CO – PO MAPPING

FOR

B.Sc (MATHEMATICS)

(W. E. F 2020-21)

DEPARTMENT OF MATHEMATICS

D. S. GOVT. COLLEGE (W), ONGOLE.

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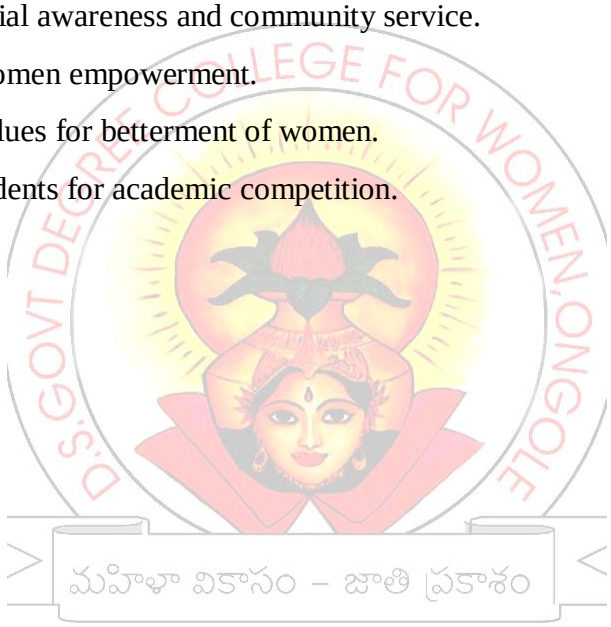
Vision

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.



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 mathematical thought 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 to ground level by mathematical modelling etc.
4. To conduct seminar, group discussion, workshop etc. for the students.

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 of critical 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 women students' betterment.
6. Actively promote social awareness through community service, contributing to a more inclusive 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 equitable future.

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 computationalproblem

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 theparadigm, its applicability; benefits, as well as current and future challenges

PSO5 Understand the key security and compliance challenges of cloud computing

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.

CO No	Upon the successful completion of the course students will be able to	PO's/PSO's	Cognitive level
CO1	Demonstrate the fundamental concepts, principles, and techniques related to first-order and higher-order differential equations.	PO1, PO5	L1, L2,L3
CO2	Understand various methods and apply the methods to solve differential equations	PO1, PO2	L2, L3
CO3	Critically analyze and evaluate the solutions obtained for differential equations	PO2, PO3	L4, L5

Mapping COs to POs: Alignment on a Three-Point Scale from Weak to Strong

	PO							
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	3				2		2	1
CO2	3	3					2	1
CO3		3	3	1			2	1

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

Mapping of CO's and PO's

CO No	Upon the successful completion of the course students will be able to	PO's/PSO's	Cognitive level
CO1	Acquire the basic knowledge of planes, lines, spheres, and cones	PO1	L1
CO2	Demonstrate and apply the basic idea of lines, spheres, and cones.	PO1, PO2	L2, L3
CO3	Understand the properties of planes, lines, spheres, and cones and apply them to solve problems.	PO1, PO2, PO4	L2, L3
CO4	Demonstrating critical thinking to choose the most suitable geometric approach for a given problem.	PO2, PO4	L3, L4

Mapping COs to POs: Alignment on a Three-Point Scale from Weak to Strong

	PO							
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	3							
CO2	3	3						
CO3	3	3		2				
CO4		3		2			1	1

COURSE 3: ABSTRACT ALGBRA

CO1. Acquire the basic knowledge and structure of groups, subgroups, cyclic groups, and the significance 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 homomorphisms, isomorphisms, 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.

Mapping of CO's and PO's

CO No	Upon the successful completion of the course students will be able to	PO's/PSO's	Cognitive level
CO1	Acquire the basic knowledge and structure of groups, subgroups, cyclic groups, and the significance of the notation of normal subgroups.	PO1, PO2	L1, L2
CO2	Study the behavior of permutations and operations on them.	PO1, PO2	L2
CO3	Evaluate and analyze the concepts of homomorphisms, isomorphisms, and permutations, along with their properties and applications, including Cayley's theorem.	PO1, PO2, PO4	L4, L5
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.	PO1, PO2, PO7	L2, L3

Mapping COs to POs: Alignment on a Three-Point Scale from Weak to Strong

CO	**PO**							
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	3	1						
CO2	3	3						
CO3	3	3		2			2	1
CO4	3	3					2	1

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 sequences and 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 context of real-valued functions.
- Application: Apply the conditions of continuity and differentiability to verify the applicability of Mean value theorems.

Mapping of CO's and PO's

CO No	Upon the successful completion of the course students will be able to	PO's/PSO's	Cognitive level
CO1	Get a clear idea about the real numbers and real-valued functions, sequences, series, limits, continuity, differentiability and integration	PO1	L1, L2
CO2	Obtain the skills to analyze and evaluate the convergence of a sequence/series.	PO2, PO4	L4, L5
CO3	Test the continuity and differentiability of a function and apply Riemann integration.	PO2, PO3, PO7	L3, L4, L5, L6
CO4	Understand the geometrical interpretation of mean value theorems and their applications.	PO2, PO4	L2, L3

Mapping COs to POs: Alignment on a Three-Point Scale from Weak to Strong

	PO							
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	3							
CO2		3		2			2	1
CO3		3	3				3	1
CO4		3		3				1

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.

Mapping of CO's and PO's

CO No	Upon the successful completion of the course students will be able to	PO's/PSO's	Cognitive level
CO1	Develop a foundational understanding of vector spaces, subspaces, bases, dimensions, Linear transformations and Inner product spaces	PO1	L1, L2
CO2	Analyze the properties of vector spaces and subspaces through mathematical proofs.	PO2, PO4	L3, L4
CO3	Apply the concepts of linear transformations to solve problems in various contexts.	PO2, PO7	L3, L4
CO4	Utilize the Cayley-Hamilton theorem to find the inverse of a matrix and calculate higher powers of matrices without using routine methods.	PO4	L5, L6

Mapping COs to POs: Alignment on a Three-Point Scale from Weak to Strong

CO	**PO**							
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	3							
CO2		3		2				1
CO3		3					2	1
CO4				2				1

Course 6B: Multiple integrals and applications of Vector Calculus

CO1. Learn multiple integrals, including double integrals for functions of two variables an triple integrals for functions of three variables, and apply them to find surface area and volume

- Understanding (L2): Understand the concepts of multiple integrals, including double integrals for functions of two variables and triple integrals for functions of three variables.
- Applying (L3): Apply multiple integrals to find surface area and volume of various shapes and regions.

CO2. Determine the gradient, divergence, and curl of a vector &vector identities.

- Knowledge (L1): Recall the definitions of gradient, divergence, and curl of a vector field.
- Understanding (L2): Explain the concepts of gradient, divergence, and curl, including their physical interpretations and describe vector identities involving gradients, divergence, and curl.

CO3. Evaluate line, surface, and volume integrals

- Understanding (L2): Understand the concept of line, surface, and volume integrals and explain the differences and purposes of line, surface, and volume integrals.
- Applying (L3): Apply the concept of line integrals to calculate the effect of vector fields along curves.
- Evaluation: Evaluate volume integrals for scalar and vector fields within 3D regions.

CO4. Understand relation between surface and volume integrals (gauss divergence theorem), relation between line integral and volume integral (Green's theorem), relation between Line and surface integral (Stokes theorem)

- Application (L3): Apply Gauss's Divergence Theorem to relate surface and volume integrals, understanding their connection in the context of field behavior, use Green's Theorem to relate line integrals around closed curves to double integrals over enclosed regions and apply Stokes' Theorem to connect line integrals and surface integrals.
- Analysis (L4): Analyze the implications and consequences of Gauss's Divergence Theorem, Green's Theorem, and Stokes' Theorem in various scenarios.
- Creating (L6): Formulate solutions to complex problems that involve gradients, divergence, curl, and different types of integrals, applying the theorems as needed.

Mapping of CO's and PO's

CO No	Upon the successful completion of the course students will be able to	PO's/PSO's	Cognitive level
CO1	Learn multiple integrals, including double integrals for functions of two variables and triple integrals for functions of three variables, and apply them to find surface area and volume.	PO1, PO2	L2, L3
CO2	Determine the gradient, divergence, and curl of a vector &vector identities.	PO1	L1, L2
CO3	Evaluate line, surface, and volume integrals.	PO1, PO2	L2, L3
CO4	Understand relation between surface and volume integrals (gauss divergence theorem), relation between line integral and volume integral (Green's theorem), relation between Line and surface integral (Stokes theorem)	PO1, PO2, PO7	L2, L3, L4, L6

Mapping COs to POs: Alignment on a Three-Point Scale from Weak to Strong

CO	**PO**							
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	3	3						
CO2	3							
CO3	3	3					2	1
CO4	3	3					2	

Course 7B: Integral Transforms with Application

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.

CO2. Determine the properties of Laplace transforms that can be solved using special functions such as the Dirac delta function, error function, Bessel function, and periodic functions.

- Application (L3): Apply the properties of Laplace transforms to functions involving special functions like Dirac delta, error function, Bessel function, and periodic functions.
- Analyzing (L4): Analyze how the properties of Laplace transforms can simplify solving differential equations involving special functions.

CO3. Understand the properties of inverse Laplace transforms and find inverse Laplace transforms of derivatives and integrals.

- Understanding (L2): Understand the concept of inverse Laplace transforms and how they relate to the original functions.
- Application (L3): Apply the properties of inverse Laplace transforms to find the inverse transforms of functions involving derivatives and integrals.

CO4. Solve ordinary differential equations with constant/variable coefficients using the Laplace transform method.

- Application (L3): Apply the Laplace transform method to solve ordinary differential equations (ODEs) with constant coefficients.
- Analyzing (L4): Analyze the steps involved in solving ODEs using the Laplace transform method and how it simplifies

Mapping of CO's and PO's

CO No	Upon the successful completion of the course students will be able to	PO's/PSO's	Cognitive level
CO1	Understand the evaluation of Laplace transforms of specific functions and find Laplace transforms of derivatives and integrals.	PO1, PO2	L1, L2, L3
CO2	Determine the properties of Laplace transforms that can be solved using special functions such as the Dirac delta function, error function, Bessel function, and periodic functions.	PO2	L3, L4
CO3	Understand the properties of inverse Laplace transforms and find inverse Laplace transforms of derivatives and integrals.	PO1, PO2	L2, L3
CO4	Solve ordinary differential equations with constant/variable coefficients using the Laplace transform method.	PO2, PO7	L3, L4

Mapping COs to POs: Alignment on a Three-Point Scale from Weak to Strong

CO	**PO**							
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	3	3						
CO2	3	3	1					1
CO3	3	3						1
CO4		3	1				2	