ESTD - 1996

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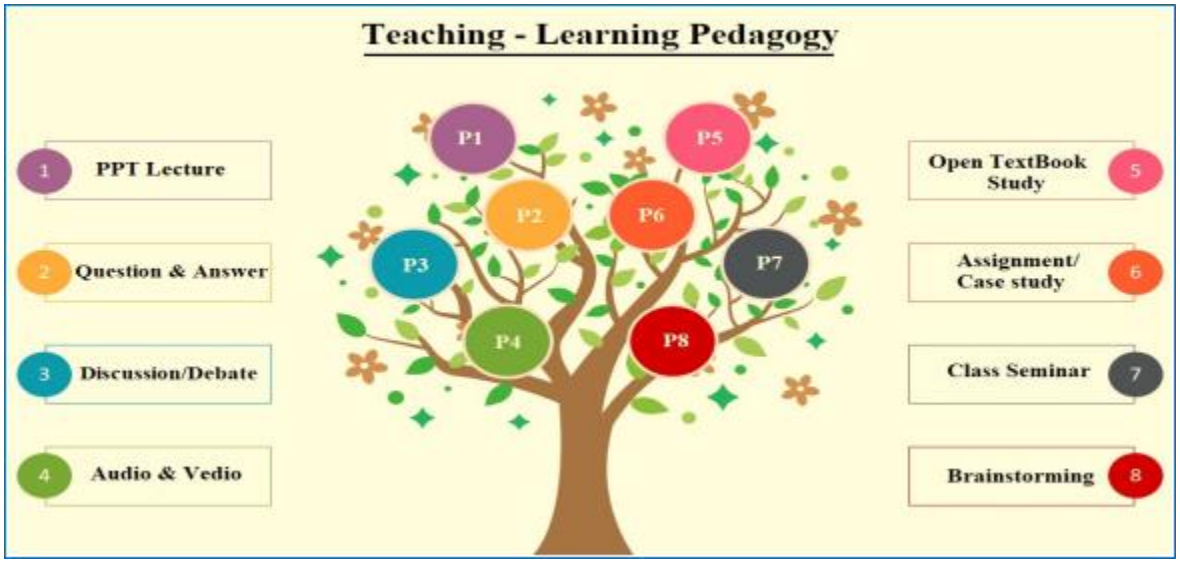
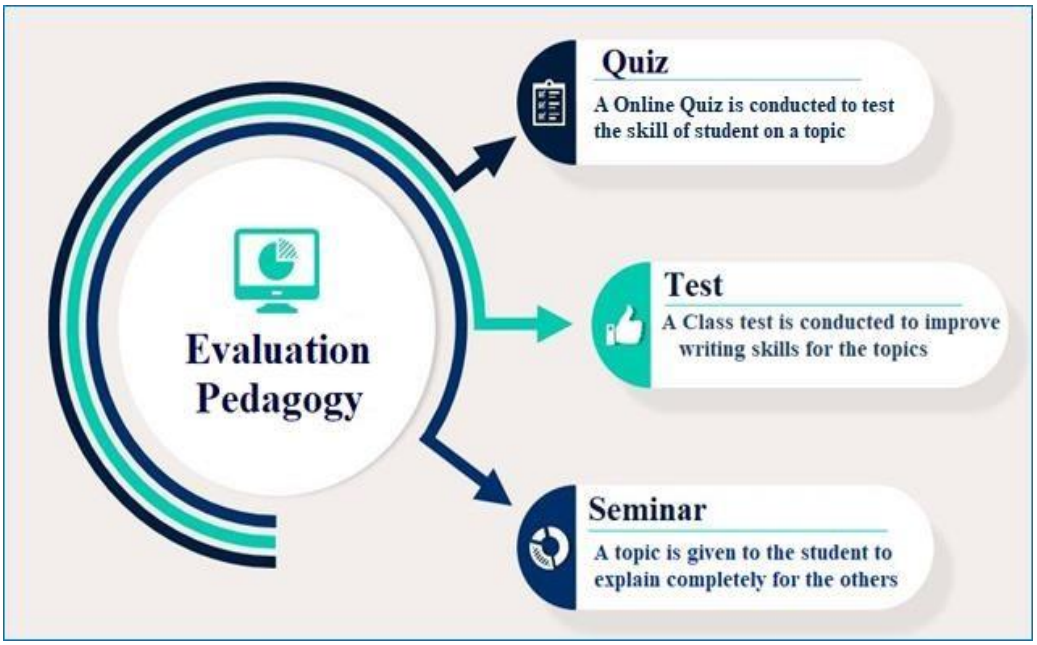
DEPARTMENT OF MATHEMATICS

Teaching Plan – 2022-2023





COURSE: B.Sc	YEAR I	SEMESTER I
Subject	**DIFFERENTIAL EQUATIONS**	
Units	1. Differential Equations of first order and first degree 2. Differential Equations of first order but not of the first degree 3. Higher order linear differential equations-I 4. Higher order linear differential equations-II 5. Higher order linear differential equations-III	
Duration	**60hours**	
Learning Objectives	1. Recognize differential equations that can be resolved using each of the three approaches—direct integration, variable separation, and integrating factor method—and employ the most appropriate approach. 2. finding a specific differential equation solution from a general solution by using an initial condition 3. Learn when to use specific equations, formulas, procedures, etc	

Units	U1	U2	U3	U4	U5
Hours Split: 60 Total: 75	12	12	12	12	12
Internal valuation:25 marks	5	5	5	5	5

ResourceMaterial:	**StudyMaterial(Handouts):** https://www.gkpad.com/sachin/05-22/-bsc-Differential-Equation.html **Text Book :** Differential Equations and Their Applications by Zafar Ahsan, published by Prentice-Hall of India Pvt. Ltd, New Delhi-Second edition. **Reference Books :** A text book of Mathematics for B.A/B.Sc, Vol 1, by N. Krishna Murthy & others, published by S.Chand & Company, New Delhi. Ordinary and Partial Differential Equations by Dr. M.D,Raisinghania, published by S. Chand & Company, New Delhi. Differential Equations with applications and programs – S. Balachandra Rao & HR Anuradha-Universities Press. Differential Equations -Srinivas Vangala & Madhu Rajesh, published by Spectrum University Press. **YouTube Links:** https://youtu.be/MwitOvQxpfY?list=PLU6SqdYcYsfJmqo86d12EoNNWKtAZqu8q https://youtu.be/VyWBA0THDRk **Power Point Presentations:** https://slideplayer.com/slide/8764662/ **QuestionBank:** https://www.ugpapers.com/2020/10/au-degree-1st-sem-previous-question-papers.html

I. Academic-Pedagogical-Evaluation :Unit-wise Pedagogy

UNIT	DESCRIPTION	PEDAGOGY	INTERNAL EVALUATION
I	Differential Equations of first order and first degree: Linear Differential Equations; Differential equations reducible to linear form; Exact differential equations; Integrating factors; Change of variables.	P1,P2,P3	PQ,P6,PT
II	Orthogonal Trajectories Differential Equations of first order but not of the 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 the first degree in x and y – Clairaut's Equation.	P1,P2,P3,P5	P6,PT
III	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, $\frac{1}{f(D)}$ is expressed as partial fractions. P.I. of f(D)y = Q when Q= b e^{ax} P.I. of f(D)y = Q when Q is b sinax or b cosax.	P1,P2,P3,P5	PQ,PT
IV	Higher order linear differential equations-II: Solution of the non-homogeneous linear differential equations with constant coefficients.	P1,P2,P4	PQ,P6,PT

	P.I. of f(D)y = Q when Q= b x^k P.I. of f(D)y = Q when Q= e^{ax}V , where V is a function of x. P.I. of f(D)y = Q when Q= xV , where V is a function of x. of f(D)y = Q when Q= x^mV , where V is a function of x.		
V	Higher order linear differential equations-III : Method of variation of parameters; Linear differential Equations with non-constant coefficients; The Cauchy-Euler Equation, Legendre's linear equations, miscellaneous differential equations.	PQ,P6,PT,**P8**	PQ,PT

COURSE: B.SC	YEAR:I	SEMESTER:II
Subject	**SOLID GEOMETRY**	
Units	1.The plane 2.The line 3.The sphere 4.The sphere and cones 5.cones	
Duration	**60hours**	
Learning Objectives	1.Once this course has been successfully completed, the learners are able to understand about planes. 2.The learner will be able to understand the fundamentals of lines, spheres, and cones after properly completing the program. 3.The learner will be able to express problems geometrically and then come up with solutions after successfully completing this course.	

Units	U1	U2	U3	U4	U5
Hours Split:Total: 60	12	12	12	12	12
Internal valuation:40marks	8	8	8	8	8

ResourceMaterial:	**StudyMaterial(Handouts):** **https://download.tuxfamily.org/openmathdep/geometry/Solid_Geometry-Godfrey.pdf** **Reference Books:** 1.Analytical Solid Geometry by Shanti Narayan and P.K. Mittal, published by S. Chand & Company Ltd. 7th Edition. 2.A text book of Mathematics for BA/B.Sc Vol 1, by V Krishna Murthy & Others, published by S. Chand & Company, New Delhi. 3.A text Book of Analytical Geometry of Three Dimensions, by P.K. Jain and Khaleel Ahmed, published by Wiley Eastern Ltd., 1999. 4.Co-ordinate Geometry of two and three dimensions by P. Balasubrahmanyam, K.Y. Subrahmanyam, G.R. Venkataraman published by Tata-MC Gran-Hill Publishers Company Ltd., New Delhi. 5.Solid Geometry by B.Rama Bhupal Reddy, published by Spectrum University Press. **YouTube Links:** https://youtu.be/unm5BzHQP_E?list=PLIolyOCe2ja4yi6hbWv_tRaHZz124pXZC **Power Point Presentations:** https://www.powershow.com/view3/4a0726-Mjg1M/Solid_Geometry_powerpoint_ppt_presentation **QuestionBank:** https://www.ugpapers.com/2020/01/au-2nd-sem-maths-question-papers.html

I. Academic-Pedagogical-Evaluation :Unit-wise Pedagogy

UNIT	DESCRIPTION	PEDAGOGY	INTERNAL EVALUATION
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	P1,P3,P2,P6	PQ,PT
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	P1,P5,P3,P2	P6,PT,PQ
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	P1,P3,P5,P7	P6,PT

IV	SPHERE AND CONES Angle of intersection of two spheres; Conditions for two spheres to be orthogonal; Radical plane; Coaxial system of spheres; Simplified from of the equation of two spheres. Definitions of a cone; vertex; guiding the curve; 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	P1,P2,P5,P6	PQ, PT
V	CONES Enveloping cone of a sphere, right circular cone ,equation of right circular cone with a given vertex, axis and semi vertical angle, condition that a cone may have three mutually perpendicular generators ,intersection of a line and a quadric cone ,tangent lines and tangent plane at a point condition that a plane may touch a cone, reciprocal cones, intersection of two cones with a common vertex.	PQ,P7,PT,**P8**	PQ,P6,PT

COURSE: B.SC	YEAR:II	SEMESTER:III
Subject	**GROUP THEORY**	
Units	1. Groups 2. Subgroups 3. Normal subgroups 4. Homomorphism 5. Permutations and cyclic groups	
Duration	**60hours**	
Learning Objectives	1. To become familiar with basic mathematical concepts and tools including closure, identity, and inverse. 2. Understand the mathematical entities known as groups. 3. Look at the importance of the concepts of cosets and normal subgroups. 4. Discover how to compare two different algebraic structures and investigate how homomorphism and isomorphism can be used to transfer properties across these structures.	

Units	U1	U2	U3	U4	U5
Hours Split:Total: 60	12	12	12	12	12
Internal valuation:40marks	8	8	8	8	8

ResourceMaterial:	**StudyMaterial(Handouts):** https://pages.mtu.edu/~kreher/ABOUTME/syllabus/GTN.pdf **Reference Books:** A text bool of bsc mathematics volume III ABSTRACT ALGEGERA by V venkateswara rao , N Krishna murthy , BVVS sarma , S Anjana sastry , S ranganatham & R bhravi sharma **YouTube Links:** https://youtu.be/DSxOCdpmeBI?list=PLdM-WZokR4tYkXOQqar8V1ShajwlDHsnT **Power Point Presentations:** https://www.slideserve.com/Patman/2-basic-group-theory **QuestionBank:** https://www.shaalaa.com/question-paper-solution/university-of-pune-bsc-group-theory-semester-5-tybsc-2017-2018_16036

UNIT	DESCRIPTION	PEDAGOGY	INTERNAL EVALUATION
I	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	P1,P2,P3	PQ,P6,PT
II	SUBGROUPS Complex Definition – Multiplication of two complexes Inverse of a complex-Subgroup definition – examples-criterion for a complex to be a subgroups. Co-sets and Lagrange's Theorem Criterion for the product of two subgroups to be a subgroup-union and Intersection of subgroups, Cosets Definition – properties of Cosets–Index of a subgroups of a finite groups–Lagrange's Theorem.	P1,P2,P4,P5	P6,PT
III	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 – simple group – quotient group – criteria for the existence of a quotient group.	P1,P2,P3	PQ,PT
IV	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.	P1,P2,P4,P5	PQ,P6,PT

V	PERMUTATIONS AND CYCLIC GROUPS 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.	PQ,P6,PT	PQ,PT

COURSE: B.SC	YEAR: II	SEMESTER: IV
Subject	**REAL ANALYSIS**	
Units	1. The real numbers and sequences. 2. Infinite series. 3. Limits and continuity. 4. Differentiation. 5. Riemann integration.	
Duration	**60hours**	
Learning Objectives	1. students will be able to exhibit proficiency in the algebraic and order properties of real numbers 2. Students will be able to demonstrate competency with real number properties by determining the supremum and infimum of sets and utilizing the completeness property of real numbers. 3. Students will be able to recognize bounded, convergent, divergent and other features of real lines. 4. Students will be able to apply the ratio ,root ,and alternating series tests ,as well as the limit comparison test to determine the convergence and absolute convergence of an infinite series of real numbers.	

Units	U1	U2	U3	U4	U5
Hours Split:Total: 60	10	12	14	10	14
Internal valuation:40marks	8	8	8	8	8

ResourceMaterial:	**StudyMaterial(Handouts):** http://pdvpmtasgaon.edu.in/uploads/dptmaths/Real_AnalysisBySizweMabizela.pdf **Reference Books:** A text book of BSC mathematics volume II REAL ANALYSIS by V venkateswara rao , N Krishna murthy , B V V S sarma ,S anjaneya sastry ,S ranganatham **YouTube Links:** https://youtu.be/qXZH6MPgdn0. **QuestionBank:** https://www.ugpapers.com/2020/02/au-degree-4th-sem-maths-2019.html

UNIT	DESCRIPTION	PEDAGOGY	INTERNAL EVALUATION
I	REAL NUMBERS The algebraic and order properties of R, Absolute value and Real line, Completeness property of R, Applications of supreme property; intervals. 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, Subsequence's and the Bolzano-weierstrass theorem – Cauchy Sequences – Cauchy's general principle of convergence theorem.	P1,P2,P3,P4	PQ,PT
II	INFINITIE SERIES 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. Absolute convergence and conditional convergence, semi convergence.	P1,P2,P3P5	P6,PT
III	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 intervals, uniform continuity.	P1,P2,P3,P4	PQ,PT,P8

IV	DIFFERENTIATION AND MEAN VALUE THEORMS : 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; Role's Theorem, Lagrange's Theorem, Cauchy's Mean value Theorem , generalized mean value theorems , Taylor's theorem, maclaurin's theorem, expansion of functions with different forms of remainders , Taylor's maclaurin's series, power series representation of functions.	P1,P2,P5	PQ,P6,PT
V	RIEMANN INTEGRATION : Riemann Integral, Riemann integral functions, Darboux theorem. Necessary and sufficient condition for R – integrability, Properties of integrable functions, Fundamental theorem of integral calculus, integral as the limit of a sum, Mean value Theorems	P1,P2,P6	PQ,PT,P5

COURSE: B.SC	YEAR: II	SEMESTER: IV
Subject	**LINEAR ALGEBRA**	
Units	1. Vector spaces- I 2. Vector spaces-II 3. Linear transformations 4. Matrix 5. Inner product space	
Duration	**60hours**	
LearningObjectives	At the end of this course, the student will be able to 1. Solve system of linear equations using technology to facilitate row reduction. Carry out matrix operations, including inverses and determinants. 2. Know the basic terminology of linear algebra in Euclidean spaces, including linear independence, spanning, basis, rank, nullity, subspace & linear transformation. 3. The abstract notions of vector space and Inner product space. 4. Finding Eigen values & Eigen vectors of a matrix or a linear transformation and using them to diagonalizable a matrix. 5. Understand the concept of projections & orthogonality among Euclidean vectors including the Gram-Schmidt orthogonalization process.	

Units	U1	U2	U3	U4	U5
Hours Split:Total: 60	10	12	14	10	14
Internal valuation:40marks	8	8	8	8	8

ResourceMaterial:	**StudyMaterial(Handouts):** **https://www.teachmint.com/tfile/studymaterial/b-sc/linearalgebra/booklinearalgebra/75fb8053-9678-4d11-a391-60ab99740385** **Reference Books:** 1. A text book of BSC mathematics volume III linear algebra by V Venkateswara rao ,N Krishna murthy , BVVS Sarma , S Anjaneya sastry ,S Ranganatham published by S.Chand 2. A Text book of Mathematics Linear Algebra Semester-V, Paper-vi, by Dr. Anjaneyulu by Deepti Publications. 3. Linear Algebra by J.N. Sharma and A.R. Vasista, published by Krishna Prakashan Mandir, Meerut250002. 4. Matrices by Shanti Narayana, published by S.Chand Publications. 5. Linear Algebra by Kenneth Hoffman and Raykunze, Published by Pearson Education. **YouTube Links:** https://youtu.be/1XlT3Y2oyAU?list=PLU6SqdYcYsfJOGZdxUpDk3w9o-w94-RoG https://youtu.be/_6oRqxY6O5w?list=PLdM-WZokR4tYxOsDe1s9QSWsVQBHfemd0 **Power Point Presentations:** **https://www.slideshare.net/itutor/linear-algebra-and-matrix** **QuestionBank:** https://www.ugpapers.com/2020/12/au-degree-5th-sem-maths-paper-vi-2019.html

UNIT	DESCRIPTION	PEDAGOGY	INTERNAL EVALUATION
I	Vector Spaces-I 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	P1,PQ,P5,P7	P6,PT,PQ
II	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.	P1,P3,P5,P7	PQ,PT
III	Linear Transformations Linear transformations, linear operators, Properties of L.T, sum and product of LTs, Algebra of Linear Operators, Range and null space of linear transformation, Rank and Nullity of linear transformations – Rank – Nullity Theorem.	P1,P5,P3,P2	PQ,P6,PT
IV	Matrix Linear Equations, Characteristic Roots, Characteristic Values & Vectors of square Matrix, Cayley – Hamilton Theorem.	PQ,PT,P8,P7	P6,PT
V	Inner product space Inner product spaces, Euclidean and unitary spaces, Norm or length of a Vector, Schwartz inequality, Triangle in Inequality, Parallelogram law, Orthogonality , Orthonormal set, complete orthonormal set, Gram – Schmidt orthogonalisation process. Bessel's inequality and Parseval's Identity	P1,P2,P5,P6	PQ, PT

COURSE:B.SC	YEAR: III	SEMESTER: V
Subject	**7B NUMERICAL ANALYSIS**	
Units	1. Finite Differences and Interpolation with Equal intervals 2. Interpolation with Equal and Unequal intervals 3. Numerical Differentiation 4. Numerical Integration 5. Numerical solution of ordinary differential equations	
Duration	**60hours**	
LearningObjectives	Students after successful completion of the course will be able to 1. understand the subject of various numerical methods that are used to obtain approximate solutions 2. Understand various finite difference concepts and interpolation methods. 3. Work out numerical differentiation and integration whenever and wherever routine methods are not applicable 3. Find numerical solutions of ordinary differential equations by using various numerical methods. 4. Analyze and evaluate the accuracy of numerical methods	

Units	U1	U2	U3	U4	U5
HoursSplit:Total: 60	15	15	15	15	15
Internal valuation:40marks	8	8	8	8	8

ResourceMaterial:	**StudyMaterial(Handouts):** https://ocw.mit.edu/courses/18-330-introduction-to-numerical-analysis-spring-2012/pages/lecture-notes/ **Reference Books:** 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. **YouTube Links:** https://youtu.be/rWyTk9eubKM?list=PLU6SqdYcYsfLrTna7UuaVfGZYkNo0cpVC **Power Point Presentations:** **https://www.slideshare.net/HaiderParekh1/numerical-methods-132504413** **QuestionBank:** https://www.ugpapers.com/2020/03/au-degree-6th-sem-maths-2019-cluster-2.html

UNIT	DESCRIPTION	PEDAGOGY	INTERNAL EVALUATION
I	Finite Differences and Interpolation with Equal intervals Introduction, Forward differences, Backward differences, Central Differences, Symbolic relations, nth Differences of Some functions, Advancing Difference formula, Differences of Factorial Polynomial, Summation of Series. Newton's formulae for interpolation. Central Difference Interpolation Formulae.	P1,P2,P3	PQ,P6,PT
II	Interpolation with Equal and Unequal intervals Gauss's Forward interpolation formulae, Gauss's backward interpolation formulae, Stirling's formula, Bessel's formula. Interpolation with unevenly spaced points, divided differences and properties, Newton's divided differences formula. Lagrange's interpolation formula, Lagrange's Inverse interpolation formula.	P1,P2,P3,P5	P6,PT
III	Numerical Differentiation Derivatives using Newton's forward difference formula, Newton's back ward difference formula, Derivatives using central difference formula, Stirling's interpolation formula, Newton's divided difference formula, Maximum and minimum values of a tabulated function.	P1,P2,P3,P5	PQ,PT
IV	Numerical Integration General quadrature formula one errors, Trapezoidal rule, Simpson's1/3– rule, Simpson's 3/8 – rule, and Weddle's rules, Euler – McLaurin Formula of summation and quadrature, The Euler transformation.	P1,P2,P4	PQ,P6,PT

V	Numerical solution of ordinary differential equations 1. Introduction, Solution by Taylor's Series, 2. Picard's method of successive approximations, 3. Euler's method, Modified Euler's method, Runge – Kutta methods.	PQ,P6,PT,**P8**	PQ,PT

Course:B.SC	**Year:III**	**Semester:V**
Subject	**7A MATHEMATICAL SPECIAL FUNCTIONS**	
Units	1. Beta and Gamma functions, Chebyshev polynomials 2. Power series and Power series solutions of ordinary differential equations 3. Hermite polynomials 4. Legendre polynomials 5. Bessel's equation	
Duration	**60hours**	
LearningObjectives	Students after successful completion of the course will be able to: 1. 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. 2. Find power series solutions of ordinary differential equations. 3. 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. 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. 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.	

Units	U1	U2	U3	U4	U5
Hours Split: Total: 60	14	12	10	14	10
Internal valuation:40marks	8	8	8	8	8

ResourceMaterial:	**StudyMaterial(Handouts):** **https://pkalika.files.wordpress.com/2020/08/special-function-kalika124pages.pdf** **Reference Books:** 1. Dr.M.D.Raisinghania, Ordinary and Partial Differential Equations, S. Chand & Company Pvt. Ltd., Ram Nagar, New Delhi-110055. 2. J.N.Sharma and Dr.R.K.Gupta, Differential equations with special functions, Krishna Prakashan Mandir. 3. Shanti Narayan and Dr.P.K.Mittal, Integral Calculus, S. Chand & Company Pvt. Ltd., Ram Nagar, New Delhi-110055. 4. George F.Simmons, Differential Equations with Applications and Historical Notes, Tata McGRAW-Hill Edition, 1994. 5. Shepley L.Ross, Differential equations, Second Edition, John Willy & sons, New York, 1974. 6. Web resources suggested by the teacher and college librarian including reading material. **YouTube Links:** https://youtu.be/5uW1-v_R0UA?list=PL3iTl9IGUE7EhKkCzOXPg_v9g9614aP4T **Power Point Presentations:** https://www.slideshare.net/niravbvyas/special-functions-23766841 **QuestionBank:** https://www.jettystudy.com/questionpaper/special-functions-previous-year-question-paper-feb-2022.680.html

UNIT	DESCRIPTION	PEDAGOGY	INTERNAL EVALUATION
I	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 properties of Chebyshev polynomials, recurrence relations, generating functions for Chebyshev polynomials.	P1,P2,P3	PQ,P6,PT
II	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.	P1,P2,P3,P5	P6,PT
III	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, Recurrence formulae for Hermite Polynomials	P1,P2,P3,P5	PQ,PT
IV	Legendre polynomials .Definition, Solution of Legendre's equation, Legendre polynomial of degree n, generating function of Legendre polynomials.Definition of $P_n(x)$ and $Q_n(x)$, General solution of Legendre's Equation n (derivations not required) to show that $P_n(x)$ is the coefficient of h^n n , in the expansion of $(1 - 2xh + h^2)^{\frac{-1}{2}}$ Orthogonal properties of Legendre's polynomials,	P1,P2,P4	PQ,P6,PT

	Recurrence formulas for Legendre's Polynomials.		
V	Bessel's equation 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. Integration of Bessel's equation in series form=0, Definition of $J_n(x)$ recurrence formulae for $J_n(x)$,Generating function for $J_n(x)$,orthogonally of Bessel functions.	PQ,P6,PT,**P8**	PQ,PT