	Course Title	Course Code	Credits	Hrs/Wk
I	ESSENTIALS ANDAPPLICATIONS OFMATHEMATICAL, PHYSICALANDCHEMICALSCIENCES	BSCM24101	4	5

Course Objective:

The objective of this course is to provide students with a comprehensive understanding of the essential concepts and applications of mathematical, physical, and chemical sciences. The course aims to develop students' critical thinking, problem-solving, and analytical skills in These areas enabling them to apply scientific principles to real-world situations.

Learning outcomes:

At the end of the course student is able to

1. Apply critical thinking skills to solve complex problems involving complex numbers, trigonometric ratios, vectors, and statistical measures.
2. Recall the basic principles and concepts underlying abroad range of fundamental areas of physics and to Connect their knowledge of physics to ever day situations
3. Recall the basic principles and concepts underlying abroad range of fundamental areas of chemistry and to Connect their knowledge of chemistry to daily life.
4. Explain the interplay and connections between mathematics, physics, and chemistry in various applications.
5. Interpret the mathematical models and physical and chemical principles to explain and predict phenomena in different contexts.
6. Describe the history and evolution of the Internet and to gain an understanding of network security concepts, including threats, vulnerabilities, and countermeasures.

UNITI:ESSENTIALS OF MATHEMATICS: 9hrs

Complex Numbers: Introduction of the new symbol i – General form of a complex number –Modulus-Amplitude form and conversions
Trigonometric Ratios: Trigonometric Ratios and their relations – Problems on calculation of angles Vectors: Definition of vector addition –Cartesian form–Scalar and vector product and problems Statistical Measures: Mean, Median, Mode of a data and problems.

UNITII:ESSENTIALS OF PHYSICS: 9hrs

Definition and Scope of Physics- Measurements and Units - Motion of objects: Newtonian Mechanics and relativistic mechanics perspective - Laws of Thermodynamics and Significance- Acoustic waves and electromagnetic waves- Electric and Magnetic fields and their interactions- Behaviour of atomic and nuclear particles- Wave-particle duality, the uncertainty principle- Theories and understanding of universe

UNITIII:ESSENTIALS OFCHEMISTRY: 9hrs

Definition and Scope of Chemistry- Importance of Chemistry in daily life -Branches ofchemistryandsignificance-PeriodicTable-
ElectronicConfiguration,chemicalchanges,classificationofmatter,Biomolecules- carbohydrates, proteins, fats and vitamins.

UNITIV:APPLICATIONS OF MATHEMATICS,PHYSICS& CHEMISTRY:9hrs

Applications of Mathematics in Physics & Chemistry: Calculus, Differential Equations &Complex Analysis

Application of Physics in Industry and Technology: Electronics and Semiconductor Industry,RoboticsandAutomation,AutomotiveandAerospaceIndustries,QualityControland Instrumentation, Environmental Monitoring and Sustainable Technologies.

ApplicationofChemistryinIndustryandTechnology:ChemicalManufacturing,Pharmaceuticalsand DrugDiscovery, Materials Science, Food and Beverage Industry.

UNITV:ESSENTIALS OF COMPUTER SCIENCE:

Milestonesofcomputerevolution-

Internet,history,InternetServiceProviders,TypesofNetworks,IP, Domain Name Services, applications.

Ethical and social implications: Network and security concepts- Information Assurance Fundamentals, Cryptography-Symmetric and Asymmetric, Malware, Firewalls, Fraud Techniques-Privacy and Data Protection

Recommended books:

1. Functions of one complex variable by John. B. Conway, Springer- Verlag.
2. Elementary Trigonometry by H.S.Hall and S.R.Knight
3. Vector Algebra by A.R.Vasishtha ,Krishna Prakashan Media(P)Ltd
4.Basic Statistics by B.L.Agarwal, Newage international Publishers
5. University Physics with Modern Physics by Hugh D.Young and Roger A. Freedman
6. Fundamentals of Physics by David Halliday, Robert Resnick, and JearlWalker
7. Physics for Scientists and Engineers with Modern Physics by Raymond A.Serway and John **W.JewettJr.**
8. Physics for Technology and Engineering" by John Bird
9. Chemistry in daily life by Kirpal Singh
10. Chemistry of bio molecules by S. P. Bhutan
11. Fundamentals of Computers by V. Raja Raman
12. Cyber Security Essentials by James Graham, Richard Howard, Ryan Olson

SEM	Course Title	Course Code	Credits	Hrs/Wk
I	ADVANCES IN MATHEMATICAL,PHYSICAL AND CHEMICALSCIENCES	BSCM24102	4	5

Course Objective:

The objective of this course is to provide students with an in-depth understanding of the recent advances and cutting-edge research in mathematical, physical, and chemical sciences. The course aims to broaden students 'knowledge beyond the foundational concepts and expose them to the latest developments in these disciplines, fostering critical thinking, research skills, and the ability to contribute to scientific advancements.

Learning outcomes:

At the end of the course students will be able to

1. Apply of mathematics in various fields of physics and chemistry
2. Explain the basic principles and concepts under lying abroad range of fundamental areas of physics and to connect their knowledge of physics to everyday situations.
3. Use the different sources of renewable energy and their generation processes and advances in nano -materials and their properties, with a focus on quantum dots.
4. Apply the knowledge in the emerging field of quantum communication and its potential applications.
5. Practice non –pollutant methods to save the ecosystem and human health.
6. Apply mathematical models ,physical and chemical principles in different contexts.

UNITI:ADVANCES IN BASICSMATHEMATICS9hrs

Straight Lines: Different forms – Reduction of general equation into various forms –Point of inter section of two straight lines

Limits and Differentiation: Standard limits – Derivative of a function –Problems on product rule and quotient rule

Integration: Integration as a reverse process of differentiation – Basic methods of integration
Matrices: Types of matrices – Scalar multiple of a matrix – Multiplication of matrices – Transpose of a matrix and determinants

UNITII:ADVANCES IN PHYSICS:9hrs

Renewable energy: Generation, energy storage, and energy-efficient materials and devices.
Recent advances in the field of nanotechnology: Quantum dots, Quantum Communication- recent advances in biophysics- recent advances in medical physics-Shape Memory Materials.

UNITIII:ADVANCES INCHEMISTRY:9hrs

Computer aided drudge sign and delivery ,Nano –sensors ,Chemical Biology, impact of chemical pollutants one co systems and human health, Dye removal-Catalysis method

SEM	Course Title	Course Code	Credits	Hrs/Wk
I	ANALYTICAL SKILLS(AS)	AS24102SC	2	2

ANALYTICAL SKILLS

Course Outcomes :

1.Understand the basic concepts of arithmetic ability, quantitative ability, logical reasoning, business computations and data interpretation and obtain the associated skills.

2. Acquire competency in the use of verbal reasoning.

3.Apply the skills and competencies acquired in the related areas.

4.Solve problems pertaining to quantitative ability, logical reasoning and verbal ability inside and outside the campus.

UNIT– 1 **(10Hrs)**

Arithmetic ability:

Algebraic operations BODMAS, Fractions, Divisibility rules, LCM&GCD(HCF).

Verbal Reasoning:

Number Series, Coding & Decoding, Blood relationship, Clocks, Calendars.

UNIT– 2: **(10Hrs)**

Quantitative aptitude:

Averages, Ratio and proportion, Problems on ages, Time-distance–speed.

Business computations:

Percentages, Profit & loss, Partnership, simple compound interest.

UNIT– 3: **(07Hrs)**

Data Interpretation:

Tabulation, Bar Graphs, Pie Charts, line Graphs, Venn diagrams.

Recommended Co-Curricular Activities (03 Hrs)

Surprise tests / Viva-Voice/ Problem solving/Group discussion.

Text Book:

Quantitative Aptitude for Competitive Examination by R.S. Agrawal , S.Chand Publications.

Reference Books:

1. Analytical skills by Showick Thorpe, published by SChand And Company Limited, Ram nagar, NewDelhi-110055.
2. Quantitative Aptitude and Reasoning by R V Praveen, PHI publishers.
3. QuantitativeAptitudeforCompetitiveExaminationbyAbhijitGuha,TataMcGrawHillPublication

SEM	Course Title	Course Code	Credits	Hrs/Wk
II	Differential Equations (Common to Major and Minor)	MAT24201 & M-MAT24201	4	5

Course objectives:

Differential Equations are important for many physical systems ,one can subject to suitable idealization , formulate a differential equations that describe show the system changes in time ,understanding the solutions of differential equation is then of paramountinte rest.

Course outcomes:

After successful completion of this course , the student will be able to;

CO 1. Solve first order first degree linear differential equations.
CO2.Convert a non-exact homogeneous equation to exact differential equation by using an integrating factor
CO3.knowthemethodsoffindingsolution of a differential equation of first order but not of first degree
CO4.solve higher-order linear differential equations for both homogeneous and non-homogeneous ,with constant coefficients.
CO5.understand and apply the appropriate methods for solving higher Order differential equations

UNIT–I-Differential Equations of first order and first degree:

Linear Differential Equations ;Differential Equations Reducible to Linear Form ;Exact Differential Equations; Integrating Factors, Equations Reducible To Exact Equations by Integrating Factors:

***UNIT– II-* Orthogonal Trajectories.**

Cartesian co-ordinates ,self-orthogonal Family of curves. Orthogonal trajectories :polar co-ordinates.

Differential Equations of first order but not of the first degree:

Equations solvable for *p* solvable for Y ,solvable for x ; Clairaut's Equation.

UNIT– III-, Higher order linear differential equations-I:

Solution of homogeneous linear differential equations of order n with constant coefficients; Solution of the non- homogeneous linear differential equations with constant coefficients by means of polynomial operators.

General Solution of f(D)y=0

General Solution of f(D)y=Q when Q is a function of x.

P.I. of f(D)y=Q when Q=be^{ax}

P.I. of f(D)y= Q when Q is $bsinax$ or $bcosax$.

UNIT–IV-Higher order linear differential equations-II:

Solution of the non-homogeneous linear differential equations with constant coefficients .P.I. of f(D)y= Q when Q=bx^k

P.I. of f(D)y=Q when Q=$e^{ax}v(x)$ P.I. of f(D)y=Q when Q=$x\,V(x)$

P.I. of f(D)y=Q when Q=$x^m v(x)$

UNIT–V-Higher order linear differential equations-III:

Method of variation of parameters (without non constant coefficient equations) ; The Cauchy-Euler Equation; Legender's Equations.

Prescribed Text Book:

1.Atextbook of mathematics for BA/BScVol1 byN.Krishna Murthy&others, published byS. Chand & Company, NewDelhi.

Reference Books:

1. Differential Equations and Their Applications by Zafar Ahsan, published by Prentice-Hall of India Learning Pvt.Ltd. New Delhi-Second edition.

2. OrdinaryandPartialDifferentialEquationsRaisinghania,publishedbyS. Chand & Company ,New Delhi.

3. Differential Equations with applications and programs – S. Balachandra Rao & HR Anuradha-universitiespress.

4. Telugu Academy Text Book for Differential Equations.

5. I-B.Sc A textbook of a Mathematics Deepthi Publications.

SEM	CourseTitle	CourseCode	Credits	Hrs/Wk
II	ANALYTICALSOLIDGEOMETRY	MAT24202	4	5

COURSE OUT COMES

After successful completion of this course, the student will be able to

CO1.understand planes and system of planes.
CO2.know the detailed idea of lines.
CO3.understand spheres and their properties.
CO4.know system of spheres and coaxial system of spheres.
CO5.underst and various types of cones.

Unit–I:ThePlane

Equation of plane in terms of its intercepts on the axis - Equations of the plane through the given points - Length of the perpendicular from a given point to a given plane - Bisectors of angles between planes -Combined equation of two planes-Orthogonal projection on a plane.

Unit–II: The Line

Equation of a line - Angle between a line and a plane - The condition that a given line may lie in a given plane - The condition that two given lines are coplanar - Number of arbitrary constants in the equations of straight line - Sets of conditions which determine a line - The shortest distance between two lines - The length and equations of the line of shortest distance between two straight lines-Length of the perpendicular from a given point to a given line.

Unit–III :The Sphere

Definition and equation of the sphere - Equation of the sphere through four given points – Plane sections of a sphere - Intersection of two spheres - Equation of a circle - Sphere through a given circle - Intersection of a sphere and a line - Power of a point - Tangent plane - Plane of contact; Polar plane-Pole of a Plane -Conjugate points-Conjugate planes.

Unit–IV:Spheres (continued)

Angle of intersection of two spheres - Conditions for two spheres to be orthogonal – Radical plane; Coaxial system of spheres Limiting Points -Simplified from of the equation of two spheres.

Unit–V:Cones

Definitions of a cone – vertex, guiding curve and generators - Equation of the cone with a given vertex and guiding curve - Equations of cones with vertex at origin are homogenous – Condition that the general equation of the second degree should represent a cone - Enveloping cone of a sphere - Right circular cone - Equation of the right circular cone with a given vertex, axis and angle.

Additional Inputs : Reciprocal cones

SEM	CourseTitle	Course Code	Credits	Hrs/Wk
III	GroupTheory	MAT23301	5	6

Course Outcomes:

After successful completion of this course, the student twill be able to;

CO1.Acquirethebasicknowledgeandstructureofgroups.
CO 2. Get the significance of the notation ofa subgroupandcosets.
CO3.Understandtheconceptofnormalsubgroupsandpropertiesofnormalsubgroup.
CO4.Studythehomomorphismsandisomorphismswithapplications.
CO5.Understandthepropertiesofpermutationandcyclicgroups.

ABSTRACTALGEBRA

UNITI:GROUPS :

Binary Operation – Algebraic structure – semi group-monoid – Group definition And elementary properties Finite and Infinite groups – examples – order of a group, Composition tables with examples.

UNITII:SUBGROUPS:

Complex Definition – Multiplication of two complexes Inverse of a complex-Subgroup definition-examples-criterion for a complex to be a subgroups; Criterion for the product of two subgroups to be a subgroup-union and Intersection of subgroups. Coset Definition– properties of Cosets– Index of a subgroups of a finite groups–Lagrange's Theorem

UNITIII:NORMALSUBGROUPS:

Normal Subgroups: Definition of normal subgroup– proper and improper normal subgroup– Hamilton group- Criterion for a subgroup to be a normal subgroup – intersection of two normal subgroups Subgroup of index 2 is a normal subgroup.

UNIT IV: HOMOMORPHISM:

Quotient groups, Definition of homomorphism – Image of homomorphism elementary properties of homomorphism–Isomorphism–automorphism definitions and elementary properties –kernel of a homomorphism –fundamental theorem on Homomorphism and applications.

UNITV: PERMUTATIONSANDCYCLICGROUPS:

Definition of permutation–permutation multiplication –Inverse of a permutation–cyclic permutations–transposition–even and odd permutations– Cayley's theorem.
Cyclic Groups-Definition of cyclic group–elementary properties–classification of cyclic groups.

SEM	Course Title	Course Code	Credits	Hrs/Wk
II B.ScMajor (III Sem)	**Numerical Methods**	MAT23302	5	6

Course Outcomes:

After successful completion of this course, the student twill be able to;

CO1. Difference between the operators ,Δ,∇,E and the relation between them.
CO 2. Know about the Newton – Gregory Forward and back ward interpolation.
CO3.Know the Central Difference operators,δ,μ,σ and relation between them.
CO4.Solve Algebraic and Transcendental equations.
CO5.Understand the concept of Curve fitting

Unit–1: **The calculus of finite differences**

The operators,Δ, ∇, E - Fundamental theorem of difference calculus- properties of, Δ, ∇, E andproblemsonthemtoexpressanyvalueofthefunctionintermsoftheleadingtermsandtheleadingdifferences-relationsbetweenEand D-relation between D and Δ-problems on one or more missing terms- Factorial notation- problems on separation of symbols- problems on Factorial notation

Unit–2: Interpolation with Equal and Unequal intervals

Derivations of Newton – Gregory Forward and backward interpolation and problems on them. Divided differences - Newton divided difference formula - Lagrange's and problems on them.

Unit–3:Central Difference Interpolation formulae

Central Difference operators, δ, μ, σ and relation between them - Gauss forward formula for equal intervals - Gauss Backward formula - Stirlings formula - Bessel's formula and problems on the above formulae.

Unit–4:Solution of Algebraic and Transcendental equation

Method for finding initial approximate value of the root - Bisection method - to find the solution of given equations by using (i) Regula Falsi method (ii) Iteration method (iii) Newton – Raphson's method and problems on them.

Unit–5:Curve Fitting

Least-squares curve fitting procedures-fitting a straight line-nonlinear curve fitting-curve fitting by a sum of exponentials.

SEM	Course Title	Course Code	Credits	Hrs/Wk
IIB.Sc.Major(IIISem)	**Laplace Transforms**	**MAT23303**	**5**	**6**

Course out comes :

CO1.Underst and the definition and properties of Laplace transformations
CO 2. Get an idea about first and second shifting theorems and change of scale property.
CO3.Underst and Laplace transforms of standard functions like Bessel, Error function etc.
CO 4. Know the reverse transformation of Laplace and properties.
CO5.Get the knowledge of application of convolution theorem

UNITI : **LAPLACETRANSFORMS– I**

Definition of Laplace Transform –Linearity Property-Piece wise Continuous Function-Existence of Laplace Transform- Functions of Exponential order and of Class A.

UNITII: LAPLACETRANSFORMS–II

First Shifting Theorem, Second Shifting Theorem, Change of Scale Property, Laplace transform of the derivative of f(t),Initial value theorem and Final value theorem.

UNIT III: LAPLACETRNASFORM–III

Laplace Transform of Integrals - Multiplication by t, Multiplication by tn - division by t – Laplace transform of Bessel Function - Laplace Transform of Error Function – Laplace transform of Sine and Cosine integrals.

UNITIV: INVERSELAPLACETRANSFORMS– I

Definition of Inverse Laplace Transform - Linearity Property - First Shifting Theorem – Second Shifting Theorem-Change of Scale property-use of partial fractions-Examples.

UNITV : INVERSELAPLACETRANSFORMS–II

Inverse Laplace transforms of Derivatives - Inverse Laplace Transforms of Integrals – Multiplication by Powers of 'p' - Division by powers of 'p' - Convolution Definition - Convolution Theorem – proof and Applications -Heaviside's Expansion theorem and its Applications

SEM	Course Title	Course Code	Credits	Hrs/Wk
IIB.Sc. Major (IIISem)	SPECIALFUNCTIONS	MAT233304	5	6

COURSE OUT COMES :

CO 1. Understand the Beta and Gamma functions, their properties and relation between these two functions, understand the orthogonal properties of Chebyshev polynomials and recurrence relations.

CO 2. Find power series solutions of ordinary differential equations.

CO 3. Solve Hermite equation and write the Hermite Polynomial of order (degree) n, also Find the generating function for Hermite Polynomials, study the orthogonal properties of Hermite Polynomials and recurrence relations.

CO 4. Solve Legendre equation and write the Legendre equation of first kind, also find the generating function for Legendre Polynomials, understand the orthogonal properties of Legendre Polynomials.

CO 5. Solve Bessel equation and write the Bessel equation of first kind of order n, also find the generating functio for Bessel function understand the orthogonal properties of Bessel unction.

UNITI: Beta and Gamma functions

Chebyshev polynomials Euler's Integrals-Beta and Gamma Functions, Elementary properties of Gamma Functions, Transformation of Gamma Functions.**Another** form of Beta Function ,Relation between Beta and Gamma Functions.Chebyshev polynomials ,**orthogonal** l properties of Chebyshev polynomials ,recurrence relations ,generating functions for Chebyshev polynomials.

UNITII: Power series and Power series solutions of ordinary differential equations.

Introduction, summary of useful results, power series, radius of convergence, theorems on Power series Introduction of power series solutions of ordinary differential equation Ordinary and singular points ,regular and Irregular singular points ,power series solution

UNITIII: Hermite polynomials

Hermite Differential Equations, Solution of Hermite Equation, Hermite polynomials, generating function for Hermite polynomials. Other forms for Hermite Polynomials, Rodrigues formula for Hermite Polynomials, to find first few Hermite Polynomials. Orthogonal properties of Hermite Polynomials,RecurrenceformulaeforHermitePolynomials

UNITIV:Legendrepolynomials

Definition,SolutionofLegendre'sequation,Legendrepolynomialofdegreen,generatingfunctionofLegendrepolynomials.,Definitionof$P_n(x)$and$Q_n(x)$,GeneralsolutionofLegendre'sEquation(derivationsnotrequired to showthat $P_n(x)$isthe coefficientofh^n,intheexpansionof$(1-2xh+h^2)^{-1/2}$ OrthogonalpropertiesofLegendre'spolynomials,RecurrenceformulasforLegendre'sPolynomials

UNITV:

Bessel's equation

Definition,SolutionofBessel'sequation,Bessel'sfunctionofthefirstkindofordern,Bessel'sfunctionofthese condkindofordern.

Integration of Bessel's equation in series form=0, Definition of $J_n(x)$,recurrence formulae for $J_n(x)$.

3.Generating function for $J_n(x)$, orthogonally of Bessel functions.

Co-CurricularActivities

Seminar/Quiz/Assignments/Applications of Functions of complex variables to Real life Problem /Problem Solving Sessions.

TEXT BOOKS:

Theory of Functions of a Complex variable by Shanti Narayan & Dr.P.K.Mittal, S.Chand & Company Ltd.

REFERENCEBOOKS:

1. Theory of Functions of a Complex Variable by A. I. Markushevich,SecondEdition,AMS Chelsea Publishing

2. Theory And Applications by M.S.Kasara,Complex Variables,2nd Edition,Prentice HallIndia Learning Private Limi

SEM	Course Title	Course Code	Credits	Hrs/Wk
II B.Sc. Major & Minor(IV Sem)	Ring Theory	MAT23401 M- MAT23401	5	6

CO 1. Acquire the basic knowledge of rings, fields and integral domains.
CO2.Get the knowledge of subrings and ideals.
CO3.Construct composition tables for finite quotient rings.
CO4.Study the homomorphisms and isomorphisms with applications.
CO5.Get the idea of division algorithm of polynomials over a field.

Unit–1RingsandFields

Definition of a ring and Examples –Basic properties – Boolean rings - Fields – Divisors of 0 and Cancellation Laws–Integral Domains–Division ring-The Characteristic of a Ring, Integral domain and Field.

Unit-2 Sub rings and Ideals

Definition and examples of Sub rings – Necessary and sufficient conditions for a subset to be a sub ring–Algebra of Sub rings– Centre of a ring –left,right and two sided ideals–Algebra of ideals

UnitIII:Principal ideals and Quotient rings

Definition of a Principal ideal ring(Domain) – Every field is a PID – The ring of integers is a PID – Exampleofa ringwhich is not a PIR–Cosets –Algebra ofcosets–Quotientrings.

Unit–4Homomorphism of Rings

Homomorphism of Rings – Definition and Elementary properties – Kernel of a homomorphism – Isomorphism – Fundamental theorems of homomorphism of rings – Maximal and prime Ideals – PrimeFields.

Unit–5 Rings of Polynomials

Polynomials in anin determinate–The Evaluation morphism –The Division Algorithmin $F[x]$–Irreducible Polynomials–Ideal Structure in $F[x]$–Uniqueness of Factorization$F[x]$.

Seminar/ Quiz/ Assignments/ Applications of ring theory concepts to Real life Problem /ProblemSolvingSessions.

Textbook

ModernAlgebrabyA.R.VasishtaandA.K.Vasishta, KrishnaPrakashanMediaPvt. Ltd.

Referencebooks

1. A First Course in Abstrac tAlgebra by John. B.Farleigh, Narosa PublishingHouse.
2. LinearAlgebrabyStephen.H.FriedbergandOthers,PearsonEducationIndia

SEM	Course Title	Course Code	Credits	Hrs/Wk
IV	REALANALYSIS	MAT204301	5	6

CourseOutcomes:

After successful completion of this course ,the student will be able to

1. Get clear idea about the real numbers and real valued functions.
2. Obtain the skills of analyzing the concepts and applying appropriate methods for testing convergence of a sequence/ series.
3. Test the continuity and differentiability and Riemann integration of a function.
4. Know the geometrical inter pretation of mean value theorems.

REALANALYSIS

UNIT – I(12 Hours)

Introduction of Real Numbers(No question is to be set from this portion)

Real Sequences:

Sequences and their limits, Range and Boundedness of Sequences, Limit of a sequence and Convergent sequence. The Cauchy's criterion, properly divergent sequences, Monotone sequences ,Necessary and Sufficient condition for Convergence of Monotone Sequence, Limit Point of Sequence ,Subsequences ,Cauchy Sequences– Cauchy's general principle of convergence theorem.

UNIT –II (12 Hours)INFINITIESERIES

Series: Introduction to series, convergence of series. Cauchy's general principle of convergence for series tests for convergence of series, Series of Non-Negative Terms.

1. P-test
2. Cauchy's nth root test or Root Test.
3. D-Alembert's Test or Ratio Test.
4. Alternating Series – Leibnitz Test.

UNIT – III (12 Hours)CONTINUITY:

Limits: Real valued Functions, Boundedness of a function, Limits of functions. Some extensions of the limit concept, Infinite Limits .Limits at infinity.(No question is to be set from this portion).

Continuous functions: Continuous functions, Combinations of continuous functions, Continuous Functions on interval.

UNIT – IV(12 Hours)

Differentiation And Mean Value Theorems: The derivability of a function, on an interval, at a point, Derivability and continuity of a function, Graphical meaning of the Derivative ,Mean value Theorems; Rolle's Theorem ,Lagrange's Theorem ,Cauchy's Mean value Theorem

UNIT – V (12 Hours)RIEMANNINTEGRATION:

Riemann Integral, Riemann integral functions, Darboux theorem. Necessary and sufficient condition for R – integrability, Properties of integrable functions, Fundamental theorem of integral calculus ,First mean value Theorem.

Additional Inputs: Meclaurins expansions of Sin x, Cos x and e^x.

- No question to be set from additional inputs.

Co-Curricular Activities(15Hours)

Seminar/Quiz/Assignments/Real Analysis and its applications/Problem Solving.

Text Book :

Introduction to Real Analysis by Robert G.Bartle and Donlad R.Sherbert, published by John Wiley.

Reference Books:

1.A Text Book of B.Sc Mathematics by B.V.S.S. Sarma and others, published by S. Chand &Company Pvt.Ltd., New Delhi.

2.Elements of Real Analysis as per UGC Syllabus by Shanthi Narayanand Dr.M.D.Raisinghania, published by S.Chand &Company Pvt .Ltd., New

SEM	Course Title	Course Code	Credits	Hrs/Wk
IV	Integral transforms with applications	MATBS506D	5	6

I. Learning Outcomes: Students after successful completion of the course will be able to

1. Evaluate Laplace transforms of certain functions, find Laplace transforms of derivatives and of integrals.
2. Determine properties of Laplace transform which may be solved by application of special functions namely Dirac delta function, error function, Bessel function and periodic function.
3. Understand properties of inverse Laplace transforms, find inverse Laplace transforms of derivatives and of integrals.
4. Solve ordinary differential equations with constant/ variable coefficients by using Laplace transform method.
5. Comprehend the properties of Fourier transforms and solve problems related to finite Fourier transforms.

II. Syllabus :(Hours: Teaching: 75 (incl. unit tests etc.05), Training: 15)

Unit – 1: Laplace transforms- I (15h)

1. Definition of Laplace transform, linearity property-piecewise continuous function. 2. Existence of Laplace transform, functions of exponential order and of class A. 3. First shifting theorem, second shifting theorem and change of scale property.

Unit – 2: Laplace transforms- II (15h)

1. Laplace Transform of the derivatives, initial value theorem and final value theorem. Laplace transforms of integrals. 2. Laplace transform of $t^n f(t)$, division by t, evolution of integrals by Laplace transforms. 3. Laplace transform of some special functions- namely Dirac delta function, error function, Bessel function and Laplace transform of periodic function.

Unit – 3: Inverse Laplace transforms (15h)

1. Definition of Inverse Laplace transform, linear property, first shifting theorem, second shifting theorem, change of scale property, use of partial fractions. 2. Inverse Laplace transforms of derivatives, inverse, Laplace transforms of integrals, multiplication by powers of 'p', division by 'p'. 3. Convolution, convolution theorem proof and applications.

Unit – 4: Applications of Laplace transforms (15h)

1. Solutions of differential equations with constants coefficients, solutions of differential equations with variable coefficients. 2. Applications of Laplace transforms to integral equations- Abel's integral equation. 3. Converting the differential equations into integral equations, converting the integral equations into differential equations.

Unit – 5: Fourier transforms (15h)

1. Integral transforms, Fourier integral theorem (without proof), Fourier sine and cosine integrals. 2. Properties of Fourier transforms, change of scale property, shifting property, modulation theorem. Convolution. 3. Convolution theorem for Fourier transform, Parseval's Identify, finite Fourier transforms.

SEM	Course Title	Course Code	Credits	Hrs/Wk
V	Numerical Methods	MAT225301-6A	5	6

Learning Outcomes:

Students after successful completion of the course will be able to

1. Understand various numerical methods that are used to obtain approximate solutions
2. Under stand various finite difference operators and interpolation methods.
3. Workoutnumericaldifferentiationandintegrationwheneverandwhereveranalyticalmethods are not applicable.
4. Find numerical solutionsofordinarydifferentialequationsbyusingvariousnumericalmethods.
5. Analyze and evaluate the accuracy of numerical methods.

Syllabus :(Hours: Teaching: 75 (incl. unit tests etc. 05), Training: 15)Unit–1:FiniteDifferences and Interpolation with Equal intervals(15h)

Introduction, Forward differences, Backward differences, Central Differences, Symbolic relations, n^{th} Differences of Some functions, 2. Advancing Difference formula, Differences of Factorial Polynomial, Summation of Series. 3. Newton's formulae for interpolation. Central Difference Interpolation Formulae.

AdditionalInput: Errors, types of errors

Unit–2:InterpolationwithEqualandUnequalintervals(15h)

Gauss's Forward interpolation formulae, Gauss's backward interpolation formulae, Stirling'sformula,Bessel'sformula.2. Interpolation with unevenly spaced points ,divided differences and properties, Newton's divided differences formula. 3.Lagrange's interpolation formula,Lagrange's Inverse interpolation formula.

AdditionalInput: Piece-wiseInterpolation:Splineinterpolationintroduction

Unit–3:Numerical Differentiation (15h)

1.Derivatives using Newton's forward difference formula, Newton's back warddifferenceformula,2.Derivativesusing central difference formula, Stirling's interpolation formula, 3. Newton's divided difference formula, Maximum and minimum values of atabulated function.

Unit–4:NumericalIntegration (15h)

Generalquadratureformulaonerrors,Trapezoidalrule,2.Simpson's1/3–rule,Simpson's3/8–rule,andWeddle'srules,3.Euler–McLaurinFormulaofsummationand quadrature, The Euler transformation.

Additionalinput:**Gaussian quadrature**

Unit–5:Numerical solution of ordinary differential equations(15h)

Introduction,SolutionbyTaylor'sSeries,2.Picard'smethodofsuccessiveapproximations,3. Euler'smethod,ModifiedEuler'smethod,Runge – Kuttamethods.

AdditionalInputs: Predictor -CorrectorMethods

References:

1. S.S.Sastry,IntroductoryMethodsofNumericalAnalysis,PrenticeHallofIndiaPvt.Ltd.,New Delhi-110001, 2006.
2. P.Kandasamy,K.Thilagavathy,CalculusofFiniteDifferencesandNumericalAnalysis.S.Chand&Company, Pvt.Ltd., Ram Nagar,New Delhi-110055.
3. R.Gupta,NumericalAnalysis, Laxmi Publications(P)Ltd.,NewDelhi.
4. H.CSaxena,FiniteDifferencesandNumericalAnalysis,S.Chand&CompanyPvt.Ltd.,RamNagar, New Delhi-110055.
5. S.Ranganatham,Dr.M.V.S.S.N.Prasad,Dr.V.RameshBabu,NumericalAnalysis,S.Chand&Company Pvt.Ltd., Ram Nagar, New Delhi-110055.
6. Webresourcessuggested bytheteacherandcollegelibrarian includingreadingmaterial.7.Ccelms.ap.gov.in/

SEM	Course Title	Course Code	Credits	Hrs/Wk
V	Mathematical Special Functions	MAT225302-7A	5	6

Learning Outcomes:

Students after successful completion of the course will be able to:

1. Understand the Beta and Gamma functions, their properties and relation between these two functions, underst and the orthogonal properties of Chebyshev polynomials and recurrence relations.
2. Find power series solutions of ordinary differential equations.
3. solve Hermite equation and write the Hermite Polynomial of order (degree) n, also find thegeneratingfunctionforHermitePolynomials,studytheorthogonalpropertiesofHermitePolynomial sandrecurrencerelations.
4. Solve Legendre equation and write the Legendre equation of first kind, also find the generating function for Legendre Polynomials,understandtheorthogonalpropertiesofLegendrePolynomials.
5. Solve Bessel equation and write the Bessel equation of first kind of order n, also find the generating function for Bessel function underst and the orthogonal properties of Bessel function.

Syllabus: (Hours: Teaching: 75 (incl. unit tests etc. 05), Training: 15)Unit–1:Betaand Gamma functions, Chebyshev polynomials (15h)

1. Euler's Integrals-Beta and Gamma Functions, Elementary properties of Gamma Functions,Transformation of Gamma Functions. 2. Another form of Beta Function, Relation betweenBetaandGammaFunctions.3.Chebyshevpolynomials,orthogonalpropertiesofCheby shev polynomials of first kind, recurrence relations, generating functions for Chebyshev polynomials.

Unit – 2: Power series and Power series solutions of ordinary differential equations (15h) Introduction, summary of useful results, power series, radius of convergence ,theorems on Power series 2.Introduction of power series solutions of ordinary differential equation 3.Ordinary and singular points, regular and irregular singular points ,power series solution.

Unit–3:Hermite polynomials(15h)

Hermite Differential Equations, Solution of Hermite Equation, Hermite polynomials ,generating function for Hermite polynomials. 2. Other forms for Hermite Polynomials,Rodrigue's formula for Hermite Polynomials, to find first few Hermite Polynomials.3.OrthogonalpropertiesofHermitePolynomials,Recurrence formulae for Hermite Polynomials.

Unit–4:Legendrepolynomials(15h)

1.Definition,SolutionofLegendre'sequation,Legendrepolynomialofdegree$n$,generating function of Legendre polynomials. 2. Definition of $P_n(x)$ and $Q_n(x)$GeneralsolutionofLegendre'sEquation(derivationsnotrequired)toshowthat$P_n(x)$ist h coefficient of h^n,in the expansion of $(1-2xh-h^2)^{-\frac{1}{2}}$ 3.Orthogonalpropertiesof Legendre'spolynomials,RecurrenceformulasforLegendre'sPolynomials.

Unit–5:Bessel'sequation (15h)

1.Definition,Solution of Bessel's equation ,Bessel's function of the first kind of order n,Bessel's function of the second kind of order$n$.2.Integration of Bessel'sequationin Series form, Definition of $J_n(x)$,recurrence formulae for$J_n(x)$.3.Generating function for $J_n(x)$,orthogonality of Bessel functions.

ReferenceBooks:

1. Dr.M.D.Raisinghania,OrdinaryandPartialDifferentialEquations,S.Chand&CompanyPvt.Ltd.,Ram Nagar, New Delhi-110055.
2. J.N.SharmaandDr.R.K.Gupta,Differentialequationswithspecialfunctions,KrishnaPrakashanMandi r.
3. ShantiNarayanandDr.P.K.Mittal,IntegralCalculus,S.Chand&CompanyPvt.Ltd.,RamNagar, New Delhi-110055.
4. GeorgeF.Simmons,DifferentialEquationswithApplicationsandHistoricalNotes,TataMcGRAW-HillEdition, 1994.
5. ShepleyL.Ross, Differentialequations, SecondEdition,JohnWilly&sons, NewYork, 1974.
6. Webresourcessuggested bytheteacherandcollegelibrarian includingreadingmaterial.7.Ccelms.ap.gov.in/

I. Co-CurricularActivities:A)Mandatory:

1. **For Teacher**: Teacher shall train students in the following skills for 15 hours, by taking relevantoutside data (Field/Web). 1. Beta and Gamma functions, Chebyshev polynomials. 2. Power series,power series solutions of ordinary differentialequations, 3. Proceduresof finding series solutionsof Hermite equation, Legendre equation and Bessel equation. 4. Procedures of finding generatingfunctionsforHermitepolynomials,LegendrePolynomials andBessel'sfunction.
2. **ForStudent:**Fieldwork/Projectwork;EachstudentindividuallyshallundertakeFieldwork/Project work, make observations and conclusions and submit a report not exceeding 10pages in the given format on the work-done in the areas like the following, by choosing any one ofthe aspects. 1. Going through the web sources like Open Educational Resources on the properties ofBeta and Gamma functions, Chebyshev polynomials, power series solutions of ordinary differentialequations.(or)2.GoingthroughthewebsourceslikeOpenEducationalResourcesontheprop ertiesofseries solutionsof Hermiteequation, Legendreequation andBessel equation.
3. **Max.MarksforFieldwork/ProjectworkReport:** 05.
4. **Suggested Format for Fieldwork/Project work Report:** Title page, Student Details, Indexpage,Stepwise work-done, Findings, Conclusionsand Acknowledgements.
5. Unittests(IE).

B) Suggested Co-Curricular Activities: **1. Assignments/collection of data, Seminar, Quiz, Groupdiscussions/Debates 2. Visits to research organizations, Statistical Cells, Universities, ISI etc. 3.Invitedlecturesand presentationson related topicsbyexperts inthespecified area.**