT -IV

Riemann Integral: Definition and Existence of the Integral−Refinement of Partitions−Darboux's Theorem−Conditions of Integrability−Integrability of the Sum and Difference of Integrable Functions−The Integral as a Limit of Sums−Some Integrable Functions−Integration and Differentiation−The Fundamental Theorem of Calculus. (**Chapter 9:**Sec. 1,2,3,4,5,6,7,8,9)

TEXT BOOKS:

1. S.C. Malik and Savita Arora, *Mathematical Analysis*, Fourth Edition, New Age International Publishers.

REFERENCE BOOKS:

1. .Kenneth A. Ross – *Elementary Analysis: The Theory of Calculus*, Springer, Second Edition, 2013
2. William F. Trench – *Introduction to Real Analysis*, Prentice Hall / Pearson Education, First Edition, 2003
3. Lee Larson – *Introduction to Real Analysis I*, University of Louisville (course notes), 2014
4. Shanti Narayan & P. K. Mittal – *A Course of Mathematical Analysis*, S. Chand & Company Ltd., Revised (29th Edition), 2005
5. Brian S. Thomson, Judith B. Bruckner & Andrew M. Bruckner – *Elementary Real Analysis*, Prentice Hall, First Edition 2001; Second Edition 2008

SEMESTER- III

DIFFERENTIAL AND VECTOR CALCULUS

Theory: 4 hours per week and**Tutorials:** 1hour per week

DSC-III

Objectives: To introduce the concepts of functions of several variables, limits, continuity, and partial differentiation. To develop problem-solving skills in handling composite functions, implicit differentiation, and optimization with constraints. To provide a foundation in evaluating line, surface, and volume integrals and their applications. To familiarize students with vector calculus concepts such as gradient, divergence, curl, and fundamental integral theorems.

Outcomes: Understand and compute partial derivatives, limits, continuity, and homogeneous functions of several variables. Apply Taylor's theorem, Lagrange multipliers, and related techniques to solve optimization problems. Evaluate line, surface, and volume integrals in Cartesian and polar coordinates. Apply vector calculus operators and integral theorems (Divergence and Stokes) to solve mathematical and physical problems.

UNIT-I

Partial Differentiation: Introduction-Functions of two Variables−Neighbourhood of a point(a, b)-Continuity of a Function of two Variables−Continuity at a point−Limit of a Function of two Variables−Partial Derivatives−Geometrical Representation of a Function of two Variables−Homogeneous Functions.(**Book 1:**Sec. 11.1, 11.2, 11.3, 11.4, 11.5, 11.6, 11.7, 11.8)

UNIT-II

Theorem on Total Differentials−Composite Functions− Differentiation of Composite Functions−Implicit Functions−Equality of $f_{xy}(a,b)$ and $f_{yx}(a,b)$, Taylor' s theorem for a function of two Variables−Maxima and Minima of functions of two variables−Lagrange's Method of undetermined multipliers.(**Book 1:**Sec. 11.9, 11.10, 11.11, 9.6, 9.7)

UNIT-III

Line Integrals, Surface integrals, Volume integrals: Line Integrals−Double Integrals−Double Integrals in Polar Co-ordinates−Surface Integrals−Volume Integrals. (**Book 2:**Sec. 2.2, 2.3, 2.4) (**Book 3:**Sec. 13.1 and 13.3)

UNIT-IV

Gradient, Divergence and Curl : Gradient of scalar field−Divergence of vector field−Curl of a vector field−Combinations of grad, div and curl. (**Book 2:**Sec. 3.2, 3.3, 3.4, 4.6)

Integral theorems: Divergence theorem−Stokes theorem. (**Book 2:**Sec. 5.1, 5.2)

TEXTBOOKS:

1. Shanti Narayan and P.K. Mittal — *Differential Calculus*, S. Chand, New Delhi, 15th Edition.
2. P.C. Matthews — *Vector Calculus*, Springer London, 1998 .
3. G.B. Thomas & R.L. Finney — Calculus, Addison-Wesley Second Edition by Finney published in 1993.

REFERENCE BOOKS:

1. William A. Granville, Percy F. Smith & William R. Longley — *Elements of the Differential and Integral Calculus*, Ginn& Co., 1941.
2. G.B. Thomas & R.L. Finney — *Calculus*, Addison-Wesley.
3. Joseph Edwards — *Differential Calculus for Beginners*, Macmillan, London, 1893.
4. R.T. Smith & R. Minton — *Calculus*, McGraw-Hill Education, 4th Edition, 2012.
5. Eli S. Pine — *How to Enjoy Calculus*, Steinlitz-Hammacher Company, 5th Edition, 1984.

SEMESTER – IV

ALGEBRA

Theory: 4 hours per week and**Tutorials:** 1hour per week

DSC-IV

Objectives: To introduce the fundamental concepts of groups and along with illustrative examples. To develop the ability to understand subgrou structures, quotient groups, normal subgroups, and their properties. To equip students with knowledge of ring theory including ideals homomorphisms, quotient rings, and special classes of rings. To provide problem-solving skills and logical reasoning needed for abstract algebra an its applications.

Outcomes: Understand the definitions and basic properties of groups, subgroups, and apply counting principles in group theory. Analyze an construct normal subgroups, quotient groups, homomorphisms, and apply Cayley's theorem and permutation groups in problem solving. Explain th structure of rings, recognize special classes of rings, and apply ring homomorphisms.

UNIT – I

Group Theory: Definition of a Group, Some Examples of Groups – Some Preliminary Lemmas – Subgroups – A Counting Principle. (Sec. 2.1, 2.2, 2.3, 2.4, 2.5)

UNIT – II

Group Theory: Normal Subgroups and Quotient Groups –Homomorphisms–Cayley's Theorem – Permutation Groups. (Sec. 2.6, 2.7, 2.9, 2.10)

UNIT – III

Ring Theory: Definition and Examples of Rings – Some Special Classes of Rings – Homomorphisms. (Sec. 3.1, 3.2, 3.3)

UNIT – IV

Ring Theory: Ideals and Quotient Rings –More Ideals and Quotient Rings – Euclidean Rings –Polynomial Rings. (Sec. 3.4, 3.5, 3.7, 3.9)

TEXT BOOK:

1. I.N. Herstein — *Topics in Algebra*, John Wiley & Sons, Second Edition, 1975.

REFERENCE BOOKS:

1. P.B. Bhattacharya, S.K. Jain & S.R. Nagpaul — *Basic Abstract Algebra*, Cambridge University Press (Indian Edition also by Hindustan Book Agency), Second Edition, 1994.
2. J.B. Fraleigh — *A First Course in Abstract Algebra*, Addison-Wesley, Seventh Edition, 2003.
3. Joseph A. Gallian — *Contemporary Abstract Algebra*, Cengage Learning, Ninth Edition, 2017.

SEMESTER-V

LINEAR ALGEBRA

Theory: 4 hours per week and**Tutorials:** 1hour per week

DSC-V

Objectives: To introduce the fundamental concepts of vector spaces, subspaces, basis, and dimension. To develop understanding of linea transformations, their properties, and their relation to matrices. To equip students with methods to solve systems of linear equations and stud eigenvalues, eigenvectors, and their applications.

Outcomes: Understand vector spaces, subspaces, basis, and dimension, and analyze linear dependence and independence. Apply concepts of linea transformations, kernel, range, rank–nullity, and composition of maps in problem solving. Represent linear maps with matrices, compute rank an nullity of matrices, and perform elementary row operations to solve systems of equations. Compute eigenvalues, eigenvectors, and wronskians, an work with inner product spaces in theoretical and applied contexts.

UNIT – I

Vector Spaces: Vector Spaces – Subspaces – Span of a Set – More about Subspaces – Linear Dependence – Independence – Dimension and Basis. (Sec. 3.1, 3.2, 3.3, 3.4, 3.5,3.6)

UNIT – II

Linear Transformations: Definition and examples – Range and Kernal of a Linear Map – Rank and Nullity – Inverse of a Linear Transformation – Consequences of Rank–Nullity Theorem – The Spaces L(U,V) – Composition of Linear Maps. (Sec. 4.1, 4.2, 4.3, 4.4, 4.5, 4.6, 4.7)

UNIT – III

Matrices: Matrix Associated with a Linear Map – Linear Map Associated with a Matrix – LinearOperations in $M_{m\times n}$ – Rank and Nullity of a Matrix. (Sec. 5.1, 5.2, 5.3, 5.4, 5.5)

UNIT – IV

Elementary Row operations – System of Equations – Eigenvalues and Eigenvectors – Wronskians– Inner Product Spaces. (Sec. 5.7, 5.8, 6.8, 6.9, 7.2)

TEXT BOOK:

1. V. Krishnamurthy, V.P. Mainra & J.L. Arora — *An Introduction to Linear Algebra*, Affiliated East-West Press Pvt. Ltd., Reprin Edition, 1976.

REFERENCE BOOKS:

1. Kenneth Hoffman & Ray Kunze — *Linear Algebra*, Prentice-Hall Inc., Second Edition, 1971.
2. Stephen H. Friedberg, Arnold J. Insel & Lawrence E. Spence — *Linear Algebra*, Pearson Education, Fourth Edition, 2003.

MULTI DISCIPLENARY COURSE

SEMESTER-V

(A) MATHEMATICS OF FINANCE ANDINSURANCE

Theory: 4 hours per week

MDC-I (A)

Objectives: To introduce the fundamental concepts of arithmetic and geometric progressions, simple and compound interest, and first-order difference equations. To develop an understanding of annuities, amortization, sinking funds, and their applications in economic and financial contexts. To provide insights into the mathematical structure of banking and insurance schemes, including mutual funds, savings contracts, and mortality models. To equip students with the ability to analyze insurance contracts, reserves, surplus, and profit-sharing mechanisms in actuarial science.

Outcomes: Apply concepts of progressions, simple/compound interest, and difference equations to solve financial mathematics problems Compute present and future values of annuities, design amortization schedules, and apply financial mathematics to supply, demand, and income models.Understand and analyze banking savings contracts, mutual funds, endowment contracts, and mortality models in actuarial mathematics Evaluate life insurance contracts, reserves, surplus, and unit-linked policies, gaining foundational skills in actuarial risk analysis and financial planning.

UNIT-I

Progressions: Arithmetic Progressions− Geometric ProgressionsInterest: Simple Interest− Compound Interest−Effective rate−Normal Rate−Present Value of a Future Amount−FirstOrder Linear Difference Equations. (**Book 1:** Sec.10.1, 10.2, 10.3, 10.4)

UNIT–II

Annuities: Simple Annuities−Future Value of an Annuity−Sinking Fund−Present Value of an Annuity−Amortization−Economic Applications: Supply, Demand and Market Equilibrium−Growth of National Income. (**Book 1:**Sec. 10.5, 10.6)

UNIT–III

Banking Versus Insurance: The Banking Savings Contract− A Small-Scale Mutual Fund− A Large-Scale Mutual Scheme−Mortality: Life and Death in the Classical Actuarial Perspective−Banking: Interest− Savings in the Bank−The Endowment Contract. (**Book 2:**Sec.1.1, 1.2, 1.3)

UNIT–IV

Insurance: The Life Endowment−A Life Assurance Contract−Individual Reserves and Mortality Request−Insurance Risk in a Finite Portfolio: With – Profit contracts: Surplus and bonus: With profit contracts, First Order Basis, Surplus−Unit Linked Insurance. (**Book 2:**Sec. 1.4, 1.5, 1.6)

TEXTBOOKS:

1. *Finite Mathematics* — Lawrence E. Spence, Harper & Row, c. 1981.
2. *Basic Life Insurance Mathematics* — Ragnar Norberg, 2002.

MULTIDISCIPLINARY COURSE
SEMESTER-V
(B) BASIC MATHEMATICS

Theory: 4 hours per week

MDC-I(B)

Objectives: To introduce the fundamentals of coordinate geometry and apply them to solve problems involving distances, areas, and triangle properties. To develop the ability to work with straight lines, their equations, and conditions of concurrency, parallelism, and perpendicularity. To provide a strong foundation in matrices and determinants, including properties and operations useful for higher studies. To equip students with methods of solving linear systems of equations using rank, matrix inversion, and Cramer's rule, with applications in business and applied problems.

Outcomes: Apply coordinate geometry concepts to compute distances, centroids, and areas of geometric figures. Analyze and solve problems related to straight lines, including intersection, concurrency, angles, and point–line relationships. Perform matrix operations, compute determinants, and utilize their properties in mathematical problem solving. Formulate and solve linear systems of equations using matrix methods, rank concept, and Cramer's rule, and interpret solutions in practical contexts.

UNIT-I

Coordinate Geometry: Fundamentals–Cartesian Coordinates system–Polar Coordinates–Distance Formula–Section Formula–Centroid of a Triangle–Area of a Triangle. (**Chapter 11**)

UNIT-II

Straight Line: Introduction–Definitions of the Terms–Different Forms of the Equations of a Straight Line–Distance of a point from a Straight Line–Angle between two Lines and Condition of Parallelism and Perpendicularity of Lines–Point of intersection of Two Lines–Condition of Concurrency of Three Given Straight Lines–Position of a Point with respect to a given Line. (**Chapter 13**)

UNIT-III

Matrices: Introduction–Definitions and Notations–Operations on Matrices–Determinant of a Square Matrix–Non Singular matrix and Singular Matrix–Sarrus Diagram for Expansion of Determinant of a matrix 3×3 – Properties of Determinants. (**Chapter 15:**Sec. 15.1, 15.2, 15.3, 15.5.1, 15.5.2, 15.5.3)

UNIT-IV

Linear System of Equations: Conversion of a business problem into a Linear System of Equations–Rank of a Matrix–Application of Rank concept–Minor and Cofactor–Adjoint of a Square matrix–Inverse of a Square Matrix–Matrix Equation–Methods to Solve Linear System of Equations–Solution to the linear system of Equations–Types of Solutions–Cramer's rule–Matrix Inversion method. (**Chapter 15:**Sec. 15.4, 15.5.4, 15.5.5, 15.5.6, 15.5.7, 15.5.8, 15.6, 15.7.1, 15.7.2, 15.7.3, 15.7.4, 15.7.4)

TEXT BOOK:

1. P. Mariappan, Business Mathematics, Pearson Publication 2015.

SEMESTER-VI

(A) NUMERICAL ANALYSIS

Theory: 4 hours per week and**Tutorials:** 1hour per week

DSE-VI(A)

Objectives: To introduce the sources of errors in numerical computations and methods for error analysis.To develop the ability to solve algebraic, transcendental equations, and interpolation problems using numerical techniques.To equip students with knowledge of curve fitting, numerical differentiation, and numerical integration techniques.To enable students to apply numerical methods for solving ordinary differential equations using classical approaches such as Euler's and Runge–Kutta methods.

Outcomes: Analyze different types of numerical errors and apply iterative methods(Bisection, False Position, Newton-Raphson, Muller) to solve algebraic and transcendental equations.Apply interpolation techniques (Newton, Gauss, Stirling, Bessel, Lagrange, Divided Differences) for estimating values of unknown functions.Use least squares methods for curve fitting, perform numerical differentiation, and apply numerical integration rules (Trapezoidal, Simpson's 1/3, Simpson's 3/8).Solve initial value problems of ordinary differential equations numerically using Taylor's method, Picard's iteration, Euler's method, and Runge–Kutta methods.

UNIT-I

Errors in Numerical Calculations−Mathematical Preliminaries−Errors and their Computations−A General Error Formula−Error in a Series Approximation. (Sec. 1.2,1.3,1.4,1.5)

Solutions of Algebraic and Transcendental Equations: Introduction−The Bisection Method−The Method of False Position−The Iteration Method–Newton Raphson Method−Muller's Method. (Sec. 2.1, 2.2, 2.3, 2.4, 2.5, 2.8)

UNIT-II

Interpolation: Introduction−Finite Differences–Differencesof a Polynomial−Newton's formulae for Interpolation−CentralDifference Interpolation formulae−Gauss Central differences formulaeStirlingformula−Bessel formula−Lagrange Interpolation Polynomial−Divided Differences and their Properties−Newton's General Interpolation formula. (Sec. 3.1,3.3, 3.5, 3.6, 3.7,3.7.1, 3.7.2, 3.7.3, 3.9.1, 3.10, 3.10.1)

UNIT-III

CurveFitting: Least SquareCurve Fitting Procedures−Fitting a Straight Line−Linearization of NonlinearLaws−Curve Fitting by Polynomials. (Sec. 4.2,4.2.1,4.2.3, 4.2.4)

NumericalDifferentiationandIntegration: Introduction−Numerical Differentiation (Using Newton's Forward and Backward Difference Formulae)–Numerical Integration: Trapezoidal Rule−Simpson's 1/3Rule−Simpson's 3/8 Rule. (Sec. 6.1,6.2,6.4,6.4.1,6.4.2,6.4.3)

UNIT-IV

NumericalSolutions ofOrdinaryDifferentialEquations: Introduction-Solution by Taylor's Series-Picard's Method of Successive Approximations−Euler's Methods−Modified Euler's method−Runge Kutta Methods. (Sec. 8.1,8.2,8.3,8.4,8.4.2,8.5)

TEXT BOOK:

1. S.S. Sastry — *Introductory Methods of Numerical Analysis*, PHI Learning Pvt. Ltd., Fifth Edition, 2012.

REFERENCE BOOKS:

1. Richard L. Burden & J. Douglas Faires — *Numerical Analysis*, Brooks/Cole Cengage Learning, Ninth Edition, 2011.
2. M.K. Jain, S.R.K. Iyengar& R.K. Jain — *Numerical Methods for Scientific and Engineering Computation*, New Age Internation Publishers, Fifth Edition, 2007.
3. B. Bradie — *A Friendly Introduction to Numerical Analysis*, Pearson Education, First Edition, 2006.

SEMESTER-VI
(B) INTEGRALTRANSFORMS

Theory: 4 hours per week and**Tutorials:** 1hour per week

DSE-VI(B)

Objectives: To introduce the concepts and properties of Laplace transforms and their applications in solving integrals and differential equations.To develop skills in computing inverse Laplace transforms and applying them to solve ordinary and simultaneous differential equations.To provide understanding of Fourier series, Fourier transforms, and their fundamental properties.To enable students to apply Laplace and Fourier transform techniques to initial and boundary value problems in science and engineering.

Outcomes: Apply Laplace transforms and their properties to evaluate integrals and solve problems involving elementary and special functions.Compute inverse Laplace transforms and use them to solve ordinary differential equations with constant and variable coefficients, as well as simultaneous systems.Understand and apply Fourier series and Fourier transforms (sine, cosine, complex forms) along with their properties and inversion theorems.Utilize convolution, Parseval's identity, and the relation between Fourier and Laplace transforms to solve initial and boundary value problems.

UNIT -I

Laplace Transforms: - Laplace Transform Definition−Linear Property of Laplace Transform−Piecewise Continuous Function−Existence of Laplace Transform−Functions of Exponential Order−Function of Class A−Laplace Transform of Some Elementary Functions−First Shifting Theorem−Change of Scale Property–Laplace Transforms of Derivatives−Laplace Transforms of Integrals−Multiplication by Powers of t −Division by t −Evaluation of Integrals−Periodic functions−SomeSpecial Functions. (Page Nos. 1−42)

Unit -II

Inverse Laplace Transform: Inverse Laplace Transform Definition−Null function−Lerch's Theorem− Linear Property−Second Shifting Theorem−Change of Scale Property−Use of Partial Fractions−Inverse Laplace Transform of Derivatives−Inverse Laplace Transform of Integrals−Multiplication by Powers of p −Division by Powers of p −Convolution Definition Convolution Theorem−Heaviside's Expansion Formula. (Page Nos.43-64)

Applications of Laplace Transform to Solutions of Differential Equations: Solution of Ordinary Differential Equations with Constant Coefficients−Solution of Ordinary Differential Equations with Variable Coefficients−Solution of Simultaneous Ordinary Differential Equations. (Page Nos. 92−117)

Unit-III

Fourier Transforms: DirichletConditions−Fourier Series−Fourier Integral Formula−Complex Fourier Transform−Inversion Theorem for Complex Fourier Transform−Fourier SineTransform−Inversion Formula for Fourier Sine Transform−Fourier Cosine Transform−Inversion Formula for Fourier Cosine Transform−Linear Property ofFourier Transform−Change of Scale Property−Shifting Property−ModulationTheorem. (Page Nos. 175-201)

Unit -IV

Convolution Theorem−Parseval's Identity−Relation Between Fourier and Laplace Transforms−Fourier Transform of Derivatives of a Function−Finite Fourier Transforms−Applications of Fourier Transforms in Initial and Boundary Value Problems. (Page Nos. 201-212 and213-245)

TEXTBOOK:

1. Vasishtha& R.K. Gupta — *Integral Transforms*, Krishna Prakashan Media (P) Ltd., Meerut, Second Edition, 2002.

REFERENCE BOOK:

2. Brian Davies — *Integral Transforms and Their Applications*, Springer, Third Edition, 2002.

SEMESTER-VI
(C) ANALYTICALSOLIDGEOMETRY

Theory: 4 hours per week and**Tutorials:** 1hour per week

DSE-VI(C)

Objectives: To introduce the fundamental properties and equations of spheres, circles, tangent planes, and radical planes.To develop an understanding of cones and cylinders, including conditions for their representation and intersections with lines and planes.To provide knowledge of right circular cones and cylinders and their geometric applications.To study general second-degree equations of conicoids, intersections, tangent planes, and enveloping surfaces.

Outcomes: Derive and analyze equations of spheres, circles, tangent planes, and solve problems involving their intersections and radical planes.Identify and formulate equations of cones, verify conditions for second-degree equations representing cones, and determine intersections with lines and planes.Explain the properties of right circular cones and cylinders and solve related analytical geometry problems.Work with conicoids and apply concepts of intersection, tangent planes, enveloping cones, and cylinders in three-dimensional geometry.

UNIT-I

Sphere: Definition−TheSphere through Fourgiven Points−Sphere−Equation ofa Circle−Intersection of a Sphere and a Line−Equation of a Tangent Plane−Angle of Intersection of Two Spheres−Radical Plane.(Sec. 6.1, 6.2, 6.3, 6.4, 6.5, 6.6, 6.7, 6.8)

UNIT-II

Cones andCylinders: Definition−Condition that the General Equation of the Second Degree Should Represents a Cone−Cone and a Plane Through its Vertex−Intersection of a Line with a Cone.(Sec. 7.1, 7.2, 7.3, 7.4)

UNIT-III

Cones andCylinders:The RightCircularCone−TheCylinder−TheRightCircularCylinder.
(Sec. 7.6, 7.7, 7.8)

UNIT-IV

The Conicoid: The General Equation of the Second Degree−Intersection of a Line with a Conicoid−Plane of Contact−Enveloping Cone and Cylinder. (Sec. 8.1,8.3,8.4,8.6)

TEXT BOOK:

1. Shanti Narayan & P.K. Mittal — *Analytical Solid Geometry*, S. Chand & Company Ltd., 17th Edition, 2012.

REFERENCE BOOKS:

1. Khaleel Ahmed — *Analytical Solid Geometry*, Himalaya Publishing House, First Edition, 2009.
2. S.L. Loney — *The Elements of Solid Geometry*, Macmillan and Co., London, Revised Edition, 1920 (frequently reprinted by Arihant/other Indian publishers in later years).
3. R.T. Smith & R.B. Minton — *Calculus*, McGraw-Hill Education, 4th Edition, 2012.

SKILL ENHANCEMENT COURSES

SEMESTER VI

(A) NUMBERTHEORY

Theory: 2 hours per week

SEC-IV

Objectives: To introduce the fundamental concepts of congruences, integer representations, and number-theoretic functions.To develop an understanding of divisor functions, Möbius inversion, and greatest integer functions.To explore Euler's generalization of Fermat's theorem and the properties of Euler's phi function.To provide students with problem-solving skills in classical number theory and its applications.

Outcomes: Understand and apply basic properties of congruences, binary/decimal representations, and number-theoretic functions.Compute and analyze divisor functions, use the Möbius inversion formula, and evaluate greatest integer functions.Apply Euler's phi function and Euler's theorem to solve problems in number theory.Demonstrate logical reasoning and analytical skills through problem solving in elementary number theory.

UNIT-I

The Goldbach Conjecture−Basic Properties of Congruences−Binary and Decimal Representation of Integers−Number Theoretic Functions−The Sum and Number of Divisors−The Mobius Inversion Formula−The Greatest Integer Function.

UNIT-II

Euler's Generalization of Fermat's Theorem: Euler's Phi Function−Euler's Theorem−Some Properties of the Euler's Phi Function.

TEXTBOOK:

1. David M. Burton — *Elementary Number Theory*, McGraw-Hill, 7th Edition, 2011.

REFERENCE BOOKS:

1. Thomas Koshy — *Elementary Number Theory with Applications*, Academic Press (Elsevier), 2nd Edition, 2007.
2. Kenneth H. Rosen — *Elementary Number Theory and Its Applications*, Addison-Wesley, 6th Edition, 2010.

SKILL ENHANCEMENT COURSES

SEMESTER VI

(B) VERBAL REASONING

Theory:2 hours per week

SEC-IV

UNIT I

Numbers And Diagrams:
Series Completion: Number Series, Alphabet series.
Series Completion: Alpha Numeric Series, Continuous Pattern Series.
Logical Venn Diagrams.
Mathematical Operations: Problem Solving by Substitution, Interchange of Signs and Numbers.

[**Text Book:** Sec. I: 1, 9, 13 (type 1and2)]

UNIT II:

Arithmetical Reasoning:
Mathematical Operations: Deriving the Appropriate Conclusions.
Arithmetical Reasoning: Calculation Based Problems, Data Base Problems.
Arithmetical Reasoning: Problems onAges, Venn Diagram-BasedProblems.
Cause and Effect Reasoning.

[**Text Book:** Sec. I: 13 (type 3), 15]

TEXT BOOK: A Modern Approach to Verbal and Non-Verbal Reasoning by Dr. R. S. Aggarwal.

SKILL ENHANCEMENT COURSES

SEMESTER VI

(C) QUANTITATIVE APTITUDE

Theory: 2 hours per week

SEC-IV

UNIT I

Arithmetical Ability:

Arithmetical Ability: Ratio and Proportion.
Arithmetical Ability: Time and Work, Time and Distance.
Arithmetical Ability: Simple Interest, Compound Interest.
Arithmetical Ability: Socks and Shares.

[**TextBook**–Sec. I: 13, 17, 18, 22, 23, 29]

UNIT II

Data Interpretation:

Data Interpretation: Tabulation.
Data Interpretation: Bar Graphs.
Data Interpretation: Pie Charts.
Data Interpretation: Line Graphs.

[**TextBook**–Sec. II: 36, 37, 38, 39]

TEXT BOOK: Quantitative Aptitude by Dr. R. S. Agarwal.

MODEL PAPER

FACULTY OF SCIENCE
B.Sc. (CBCS) Theory Examination
Semester– I, II, III, IV, V, VI
Subject: Mathematics

Time: 3Hrs. **Max. Marks: 80**

PART – A (Short Answer Type)

NOTE: Answer any eight (8) Questions **(8 x 4 = 32 Marks)**

1. Question from Unit – I
2. Question from Unit – I
3. Question from Unit –I
4. Question from Unit – II
5. Question from Unit – II
6. Question from Unit – II
7. Question from Unit – III
8. Question from Unit – III
9. Question from Unit – III
10. Question from Unit – IV
11. Question from Unit – IV
12. Question from Unit – IV

PART – B (Eassy Answer Type)

NOTE: Answer all questions **(4 x 12 = 48 Marks)**

13. (a) Question from Unit - I
(OR)
(b) Question from Unit - I

14. (a) Question from Unit - II
(OR)
(b) Question from Unit - II

15. (a) Question from Unit - III
(OR)
(b) Question from Unit - III

16. (a) Question from Unit – IV
(OR)
(b) Question from Unit – IV

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MODEL PAPER

FACULTY OF SCIENCE
B.Sc. (CBCS) I –Internal Assessment
Semester – I, II, III, IV, V, VI
Subject: Mathematics

Time: 1 Hrs. **Max. Marks: 10**

PART – A

Multiple Choice Questions **(10 Q x $\frac{1}{2}$ = 5 Marks)**

Question No. 1 to 10

PART – B

Fill in the blank Questions **(10 Q x $\frac{1}{2}$ = 5 Marks)**

Question No. 11 to 20

NOTE: AFTER COMPLETION OF TWO UNITS SYLLABUS OUT OF FOUR UNITS

MODEL PAPER

FACULTY OF SCIENCE
B.Sc. (CBCS) II –Internal Assessment
Semester – I, II, III, IV, V, VI
Subject: Mathematics

Time: 1 Hrs. **Max. Marks: 10**

PART – A

Multiple Choice Questions **(10 Q x $\frac{1}{2}$ = 5 Marks)**

Question No. 1 to 10

PART – B

Fill in the blank Questions **(10 Q x $\frac{1}{2}$ = 5 Marks)**

Question No. 11 to 20

NOTE: AFTER COMPLETION OF REMAINING TWO UNITS SYLLABUS

NOTE: TOTAL 20 MARKS FOR INTERNAL ASSESSMENT. TWO INTERNAL ASSESSMENTS FOR EACH SEMESTER AND 10 MARKS FOR EACH INTERNAL ASSESSMENT.