	Course Title	Course Code	Credits	Hrs/Wk
I	ESSENTIALS ANDAPPLICATIONS OFMATHEMATICAL, PHYSICALANDCHEMICALSCIENCES		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. Applycriticalthinkingskillstosolvecomplexproblemsinvolvingcomplexnumbers,trigonometric ratios, vectors, and statistical measures.
2. Recallthebasicprinciplesandconceptsunderlyingabroadrangeoffundamentalareasofphysics and to Connect their knowledge of physics to everyday situations
3. Recallthebasicprinciplesandconceptsunderlyingabroadrangeoffundamentalareasofchemistryand to Connect their knowledge of chemistry to daily life.
4. Explaintheinterplayandconnectionsbetweenmathematics,physics,andchemistryinvariousapplications.
5. Interpret the mathematicalmodelsandphysicalandchemicalprinciplestoexplainandpredictphenomenain different contexts.
6. Describethehistoryandevolutionoftheinternetandtogainanunderstandingofnetworksecurityconcepts, including threats, vulner abilities,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:ESSENTIALSOFPHYSICS: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, fatsand vitamins.

UNITIV:APPLICATIONSOFMATHEMATICS,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,QualityControlandInstrumentation,EnvironmentalMonitoringand Sustainable Technologies.

ApplicationofChemistryinIndustryandTechnology:ChemicalManufacturing,Pharmaceuticalsa ndDrugDiscovery,MaterialsScience,FoodandBeverageIndustry.

UNITV:ESSENTIALSOFCOMPUTER 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. Functionsofonecomplexvariable byJohn.B.Conway,Springer- Verlag.
2. ElementaryTrigonometrybyH.S.Hall and S.R.Knight
3. VectorAlgebrabyA.R.Vasishtha,KrishnaPrakashanMedia(P)Ltd.
4.BasicStatisticsbyB.L.Agarwal,NewageinternationalPublishers
5. UniversityPhysics withModern PhysicsbyHugh D.YoungandRogerA. Freedman
6. Fundamentalsof PhysicsbyDavid Halliday,Robert Resnick,and JearlWalker
7. PhysicsforScientistsand EngineerswithModern Physics"byRaymond A.SerwayandJohn **W.JewettJr.**
8. PhysicsforTechnologyand Engineering"byJohn Bird
9. ChemistryindailylifebyKirpalSingh
10. Chemistryof bio molecules byS. P. Bhutan
11. Fundamentalsof Computers byV. Raja Raman
12. CyberSecurityEssentials byJamesGraham,RichardHoward, RyanOlson

STUDENTACTIVITIES

UNITI:ESSENTIALSOFMATHEMATICS:

1:Complex NumberExploration
Provide students with a set of complex numbers in both rectangular and polar forms.Theywillplot thecomplexnumberson thecomplexplaneandidentifytheirproperties 2:TrigonometricRatios Problem Solving
Give students a set of problems that require the calculation of trigonometric ratios and theirrelations.
Studentswill solvethe problemsusingtheappropriatetrigonometricfunctions (sine,cosine,tangent,etc.)and trigonometricidentities.
3:VectorOperationsand Applications
Providestudents withaset ofvectors inCartesianform.
Studentswillperformvectoradditionandsubtractionoperationstofindtheresultantvectors.The ywill also calculate thescalar and vector products ofgiven vectors.
4:StatisticalMeasuresandDataAnalysis
Givestudentsa datasetcontainingnumerical values.
Studentswillcalculatethemean,median,andmodeofthedata, as wellasotherstatisticalmeasuresifappropriate(e.g.,range,standard deviation).
Theywill interprettheresults andanalyzethecentraltendencies anddistributionofthe data.

UNITII:ESSENTIALSOFPHYSICS:

1. Concept Mapping: Divide students into groups and assign each group one of the topics.Studentswillcreateaconceptmapillustratingthe keyconcepts,relationships,andapplicationsrelatedto their assigned topic.
Encouragestudentstousevisualelements,arrows,andlabelstorepresentconnectionsa ndinterdependenciesbetween concepts.
2. LaboratoryExperiment
Select a laboratory experiment related to one of the topics, such as motion of objects or electricandmagneticfields.
Providethenecessarymaterials,instructions,andsafetyguidelinesforconductingtheexperiment.S tudents will work in small groups to carry out the experiment, collect data, and analyze the

SEM	Course Title	Course Code	Credits	Hrs/Wk
I	ADVANCES IN MATHEMATICAL,PHYSICAL AND CHEMICALSCIENCES	MATBS106-B	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 foundation alL 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. Explainthebasicprinciplesandconceptsunderlyingabroadrangeoffundamentalareasofphysics and to connect their knowledge of physics to every day 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. Applytheknowledgeintheemergingfieldofquantumcommunicationanditspotentialapplicat ions.
5. Practice non –pollutant methods to save the eco system and human health.
6. Applymathematicalmodels,physicalandchemicalprinciplesindifferentcontexts.

UNITI:ADVANCES IN BASICSMATHEMATICS9hrs

Straight Lines: Different forms – Reduction of general equation into various forms –Point of intersection 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:ADVANCESINPHYSICS: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 drugde sign and delivery , Nano -sensors, Chemical Biology, impact of chemical pollutants one co systems and human health, Dye removal-Catalysis method

UNITIV:ADVANCEDAPPLICATIONSOFMATHEMATICS,PHYSICS&CHEMISTRY

9hrs

MathematicalModelingapplicationsinphysicsandchemistryApplicationofRenewableenergy:GridInteg ration and Smart Grids ,Application of nano technology: Nano medicine,

Application of biophysics: Biophysical Imaging, Biomechanics, Neuro-physics,Applicationofmedicalphysics:RadiationTherapy,Nuclearmedicine

Solidwastemanagement,Environmentalremediation-GreenTechnology,Watertreatment.

UNITV:AdvancedApplicationsofcomputerScience9hrs

Number System-Binary, Octal, decimal, and Hexadecimal, Signals-Analog, Digital, Modem, Codec, Multiplexing, Transmission media, error detection and correction- Parity check and CRC , Networking devices- Repeater ,hub, bridge, switch ,router, gateway.

Recommended books:

1. CoordinateGeometrybyS.L.Lony,ArihantPublications
2. CalculusbyThomasandFinny,PearsonPublications
3. MatricesbyA.R.VasishthaandA.K.Vasishtha,KrishnaPrakashanMedia(P)Ltd.
4. "RenewableEnergy:PowerforaSustainableFuture"byGodfreyBoyle
5. "EnergyStorage:ANontechnicalGuide" byRichardBaxter
6. "Nanotechnology:PrinciplesandApplications"bySulabhaK.KulkarniandRaghvendraA.Bohar a
7. "Biophysics:AnIntroduction" byRodneyCotterill
8. "MedicalPhysics:Imaging"byJamesG.Webster
9. "ShapeMemoryAlloys:PropertiesandApplications" byDimitrisC.Lagoudas
10. NanomaterialsandapplicationsbyM.N.Borah
11. EnvironmentalChemistrybyAnil.K.D.E.
12. DigitalLogicDesign byMorrisMano
13. DataCommunication&NetworkingbyBahrouzForouzan.

STUDENTACTIVITIES

UNITI:ADVANCES IN BASICMATHEMATICS

1:StraightLinesExploration

Provide students with a set of equations representing straight lines in different forms, such as slope-interceptform, point-slope form, or generalform.

Students will explore the properties and characteristics of straight lines, including their slopes,intercepts,and point ofintersection.

2:LimitsandDifferentiationProblemSolving

Studentswillapplytheconceptoflimitstosolvevariousproblemsusing standardlimits.Encourage students to interpret the results and make connections to real-world applications, such asanalyzingratesofchange or optimizingfunctions.

3:IntegrationExploration

Analytical Skills syllabus, blue print and model paper:

SEM	Course Title	Course Code(LS)	Hrs/Sem	Credits	Hrs/Wk	Sem End Exam(2 Hrs)
I	ANALYTICAL SKILLS(AS)	Life skill course	30	2	2	40marks

ANALYTICALSKILLS

Course Objective:
Intended toinculcatequantitativeanalyticalskillsandreasoningasaninherentabilityin students.
Course Outcomes :After successful completion of this course, the student will be able to;

- Understandthebasicconceptsofarithmeticability,quantitativeability,logicalreasoning,business
  Computations and data interpretation and obtain the associated skills.
- Acquire competency in the use of verbal reasoning.
- Apply the skills and competencies aoquired in the related areas
- Solve problems pertaining to
  quantitativeability,logicalreasoningandverbalabilityinsideandoutsidethe campus.

UNIT – 1: (10Hrs)
Arithmetic ability: Algebraic operations BODMAS, Fractions, Divisibility rules, LCM &GCD(HCF).
VerbalReasoning: NumberSeries,Coding&Decoding,Bloodrelationship,Clocks,Calendars.

UNIT – 2: (10Hrs)
Quantitativeaptitude: Averages,Ratioandproportion,Problemsonages,Time-distance–speed.
Businesscomputations:Percentages,Profit&loss,Partnership,simplecompoundinterest.

UNIT – 3: (07Hrs)
Data Interpretation :Tabulation, Bar Graphs ,Pie Charts, line Graphs. Venn diagrams.

Recommended Co-Curricular Activities(03 H)
Surprise tests / Viva-Voice/ Problem solving/Group discussion.

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

ReferenceBooks:

1. Analytical skills by Showick Thorpe, published by S Chand And Company Limited, Ramnagar ,New Delhi-110055.
2. Quantitative Aptitude and Reasoning by R V Praveen, PHI publishers.
3. QuantitativeAptitudeforCompetitiveExaminationbyAbhijitGuha,TataMcGraw HillPublications

SEM	Course Title	Course Code	Credits	Hrs/Wk
II	Differential Equations(Common to Major and Minor)	MATBS206-A	4	5

Course objectives:

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

Course outcomes:

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

1.Solve linear differential equations

2.Convert non - exact homogeneous equations to exact differential equations by using integrating factors

3.Know the methods of finding solutions of differential equations of the first order but not of the first degree.

4.Understand the concept and apply appropriate methods for solving 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 exact equations by integrating factors:

1. Inspection Method 2. 1 / Mx + Ny 3. 1 / Mx - Ny

UNIT – II: Orthogonal Trajectory and Differential Equations of first order but not of the first degree

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

Equations solvable for p; Equations solvable for y, Equations solvable for x - Clairaut's Equation.

Orthogonal trajectories : Cartesian and polar co- ordinates.

UNIT – III: Higher order linear differential equations

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.

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

P.I. of $f(D)y = Q$ when Q is b sin ax or b cos ax.

UNIT – IV: Higher order linear differential equations (continued)

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 $Q = be^{ax} V$

P.I. of $f(D)y = Q$ when $Q = xV$

UNIT –V: Higher order linear differential equations with non-constant coefficients

Linear differential equations with non-constant coefficients : The Cauchy-Euler Equation

;Legender's Equations, Method of variation of parameters.

Activities

Seminar/ Quiz/ Assignments/ Applications of Differential Equations to Real life Problem /Problem Solving Sessions.

Text Book

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

Reference Books

1. Ordinary and Partial Differential Equations by Dr. M.D. Raisinghania, published by S. Chand &Company. New Delhi.

2. Differential Equations with applications and programs – S. Balachandra Rao & HR Anuradha-Universities Press.

SEM	Course Title	Course Code	Credits	Hrs/Wk
II	ANALYTICAL SOLID GEOMETRY		4	5

Course outcomes:

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

1. Describe the planes and their properties
2. Solve the shortest distance between the lines
3. Use the concepts of spheres in applications.
4. Solve the limiting points of a spheres
5. Define cone, enveloping cone, reciprocal cone and their properties.

Unit – I : The Plane

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 two 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 semi vertical angle.

Additional Inputs : Reciprocal cones

Co-Curricular Activities:

Seminar/ Quiz/ Assignments/Threedimensional analytical Solid geometry and its applications/ Problem Solving Sessions.

Prescribed Text Book:

Third Semester syllabus and blue print for question paper

SEM	Course Title	Course Code	Credits	Hrs/Wk
III	ABSTRACTALGEBRA	MAT203301	5	6

Course Outcomes:

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

1 Acquire the basic knowledge and structure of groups, subgroups and cyclicgroups.

2 Get the significance of the notation of a normal subgroups.

3 Get the behavior of permutations and operations on them.

4 Study the homomorphism and isomorphism with applications.

5 Understand the ring theory concepts with the help of knowledge in group theory and prove the therems

6 Understand the aplications of ring theory in various fields.

ABSTRACTALGEBRA

UNIT– I(12 Hours)

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.

UNIT-II(12 Hours)

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.

Co-sets and Lagrange'sTheorem:

Cosets Definition – properties of Cosets–Index of a subgroups of a finite groups–Lagrange's Theorem.

UNIT–III(12Hours)

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 – Sub group of index 2 is a normal sub group –quotient group – criteria for the existence of a quotient group.

UNIT–IV(12Hours)

HOMOMORPHISM :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.

PERMUTATIONS:

Definition of permutation – permutation multiplication – Inverse of a permutation – cyclic permutations–transposition –even and odd permutations– Cayley's theorem.

UNIT– V (12 Hours)

RINGS Definition of Ring and basic properties, Boolean Rings, divisors of zero and cancellation laws Rings, Integral Domains, Division Ring and Fields, The characteristic of a ring – The characteristic of an Integral Domain,The characteristic of a Field.Sub Rings.

Additional Inputs: Ideal of a Ring and Principal Ideal Ring.

- No question to be set from Additional Inputs for question paper setting.

Co-Curricular Activities(15Hours)

Seminar/Quiz/Assignments/Grouptheoryanditsapplications/ProblemSolving.

Text Book:

A text book of Mathematics for B.A. / B.Sc. by B.V.S.S. SARMA and others, published byS.Chand&Company, NewDelhi.

ReferenceBooks:

1. AbstractAlgebrabyJ.B. Fraleigh,PublishedbyNarosa publishinghouse.
2. ModernAlgebra byM.L. Khanna.
3. RingsandLinear AlgebrabyPundir&Pundir,published byPragathiPrakashan

Fourth Semester paper IV and V Syllabus and blue prints and model papers:

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	CourseTitle	Course Code	Credits	Hrs/Wk
IV	LINEARALGEBRA	MAT204302	5	6

Course Outcomes:

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

1. Understand the concepts of vector spaces, subspaces, basises, dimension and their properties
2. Understand the concepts of linear transformations and their properties
3. Apply Cayley- Hamilton theorem to problems for finding the inverse of a matrix and higher powers of matrices without using routine methods
4. Learn the properties of inner product spaces and determine orthogonality in inner product spaces.

UNIT –I(12 Hours)

Vector Spaces, General properties of vector spaces, n-dimensional Vectors, addition and scalar multiplication of Vectors, internal and external composition, Null space, Vector subspaces, Algebra of subspaces, Linear Sum of two subspaces, linear combination of Vectors, Linear span Linear independence and Linear dependence of Vectors.

Vector Spaces-II:

Basis of Vector space, Finite dimensional Vector spaces, basis extension, co-ordinates, Dimension of a Vector space, Dimension of a subspace, Quotient space and Dimension of Quotient space.

Linear Transformations:

Linear transformations ,linear operators ,Properties of L. T . sum and product of LTs ,Range and null space of linear transformation. Rank and Nullity of linear transformations – Rank – Nullity Theorem.

Matrix:

Linear Equations, Characteristic equations, Characteristic Values & Vectors of square matrix, Cayley–Hamilton Theorem.

UNIT –V(12Hours)

Inner product space:

Inner product spaces, Euclidean and unitary spaces, Norm or length of a Vector, Schwartz inequality, Triangle Inequality, Parallelogram law, Orthogonality, Orthonormal set, Gram–Schmidtorthogonalisationprocess.Bessel'sinequalityandParseval'sIdentity

Co-Curricular Activities(15Hours)

Seminar/Quiz/Assignments/ Linear algebra and its applications/Problem Solving.

Text Book

Linear Algebra by J.N. Sharma and A.R. Vasista, published by Krishna PrakashanMandir,Meerut-250002.

Reference Books

1. Matrices by Shanti Narayana ,published by S.Chand Publications.

2. Linear Algebra by Kenneth Hoffman and RayKunze,published by Pearson Education(low priced edition), New Delhi.

3. LinearAlgebrabyStephenH.Friedberget.al.publishedbyPrenticeHallof India Pvt .Ltd. 4thEdition, 2007

SEM	Course Title	Course Code	Credits	Hrs/Wk
V	Numerical Methods	MATBS506A	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. Understand various finite difference operators and interpolation methods.
3. Work out numerical differentiation and integration whenever and wherever analytical methods are not applicable.
4. Find numerical solutions of ordinary differential equations by using various numerical methods.
5. Analyze and evaluate the accuracy of numerical methods.

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

Unit – 1: Finite Differences 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.

Additional Input: Errors, types of errors

Unit – 2: Interpolation with Equal and Unequal intervals (15h)

1. Gauss's Forward interpolation formulae, Gauss's backward interpolation formulae, Stirling's formula, Bessel's formula. 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.

Additional Input: Piece-wise Interpolation: Spline interpolation introduction

Unit – 3: Numerical Differentiation (15h)

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

Unit – 4: Numerical Integration (15h)

General quadrature formula on errors, Trapezoidal rule, 2. Simpson's1/3- rule, Simpson's 3/8 – rule, and Weddle's rules, 3. Euler – McLaurin Formula of summation and quadrature, The Euler transformation.

Additional input: Gaussian quadrature

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

Introduction, Solution by Taylor's Series, 2. Picard's method of successive approximations, 3. Euler's method, Modified Euler's method, Runge – Kutta methods.

Additional Inputs: Predictor-Corrector Methods

References:

1. S.S.Sastry, Introductory Methods of Numerical Analysis, Prentice Hall of India Pvt. Ltd., New Delhi-110001, 2006.
2. P.Kandasamy, K.Thilagavathy, Calculus of Finite Differences and Numerical Analysis. S. Chand & Company, Pvt. Ltd., Ram Nagar, New Delhi-110055.
3. R.Gupta, Numerical Analysis, Laxmi Publications (P) Ltd., New Delhi.
4. H.C Saxena, Finite Differences and Numerical Analysis, S. Chand & Company Pvt. Ltd., Ram Nagar, New Delhi-110055.
5. S.Ranganatham, Dr.M.V.S.S.N.Prasad, Dr.V.Ramesh Babu, Numerical Analysis, S. Chand & Company Pvt. Ltd., Ram Nagar, New Delhi-110055.
6. Web resources suggested by the teacher and college librarian including reading material.
7.Ccelms.ap.gov.in/

Co-Curricular Activities: A) Mandatory:

For Teacher: Teacher shall train students in the following skills for 15 hours, by taking relevant outside data (Field/Web).

1. Applications of Newton's forward and back ward difference formulae. 2. Applications of Gauss forward and Gauss back ward, Stirling's and Bessel's formulae.
3. Applications of Newton's divided differences formula and Lagrange's interpolation formula.
4. Various methods to find the approximation of a definite integral.
5. Different methods to find solutions of Ordinary Differential Equations.

For Student: Fieldwork/Project work; Each student individually shall undertake Fieldwork/Project work and submit a report not exceeding 10 pages in the given format on the work done in the areas like the following, by choosing any one of the aspects.

1. Collecting the data from the identified sources like Census department or Electricity department, by applying the Newton's, Gauss and Lagrange's interpolation formula, making observations and drawing conclusions. (Or)

2. Selection of some region to find the area by applying Trapezoidal rule, Simpson's1/3-- rule, Simpson's 3/8 – rule, and Weddle's rules. Comparing the solutions with analytical solution and concluding which one is the best method. (Or)

3.Findingsolutionof the ODE by Taylor's Series, Picard's method of successive approximations, Euler's method, Modified Euler's method, Runge--Kutta methods. Comparing the solutions with analytical solution, selecting the best method.

Max. Marks for Fieldwork/Project work Report: 05.

Suggested Format for Fieldwork/Project work Report: Title page, Student Details, Index page, Stepwise work-done, Findings, Conclusions and Acknowledgements.

5. Unit tests (IE).

B)Suggested Co-Curricular Activities:

1. Assignments/collection of data, Seminar, Quiz, Group discussions/Debates
2. Visits to research organizations, Statistical Cells, Universities, ISI etc.
3. Invited lectures and presentations on related topics by experts in the specified area.

SEM	Course Title	Course Code	Credits	Hrs/Wk
V	Mathematical Special Functions	MATBS506B	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, understand 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 the generating function for Hermite Polynomials, study the orthogonal properties of Hermite Polynomials and recurrence relations.
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.
5. Solve Bessel equation and write the Bessel equation of first kind of order n, also find the generating function for Bessel function understand the orthogonal properties of Bessel unction.

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

Unit – 1: Beta and 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 between Beta and Gamma Functions. 3. Chebyshev polynomials, orthogonal properties of Chebyshev 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. Orthogonal properties of Hermite Polynomials, Recurrence formulae for Hermite Polynomials.

Unit – 4: Legendre polynomials (15h)

1.Definition, Solution of Legendre's equation, Legendre polynomial of degree n, generating function of Legendre polynomials. 2. Definition of $P_n(x)$ and $Q_n(x)$ General solution of Legendre's Equation (derivations not required) to show that $P_n(x)$ is the coefficient of h^n , in the expansion of $(1-2xh-h^2)^{\frac{-1}{2}}$ 3. Orthogonal properties of Legendre's polynomials, Recurrence formulas for Legendre's Polynomials.

Unit – 5: Bessel's equation (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's equation in