

GDC Memorial College, Bahal (Bhiwani)

Department of Mathematics

2017-18(Odd)

Learning Objective & Outcomes

B.Sc. – 1st Semester

Subject : Algebra

Subject Code : MA01 (1)

Learning Objective

1. Work with matrices and determine if a given square matrix is invertible.
2. Learn to solve systems of linear equations and application problems requiring them.
3. Learn to compute determinants and know their properties.
4. Learn to find and use eigenvalues and eigenvectors of a matrix.
5. Learn about and work with vector spaces and subspaces.

Learning Outcomes

After the completion of the course, Students will be able to

1. Find the inverse of a square matrix.
2. Solve the matrix equation $Ax = b$ using row operations and matrix operations.
3. Find the determinant of a product of square matrices, of the transpose of a square matrix, and of the inverse of an invertible matrix
4. Find the characteristic equation, eigenvalues and corresponding eigenvectors of a given matrix.
5. Determine if a given matrix is diagonalizable.

GDC Memorial College, Bahal (Bhiwani)

Department of Mathematics

2017-18(Odd)

Learning Objective & Outcomes

B.Sc. 1st Semester

Subject: Calculus

Subject Code: MA01(2)

Learning Objective

1. Use the fact that the derivative is the slope of the tangent line to the curve at a given point to help determine the derivatives of simple linear functions.
2. Determine whether the equation of a function given is differentiable or continuous at a particular value of x .
3. Determine the information from a graph that when the second derivative is positive the graph is concave upward, when the second derivative is negative the graph is concave downward, and when there is a switch in sign there is an inflection point.
4. Understand the various forms of a line including: standard form, point slope form, and slope intercept form.
5. Calculate definite integrals that may involve logarithms, exponentials, polynomials, and powers by using the Fundamental Theorem of Calculus.

Learning Outcomes

After the completion of the course, Students will be able to

1. understand the relationship between the derivative and the definite integral as expressed in both parts of the Fundamental Theorem of Calculus.
2. locate the x and y intercepts, any undefined points, and any asymptotes.
3. determine asymptotes for rational expressions (we will not go into these graphs in much detail)
4. apply the techniques from the previous section to graph a fourth degree polynomial or higher
5. determine if there is any symmetry to aid in the graphing process.
6. determine the point(s) of intersection of pairs of curves.

GDC Memorial College, Bahal (Bhiwani)

Department of Mathematics

2017-18(Odd)

Learning Objective & Outcomes

B.Sc. 1st Semester

Subject: Solid Geometry

Subject Code: MA01(3)

Learning Objective

1. To get basic knowledge about Circle, Cone, Parabola, Hyperbola, Ellipse etc.
2. To understand the concepts & advance topics related to two & three dimensional geometry.
3. To study the applications of conics.
4. To study the application of Sphere, cone and cylinder.
5. To study how to trace the curve.

Learning Outcomes

After the completion of the course, Students will be able to

1. understand geometrical terminology for angles, triangles, quadrilaterals and circles.
2. measure angles using a protractor.
3. use geometrical results to determine unknown angles.
4. recognise line and rotational symmetries.
5. find the areas of triangles, quadrilaterals and circles and shapes based on these.

GDC Memorial College, Bahal (Bhiwani)

Department of Mathematics

2017-18(Even)

Learning Objective & Outcomes

B.Sc.(Mathematics) 2nd Semester

Subject :Number Theory And Trigonometry

Subject Code : MA02(1)

Learning Objective

1. Define and interpret the concepts of divisibility, congruence, greatest common divisor, prime, and prime-factorization.
2. Apply the Law of Quadratic Reciprocity and other methods to classify numbers as primitive roots, quadratic residues, and quadratic non-residues.
3. Formulate and prove conjectures about numeric patterns.
4. Produce rigorous arguments (proofs) centered on the material of number theory, most notably in the use of Mathematical Induction and/or the Well Ordering Principal in the proof of theorems.
5. Evaluate trigonometric and inverse trigonometric functions.
6. Solve trigonometric equations and applications.
7. Apply and prove trigonometric identities.

Learning Outcomes

After the completion of the course, Students will be able to

1. Demonstrate knowledge and understanding of topics including, but not limited to divisibility, prime numbers, congruences, quadratic reciprocity, Diophantine equations.
2. Learn methods and techniques used in number theory.
3. Write programs/functions to compute number theoretic functions.
4. Use mathematical induction and other types of proof writing techniques.
5. Evaluate trigonometric and inverse trigonometric functions.
6. Solve trigonometric equations and applications.
7. Apply and prove trigonometric identities.

GDC Memorial College, Bahal (Bhiwani)

Department of Mathematics

2017-18(Even)

Learning Objective & Outcomes

B.Sc. 2nd Semester

Subject: Ordinary Differential Equations

Subject Code: MA02(2)

Learning Objective

1. Evaluate first order differential equations including separable, homogeneous, exact, and linear.
2. Show existence and uniqueness of solutions.
3. Solve second order and higher order linear differential equations.
4. Create and analyze mathematical models using higher order differential equations to solve application problems such as harmonic oscillator and circuits.
5. Solve differential equations using variation of parameters
6. Solve linear systems of ordinary differential equations

Learning Outcomes

After the completion of the course, Students will be able to

1. Student will be able to solve first order differential equations utilizing the standard techniques for separable, exact, linear, homogeneous, or Bernoulli cases.
2. Student will be able to find the complete solution of a nonhomogeneous differential equation as a linear combination of the complementary function and a particular solution.
3. Student will be introduced to the complete solution of a nonhomogeneous differential equation with constant coefficients by the method of undetermined coefficients.
4. Student will be able to find the complete solution of a differential equation with constant coefficients by variation of parameters.
5. Student will have a working knowledge of basic application problems described by second order linear differential equations with constant coefficients.

GDC Memorial College, Bahal (BHiwani)

Department of Mathematics

2017-18(Even)

Learning Objective & Outcomes

B.Sc.(Mathematics) 2nd Semester

Subject : Vector Calculus

Subject Code : MA02(3)

Learning Objectives

1. Define vector fields.
2. Calculate line integrals along piecewise smooth paths; interpret such quantities as work done by a force .
3. Use the fundamental theorem of line integrals.
4. Use Green's theorem to evaluate line integrals along simple closed contours on the plane.
5. Compute the curl and the divergence of vector fields.
6. Apply Stokes' theorem to compute line integrals along the boundary of a surface.
7. Use Stokes' theorem to give a physical interpretation of the curl of a vector field.
8. Use the divergence theorem to give a physical interpretation of the divergence of a vector field.

Learning Outcomes

1. Memorize definition of directional derivative and gradient and illustrate geometric meanings with the aid of sketches.
2. Memorize theorem relating directional derivative to gradient and reproduce proof.
3. Calculate directional derivatives and gradients.
4. Apply gradient to solve problems involving normal vectors to level surfaces.
5. Explain the concept of a vector integration a plane and in space.

GDC Memorial College, Bahal (Bhiwani)

Department of Mathematics

2017-18(odd)

Learning Objective & Outcomes

B.Sc. 3rd Semester

Subject : Advanced Calculus

Subject Code : MA03(1)

Learning Objectives

1. To understand Different indeterminate forms of limit.
2. Calculate functional value in neighbourhood of some point using expansions.
3. To understand the behaviour of curve in space.
4. Continuity and Limits - Prove convergence and divergence of limits using the ϵ - δ definition.
5. Differentiation - Identify and prove basic facts about derivatives and their properties.
6. To understand the maximum and minimum behaviour of a function of two variables.

Learning Outcomes

1. The student is expected to learn about the basic principles of multi-variable calculus with proofs.
2. To have full knowledge of calculus involving the fundamental tools such as continuity and differentiability.
3. Students are able to reason rigorously in mathematical arguments. They can follow abstract mathematical arguments and write their own proofs.
4. Students are able to effectively communicate mathematics: reading, writing, listening, and speaking. Students make effective use of the library, conduct research and make oral and written presentations of their findings.
5. To know Relationship between the increasing and decreasing behavior of f and the sign of f

GDC Memorial College, Bahal (Bhiwani)

Department of Mathematics

2017-18(Odd)

Learning Objective & Outcomes

B.Sc. 3th Semester

Subject: Partial Differential Equation

Subject Code: MA03(2)

Learning Objective

1. Introduce students to partial differential equations.
2. Introduce students to how to solve linear Partial Differential with different methods.
3. To derive heat and wave equations in 2D and 3D.
4. Find the solutions of PDEs are determined by conditions at the boundary of the spatial domain and initial conditions at time zero.
5. Technique of separation of variables to solve PDEs and analyze the behavior of solutions in terms of eigen function expansions.

Learning Outcomes

After the completion of the course, Students will be able to

1. classify partial differential equations and transform into canonical form
2. solve linear partial differential equations of both first and second order
3. apply partial derivative equation techniques to predict the behaviour of certain phenomena.
4. apply specific methodologies, techniques and resources to conduct research and produce innovative results in the area of specialisation.
5. extract information from partial derivative models in order to interpret reality.
6. identify real phenomena as models of partial derivative equations.

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Department of Mathematics

2017-18(Odd)

Learning Objective & Outcomes

B.Sc. – 3rd Semester

Subject : Statics

Subject Code : MA03(3)

Learning Objective

1. Develop an understanding of the principles of statics
2. Develop an ability to analyze problems in a systematic and logical manner, including the ability to draw free-body diagrams.
3. Ability to analyze the statics of trusses, frames and machine.
4. Ability to apply laws of statics.
5. To know the knowledge of equilibrium conditions of a static body.

Learning Outcomes

After the completion of the course, Students will be able to

1. An ability to construct free-body diagrams and to calculate the reactions necessary to ensure static equilibrium.
2. An understanding of the analysis of distributed loads.
3. A knowledge of internal forces and moments in members.
4. An ability to calculate centroids and moments of inertia.

GDC Memorial College, Bahal (Bhiwani)

Department of Mathematics

2017-18(Even)

Learning Objective & Outcomes

B.Sc.(Mathematics) 4thSemester

Subject : Sequences And Series

Subject Code : MA04(1)

Learning Objective

1. Learn to work with logarithmic, exponential, and inverse trigonometric functions.
2. Learn to work with infinite sequences and series.
3. Learn to work with infinite sequence is bounded.
4. Learn to work with an infinite sequence is monotonic.
5. Learn to work with an infinite sequence is convergent or divergent.
6. Find the sequence of partial sums of an infinite series.
7. Determine if a geometric series is convergent or divergent.
8. Find the sum of a convergent geometric series.

Learning Outcomes

After the completion of the course, Students will be able to

1. Determine if an infinite sequence is bounded.
2. Determine if an infinite sequence is monotonic.
3. Determine if an infinite sequence is convergent or divergent.
4. Find the sequence of partial sums of an infinite series.
5. Determine if a geometric series is convergent or divergent.
6. Find the sum of a convergent geometric series.
7. Determine if an infinite series is convergent or divergent by selecting the appropriate test from the following: (a) test for divergence; (b) integral test; (c) p-series test; (d) the comparison tests; (e) alternating series test; (f) absolute convergence test; (g) ratio test; and (h) root test.
8. Determine if an infinite series converges absolutely or conditionally.

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2017-18 (Even)

Learning Objective & Outcomes

B.Sc. 4th Semester

Subject: Special Function & Integral Transforms

Subject Code: MA04(2)

Learning Objective

1. To analyze properties of special functions by their integral representations and symmetries.
2. To determine properties of Fourier Transform which may be solved by application of special functions.
3. To determine properties of Laplace Transform which may be solved by application of special functions.
4. To determine properties of Legendre Polynomial which may be solved by application of special functions.

Learning Outcomes

After the completion of the course, Students will be able to

1. understand integral calculus and special functions of various engineering problem and to know the application of some basic mathematical methods via all these special functions.
2. explain the applications and the usefulness of these special functions.
3. classify and explain the functions of different types of differential equations.
4. understand purpose and functions of the gamma and beta functions, Fourier series and Transformation.
5. use the gamma function, beta function and special functions to: evaluate different types of integral calculus problems and Fourier series to solve differential equations.

GDC Memorial College, Bahal (Bhiwani)

Department of Mathematics

2017-18(Even)

Learning Objective & Outcomes

B.Sc. 4th Semester

Subject: Programming in C & Numerical Methods

Subject Code: MA04(3)

Learning Objective

1. To develop programming skills using the fundamentals and basics of C language.
2. To study the advantages of user defined data type that provides flexibility for application development.
3. To enable effective usage of arrays, structures, functions and pointers.
4. Derive appropriate numerical methods to solve algebraic and transcendental equations.
5. Derive appropriate numerical methods to solve a linear system of equations.
6. Prove results for various numerical root finding methods.

Learning Outcomes

After the completion of the course, Students will be able to

1. Read, understand and trace the execution of programs written in C language.
2. Write the C code for a given algorithm.
3. Write programs that perform operations using derived data types.
4. Solve an algebraic or transcendental equation using an appropriate numerical method.
5. Solve a linear system of equations using an appropriate numerical method.
6. Perform an error analysis for a given numerical method.

GDC Memorial College, Bahal (Bhiwani)

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2017-18(Odd)

Learning Objective & Outcomes

B.Sc. (Mathematics) 5th Semester

Subject: Real Analysis

Subject Code: MA05(1)

Learning Objective

The student will:

1. Define the real numbers, least upper bounds, and the triangle inequality.
2. Define functions between sets; equivalent sets; finite, countable and uncountable sets.
Recognize convergent, divergent, bounded, Cauchy and monotone sequences.
3. Calculate the limit superior, limit inferior, and the limit of a sequence.
4. Recognize alternating, convergent, conditionally and absolutely convergent series.
5. Determine if subsets of a metric space are open, closed, connected, bounded, totally bounded and/or compact.
6. Determine if a function on a metric space is discontinuous, continuous, or uniformly continuous.

Learning Outcomes

After the completion of the course, Students will be able to

1. describe fundamental properties of the real numbers that lead to the formal development of real analysis.
2. comprehend rigorous arguments developing the theory underpinning real analysis.
3. demonstrate an understanding of limits and how they are used in sequences, series, differentiation and integration.
4. construct rigorous mathematical proofs of basic results in real analysis.
5. appreciate how abstract ideas and rigorous methods in mathematical analysis can be applied to important practical problems.

GDC Memorial College, Bahal (Bhiwani)

Department of Mathematics

2017-18 (Odd)

Learning Objective & Outcomes

B.Sc. 5th Semester

Subject: Groups & Rings

Subject Code: MA05(2)

Learning Objective

1. Present the relationships between abstract algebraic structures with familiar numbers systems such as the integers and real numbers.
2. Present concepts of and the relationships between operations satisfying various properties (e.g. commutative property).
3. Present concepts and properties of various algebraic structures.
4. Discuss the importance of algebraic properties relative to working within various number systems.
5. Develop the ability to form and evaluate conjectures.

Learning Outcomes

After the completion of the course, Students will be able to

1. understand the importance of algebraic properties with regard to working within various number systems.
2. extend group structure to finite permutation groups (Cayley's Theorem).
3. understand Sylow's Theorems.
4. generate groups given specific conditions.
5. investigate symmetry using group theory.
6. understand the three major concrete models of Boolean algebra: the algebra of sets, the algebra of electrical circuits, and the algebra of logic.

GDC Memorial College, Bahal (Bhiwani)

Department of Mathematics

2017-18(Odd)

Learning Objective & Outcomes

B.Sc. – 5th Semester

Subject : Dynamics

Subject Code : MA05(3)

Learning Objective

1. Develop an understanding of the principles of dynamics.
2. Develop an ability to analyze problems in a systematic and logical manner, including the ability to draw free-body diagrams of rigid body.
3. Ability to analyze the dynamics of rigid body.
4. Discuss the motion on smooth and rough planes.
5. Discuss general motion of rigid body, Keplers laws.

Learning Outcomes

After the completion of the course, Students will be able to

1. An ability to construct free-body diagrams.
2. An understanding of the analysis of distributed loads.
3. A knowledge of internal forces and moments in members.
4. Apply Keplers laws to solve the problems.

GDC Memorial College, Bahal (Bhiwani)

Department of Mathematics

2017-18(Even)

Learning Objective & Outcomes

B.Sc. 6th Semester

Subject: Real & Complex Analysis

Subject Code: MA06(1)

Learning Objective

1. Understand how complex numbers provide a satisfying extension of the real numbers;
2. Learn techniques of complex analysis that make practical problems easy (e.g. graphical rotation and scaling as an example of complex multiplication);
3. Appreciate how mathematics is used in design (e.g. conformal mapping);
4. Unlearn (if ever learned) the notion that mathematics is all about getting "the right answer";
5. To understand signals and systems in terms of both the time and transform domains, taking advantage of the complementary insights and tools that these different perspectives provide.
6. Development of the mathematical skills to solve problems involving convolution, filtering, modulation and sampling.

Learning Outcomes

After the completion of the course, Students will be able to

1. Students will be able to understand the concept of limit for real functions and be able to calculate limits of standard functions and construct simple proofs involving this concept;
2. Student will be introduced to the concept of continuity and be familiar with the statements and proofs of the standard results about continuous real functions;
3. Student will understand the concept of the differentiability of a real valued function and be familiar with the statements and proofs of the standard results about differentiable real functions.
4. Student will have a working knowledge of differentiability for complex functions and be familiar with the Cauchy-Riemann equations;
5. Student will evaluate integrals along a path in the complex plane and understand the statement of Cauchy's Theorem.

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2017-18(Even)
Learning Objective & Outcomes
B.Sc.(Mathematics) 6th Semester

Subject :Linear Algebra

Subject Code : MA06(2)

Learning Objective

1. Solve systems of linear equations,
2. Analyze vectors in $\mathbb{R}^n$ geometrically and algebraically,
3. Recognize the concepts of the terms span, linear independence, basis, and dimension, and apply these concepts to various vector spaces and subspaces,
4. Use matrix algebra and the related matrices to linear transformations,
5. Compute and use determinants,
6. Compute and use eigenvectors and eigenvalues,
7. Determine and use orthogonality, and
8. Use technological tools such as computer algebra systems or graphing calculators for visualization and calculation of linear algebra concepts.

Learning Outcomes

After the completion of the course, Students will be able to

1. Identify and construct linear transformations of a matrix.
2. Characterize linear transformations as onto, one-to-one.
3. Solve linear systems represented as linear transforms.
4. Express linear transforms in other forms, such as as matrix equations, and vector equations.
5. Characterize a set of vectors and linear systems using the concept of linear independence.

GDC Memorial College, Bahal (Bhiwani)

Department of Mathematics

2017-18(Even)

Learning Objective & Outcomes

B.Sc. 6th Semester

Subject: Numerical Analysis

Subject Code: MA06(3)

Learning Objective

1. The course will also develop an understanding of the elements of error analysis for numerical methods and certain proofs.
2. The main objective of this course is to provide students with an introduction to the field of numerical analysis.
3. Derive appropriate numerical methods to solve interpolation based problems.
4. Derive appropriate numerical methods to solve probability based problems.
5. Prove results for various numerical root finding methods.

Learning Outcomes

After the completion of the course, Students will be able to

1. understand the theoretical and practical aspects of the use of numerical analysis.
2. proficient in implementing numerical methods for a variety of multidisciplinary applications.
3. establish the limitations, advantages, and disadvantages of numerical analysis.
4. derive numerical methods for various mathematical operations and tasks, such as interpolation, differentiation, integration, the solution of linear and nonlinear equations, and the solution of differential equations.
5. understand of common numerical analysis and how they are used to obtain approximate solutions to otherwise intractable mathematical problems.