Government Degree College
Affliated to Andhra University
(Upgraded to Model Degree College under RUSA 2.0)
Paderu, Visakhapatnam-District,AP.
Est:1985 NAAC " B "Grade phone no: 08935 250013 Email.ID :Paderu.jkc@gmail

CO – PO MAPPINGFOR

B.Sc (MATHEMATICS)

(W. E. F 2020-21)

DEPARTMENT OF MATHEMATICS

GOVT. DEGREE COLLEGE, PADERU.

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GOVT DEGREE COLLEGE, PADERU.

Vision

To become a centre of educational excellence for empowering women in different fields of life by realising their capabilities so that they can take their rightful place in the society.

Mission

- To inculcate the spirit of quality in higher education.
- To trigger skills related to education and life.
- To enhance physical wellbeing.
- To promote social awareness and community service.
- To enlighten women empowerment.
- To Inculcate values for betterment of women.
- To train the students for academic competition.

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DEPARTMENT OF MATHEMATICS

B. SC (MATHEMATICS)

VISION

1. To enable the rural and urban students strong in doing mathematics.
2. Encouraging them for further higher studies and to write competitive exams.
3. Instill analytical and logical thinking among students and promote mathematicalthought as an important area of human thought.

MISSION

1. To develop the mathematical thinking of the students.
2. To learn mathematical software knowledge for further higher education.
3. To create an environment that supports to solve rural problems and give its usages toground level by mathematical modelling etc.
4. To conduct seminar, group discussion, workshop etc. for the students.

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DEPARTMENT OF MATHEMATICS

B. SC (MATHEMATICS)

Programme Outcomes (POs)

1. Acquire a comprehensive understanding of domain-specific knowledge and demonstrate their acquired skills effectively during practical transactions within the specific domain.
2. Demonstrate proficient analytical and problem-solving skills through the application ofcritical thinking strategies to address real-world situations effectively.
3. Master effective communication, collaborate skillfully with diverse stakeholders, nurture meaningful dialogues, build strong professional bonds in and beyond college.
4. Exhibit proficiency in ethically using information from diverse sources, analyzing and synthesizing data effectively for real-world research.
5. Exemplify ethical standards in personal and professional contexts, appreciate diverse cultures, evaluate social responsibility's impact on well-being, and advocate for womenstudents' betterment.
6. Actively promote social awareness through community service, contributing to a moreinclusive and compassionate global community.
7. Embrace continuous learning, create professional growth chances, and prioritize personality development and physical well-being for a holistic approach.
8. Foster self-confidence, advocate women empowerment, demonstrate expertise for growth in studies, employment, and entrepreneurship, creating a brighter and equitablefuture.

PROGRAM SPECIFIC OUTCOMES:

MATHS PHYSICS COMPUTER SCIENCE

PSO1. Understand the concepts of vector spaces, group theory, quantum mechanics, optical, thermal, electrical, mechanical properties of a materials, probability, algorithm design, data base.

PSO2. Analyze the concepts of mathematics, physics and computers science able to relatethem in numerical programming of models of physical systems.

PSO3. To impart knowledge of a broad range of Computer Science skills, tools, and mathematical techniques, and the capability of applying them to analyze and design complex systems.

PSO4. Acquire logical and analytical skills to apply the concepts to model and solve real life problems in related areas.

PSO5. Engage in professional development in the fields of Information Technology and Computer Science.

MATHS CLOUD COMPUTING COMPUTER SCIENCE

PSO1. Acquire good knowledge and understanding in advanced areas of mathematics and statistics, chosen by the student from the given courses.

PSO2. Design, implements, test, and evaluate a computer system, component, or algorithm to meet desired needs and to solve a computational problem

PSO3. Demonstrate understanding of the principles and working of the hardware and software aspects of computer systems

PSO4. Acquire the fundamental ideas behind Cloud Computing, the evolution of the paradigm, its applicability; benefits, as well as current and future challenges

PSO5 Understand the key security and compliance challenges of cloud computing

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COURSE 1: DIFFERENTIAL EQUATIONS

CO1. Demonstrate the fundamental concepts, principles, and techniques related to first-order and higher-order differential equations.

- Knowledge: Recall the fundamental concepts and principles of first-order and higher-order differential equations.
- Understanding: Explain the differences between first-order and higher-order differential equations and their significance in various applications.

CO2. Understand various methods and apply the methods to solve differential equations

- Understand: Explain the general principles behind each method, such as separation of variables and integrating factors, and how they relate to different types of differential equations.
- Application: Utilize the method of undetermined coefficients to solve a second-order linear homogeneous ordinary differential equation with constant coefficients.

CO3. Critically analyze and evaluate the solutions obtained for differential equations

- Analysis: Examine and identify the strengths and limitations of the solutions obtained for differential equations in different contexts.
- Evaluation: Assess the accuracy, validity, and applicability of the solutions, considering factors such as initial conditions and real-world implications.

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COURSE: THREE DIMENTIONAL ANALYTICAL GEOMETRY

CO1. Acquire the basic knowledge of planes, lines, spheres, and cones

- Remembering: Acquire fundamental knowledge about the properties, equations, and characteristics of planes, lines, spheres, and cones.

CO2. Demonstrate a basic idea of lines, spheres, and cones

- Understanding: Demonstrate a foundational understanding of the concepts of lines, spheres, and cones.
- Application: Apply the basic understanding of lines, spheres, and cones to solve problems involving these geometric shapes.

CO3. Understand the properties of planes, lines, spheres, and cones and apply them to solve problems

- Understanding: Understand the inherent properties of planes, lines, spheres, and cones and how they relate to geometric problem-solving.
- Applying : Apply the understanding of properties to solve problems involving planes,lines, spheres, and cones.

CO4. Demonstrating critical thinking to choose the most suitable geometric approach for a given problem.

- Applying: Apply critical thinking to analyze given problems and choose appropriate geometric approaches.
- Analyzing: Analyze problem characteristics and select the most suitable geometric approach, showcasing higher-order thinking skills

COURSE 3: ABSTRACT ALGBRA

CO1. Acquire the basic knowledge and structure of groups, subgroups, cyclic groups, and thesignificance of the notation of normal subgroups.

- Remembering: Recall the fundamental concepts of groups, subgroups, cyclic groups, and the significance of notation for normal subgroups.
- Understanding: Understand the structure and properties of groups, subgroups, cyclic groups, and the importance of normal subgroups.

CO2. Study the behavior of permutations and operations on them.

- Understanding: Understand the behavior of permutations and the operations applied to them.

CO3. Evaluate and analyze the concepts of homomorphisms, isomorphisms, anrd permutations, along with their properties and applications, including Cayley's theorem.

- Analyzing: Analyze the concepts of homomorphisms, isomorphisms, permutations, and their properties, including their applications such as Cayley's theorem.
- Evaluating: Evaluate the significance and practical applications of homo morphisms, iso morphisms, and permutations, including their role in Cayley's theorem.

CO4. Understand the concepts of ring theory, including its connection with group theory, and be able to prove relevant theorems. Also, comprehend the applications of ring theory in various fields.

- Understanding: Understand the foundational concepts of ring theory, its connection with group theory, and its relevance in various fields.
- Applying: Apply the understanding of ring theory to prove relevant theorems and demonstrate its applications in different contexts.

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COURSE 4 : REAL ANALYSIS

CO1. Get a clear idea about the real numbers and real-valued functions

- Remembering: Obtain a foundational understanding of real numbers and real-valued functions.
- Understand: Understand the properties of real numbers, including algebraic and order properties, and apply them in analyzing sequences and intervals.

CO2. Obtain the skills to analyze and evaluate the convergence of a sequence/series.

- Analyzing: Analyze and evaluate the convergence of sequences and series.
- Evaluating: Apply higher-order evaluation skills to assess the convergence of sequencesand series.

CO3. Test the continuity and differentiability of a function and apply Riemann integration.

- Understand: Grasp the definitions of continuity and differentiability of functions.
- Application: Apply tests to determine the continuity and differentiability of functions and utilize Riemann integration techniques.

CO4. Understand the geometrical interpretation of mean value theorems.

- Understand: Grasp the geometrical interpretation of mean value theorems in the contextof real-valued functions.
- Application: Apply the conditions of continuity and differentiability to verify the applicability of Mean value theorems.

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COURSE 5: LINEAR ALGEBRA

CO1. Develop a foundational understanding of vector spaces, subspaces, bases, and dimensions.

- Knowledge: Define vector spaces, subspaces, bases, and dimensions.
- Understanding: Explain the relationships between these concepts and their significance in linear algebra.

CO2. Analyze the properties of vector spaces and subspaces through mathematical proofs.

- Application: Apply mathematical proofs to demonstrate properties of vector spaces and subspaces.
- Analysis: Analyze how these properties hold true and what they imply about the nature of vector spaces and their subsets.

CO3. Apply the concepts of linear transformations to solve problems in various contexts.

- Application: Apply linear transformations to solve problems in different fields.
- Analysis: Analyze the effects of linear transformations on vectors and matrices in

CO4. Utilize the Cayley-Hamilton theorem to find the inverse of a matrix and calculate higher powers of matrices without using routine methods

- Evaluation: Evaluate the practical benefits and implications of utilizing the theorem for matrix calculations.
- Creative: Combine the knowledge of the Cayley-Hamilton theorem with matrix manipulation techniques to find inverses and compute higher powers of matrices.

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Course-6A: Numerical Analysis(Skill Enhancement Course (Elective), 5 credits)

Learning Outcomes: 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.
4. Find numerical solutions of ordinary differential equations by using various numerical methods.
5. Analyze and evaluate the accuracy of numerical methods.

Unit – 1: ERRORS IN NUMERICAL COMPUTATIONS

Errors and their accuracy , mathematical preliminaries ,errors and their analysis ,absolute , relative and percentage errors , general errors formula ,errors in series approximation .

Unit -2 :solution of algebraic and transidental equations

The bisection method ,the iteration method ,the method of false position method ,newtons –Rapsonsons method ,generalized Newton –rapshson method ,mullers method .

Unit -3 : interpolation -1

Interpolation : errors in polynomials interpolation ,finite differences , Forward differences, Backward differences, Central Differences, Symbolic relations, nth Detection of errors by use of differences tables , Difference of polynomials,

Unit -4 : interpolation -2

3. Newton's formulae for interpolation. Central Difference Interpolation Formulae ,gauss central difference formulae ,stirlings central difference formula , Bessel's formula ,Everett's formula .

Unit – 5: interpolation -3

Interpolation with unevenly spaced points ,Lagrange's formula ,errors in lag ranges formula .divided differences and their properties ,relation between divided differences and forward differences ,relation between divided difference s and backward differences ,relation between divided difference and central differences ,Newton general interpolation formula ,inverse interpolation .

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COURSE : ADVANCED NUMERICAL ANALYSIS

Unit -1:

Curve fitting :

Least-squares curves fitting procedures, fitting a straight line ,non linear curve fitting ,curve fitting by a sum of exponentials .

Unit -2 :

Numerical differentiation : derivatives using Newton's forward difference formula.
Newton's backward difference formula , derivatives using central difference formula .
Stir lings interpolation formula , Newton's divided difference formula ,maximum and minimum values of a tabulated function .

Unit-3 :

Numerical integration : general Qudrature formula on errors, trapezoidal rule ,Simpsons 1/3 rule ,Simpsons 3/8 rule ,weddles rule ,Euler's maclarians formula of summation and quadrature , the Euler's transformation .

Unit -4

Solution of simultaneous linear systems of equations :
Solution of linear systems direct method ,matrix inversion method ,Gaussian elimination method ,gauss-Jordon method ,method of factorization ,solution of tridiagonal systems ,iterative methods ,jacobians method ,gauss –seidal method .

Unit -5 :

Numerical solution of ordinary differential equations : introduction ,solution of Taylors series ,Picard's method of successive approximations ,Euler's method , modified Euler's method ,Runge kutta methods .

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Course 8A: Integral Transforms

CO1. Understand the evaluation of Laplace transforms of specific functions and find Laplace transforms of derivatives and integrals.

- Knowledge (L1): Recall the definition of the Laplace transform and memorize the Laplace transforms of common functions like exponential, unit step, etc.
- Understanding (L2): Explain the concept of the Laplace transform and its purpose in solving differential equations.
- Applying (L3): Apply the Laplace transform to find the transformed version of specific functions.

UNIT -1 : Application of Laplace transformations of differential equations

Solution of ordinary differential equations .

Solution of differential equations with constant coefficient

Solution of differential equations with variable coefficient

Unit -2 : application of Laplace transformation

Solution of simultaneous ordinary differential equations .

Solution of partial differential equations .

Unit -3 :application of Laplace transforms to integral equations .

Integral equations –ables ,integral equation- integral equation of convolution type ,integro differential equations .application of l.t to integral equations .

Unit -4 : fourier transform -1

fourier transform - fourier transform - fourier cosine transform - line propriety of fourier transform –change of scale property for fourier transform - sine transform and cosine transform

shifting property – modulation theorem .

Unit -5 : fourier transform -2

convolution theorem for fourier transform – parsevals identity – relationship between fourier

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Course-7A: Mathematical Special Functions (Skill Enhancement Course (Elective), 5 credits)

I. 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.

CO – 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, recurrence relations, generating functions for Chebyshev polynomials.

CO – 2: Power series and Power series solutions of ordinary differential equations (15h)
1. 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.

CO – 3: Hermite polynomials (15h)
1. Hermite Differential Equations, Solution of Hermite Equation, Hermite polynomials, generating function for Hermite polynomials.
2. Other forms for Hermite Polynomials, Rodrigues formula for Hermite Polynomials, to find first few Hermite Polynomials.
3. Orthogonal properties of Hermite Polynomials, Recurrence formulae for Hermite Polynomials.

CO – 4: Legendre polynomials (15h)
1. Definition, Solution of Legendre's equation, Legendre polynomial of degree n, generating function of Legendre polynomials. , General solution of Legendre's Equation (derivations not)x(and Qn)x (2. Definition of Pn is the coefficient of h)x(required) to show that Pn n , in the expansion of $(1 - 2xh + h^2)^{-1}$ 2 3. Orthogonal properties of Legendre's polynomials, Recurrence formulas for Legendre's Polynomials.

CO-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 series form=0, Definitionof .)x(recurrence for mulae for Jn ,)x(Jn , orthogonally of Bessel functions.)x(3. Generating function for Jn

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Course-7A: Mathematical Special Functions (Skill Enhancement Course (Elective), 5 credits)

I. 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.

CO – 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, recurrence relations, generating functions for Chebyshev polynomials.

CO – 2: Power series and Power series solutions of ordinary differential equations (15h)
1. 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.

CO – 3: Hermite polynomials (15h)
1. Hermite Differential Equations, Solution of Hermite Equation, Hermite polynomials, generating function for Hermite polynomials.
2. Other forms for Hermite Polynomials, Rodrigues formula for Hermite Polynomials, to find first few Hermite Polynomials.
3. Orthogonal properties of Hermite Polynomials, Recurrence formulae for Hermite Polynomials.

CO – 4: Legendre polynomials (15h)
1. Definition, Solution of Legendre's equation, Legendre polynomial of degree n, generating function of Legendre polynomials. , General solution of Legendre's Equation (derivations not)x(and Qn)x (2. Definition of Pn is the coefficient of h)x(required) to show that Pn n , in the expansion of $(1 - 2xh + h^2)^{-1}$ 2 3. Orthogonal properties of Legendre's polynomials, Recurrence formulas for Legendre's Polynomials.

CO-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 series form=0, Definitionof .)x(recurrence for mulae for Jn ,)x(Jn , orthogonally of Bessel functions.)x(3. Generating function for Jn