RPS Degree College, Balana (Mahendergarh)

Department of Mathematics

2019-20

Learning Objective & Outcomes

B.A. – 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.

RPS Degree College, Balana (Mahendergarh)

Department of Mathematics

2019-20

Learning Objective & Outcomes

B.A. 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.

RPS Degree College, Balana (Mahendergarh)

Department of Mathematics

2019-20

Learning Objective & Outcomes

B.A. 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.

RPS Degree College, Balana (Mahendergarh)

Department of Mathematics

2019-20

Learning Objective & Outcomes

B.A.(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.

RPS Degree College, Balana (Mahendergarh)

Department of Mathematics

2019-20

Learning Objective & Outcomes

B.A. 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.

RPS Degree College, Balana (Mahendergarh)

Department of Mathematics

2019-20

Learning Objective & Outcomes

B.A.(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.

RPS Degree College, Balana (Mahendergarh)

Department of Mathematics

2019-20

Learning Objective & Outcomes

B.A. 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 expensions.
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

RPS Degree College, Balana (Mahendergarh)

Department of Mathematics

2019-20

Learning Objective & Outcomes

B.A. 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.

RPS Degree College, Balana (Mahendergarh)

Department of Mathematics

2019-20

Learning Objective & Outcomes

B.A. – 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.

RPS Degree College, Balana (Mahendergarh)

Department of Mathematics

2019-20

Learning Objective & Outcomes

B.A.(Mathematics) 4th Semester

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.

RPS Degree College, Balana (Mahendergarh)

Department of Mathematics

2017-18 (Even)

Learning Objective & Outcomes

B.A. 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 known 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.

RPS Degree College, Balana (Mahendergarh)

Department of Mathematics

2019-20

Learning Objective & Outcomes

B.A. 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.

RPS Degree College, Balana (Mahendergarh)

Department of Mathematics

2019-20

Learning Objective & Outcomes

B.A. (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.

RPS Degree College, Balana (Mahendergarh)

Department of Mathematics

2017-18 (Odd)

Learning Objective & Outcomes

B.A. 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.

RPS Degree College, Balana (Mahendergarh)

Department of Mathematics

2019-20

Learning Objective & Outcomes

B.A. – 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.

RPS Degree College, Balana (Mahendergarh)

Department of Mathematics

2019-20

Learning Objective & Outcomes

B.A. 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.

RPS Degree College, Balana (Mahendergarh)

Department of Mathematics

2019-20

Learning Objective & Outcomes

B.A.(Mathematics) 6th Semester

Subject :Linear Algebra **Subject Code : MA06(2)**

Learning Objective

1. Solve systems of linear equations,
2. Analyze vectors in 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.

RPS Degree College, Balana (Mahendergarh)

Department of Mathematics

2019-20

Learning Objective & Outcomes

B.A. 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.

RPS Degree College, Balana (Mahendergarh)

Department of Mathematics

2019-20

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.

RPS Degree College, Balana (Mahendergarh)

Department of Mathematics

2019-20

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.

RPS Degree College, Balana (Mahendergarh)

Department of Mathematics

2019-20

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.

RPS Degree College, Balana (Mahendergarh)

Department of Mathematics

2019-20

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.

RPS Degree College, Balana (Mahendergarh)

Department of Mathematics

2019-20

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.

RPS Degree College, Balana (Mahendergarh)

Department of Mathematics

2019-20

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.

RPS Degree College, Balana (Mahendergarh)

Department of Mathematics

2019-20

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 expensions.
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

RPS Degree College, Balana (Mahendergarh)

Department of Mathematics

2019-20

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.

RPS Degree College, Balana (Mahendergarh)

Department of Mathematics

2019-20

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.

RPS Degree College, Balana (Mahendergarh)

Department of Mathematics

2019-20

Learning Objective & Outcomes

B.Sc.(Mathematics) 4th Semester

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.

RPS Degree College, Balana (Mahendergarh)

Department of Mathematics

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 known 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.

RPS Degree College, Balana (Mahendergarh)

Department of Mathematics

2019-20

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.

RPS Degree College, Balana (Mahendergarh)

Department of Mathematics

2019-20

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.

RPS Degree College, Balana (Mahendergarh)

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.

RPS Degree College, Balana (Mahendergarh)

Department of Mathematics

2019-20

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.

RPS Degree College, Balana (Mahendergarh)

Department of Mathematics

2019-20

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.

RPS Degree College, Balana (Mahendergarh)

Department of Mathematics

2019-20

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 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.

RPS Degree College, Balana (Mahendergarh)

Department of Mathematics

2019-20

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.

RPS Degree College, Balana (Mahendergarh)

Department of Mathematics

Learning Objective & Outcomes

M.Sc. (Mathematics) 1st Semester

Subject: Abstract Algebra-I

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. Generate groups given specific conditions.
2. Investigate symmetry using group theory.
3. Identify plane periodic patterns (lattices).
4. Understand the base of the coding theory as an application of finite fields.
5. Demonstrate knowledge that the rational numbers and real numbers can be ordered and that the complex numbers cannot be ordered, but that any polynomial equation with real coefficients can be solved in the complex field.
6. Discuss the three major concrete models of Boolean algebra: the algebra of sets, the algebra of electrical circuits, and the algebra of logic.
7. Describe other applications of abstract algebra such as in avoiding problems of round off in computations

RPS Degree College, Balana (Mahendergarh)

Department of Mathematics

Learning Objective & Outcomes

M.Sc. (Mathematics) 1st Semester

Subject: Measure & Integration

Learning Objective

1. Revision of basic tools, including in particular the concept of countable/uncountable sets.
2. Be able to describe at least one approach to the construction of Lebesgue measure, the Lebesgue integral of a function and measure spaces.
3. Know the principal theorems as treated and their proofs and be able to use them in the investigation of examples.
4. Be able to prove simple unseen propositions concerning measure spaces, Lebesgue measure and integration.
5. To gain understanding of the abstract measure theory and definition and main properties of the integral.
6. To construct Lebesgue's measure on the real line and in n-dimensional Euclidean space.
7. To explain the basic advanced directions of the theory.

Learning Outcomes

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

1. understand σ-algebras, measurable sets, measures, outer measures, Lebesgue measure and its properties, completion of measures.
2. understand measurable functions, approximation by simple functions.
3. understand Lebesgue integral, Monotone Convergence Theorem, Dominated Convergence Theorem, coincidence of Lebesgue and Riemann integral for Riemann integrable functions.
4. develop an appreciation of the basic concepts of measure theory. These methods will be useful for further study in a range of other fields, e.g. Stochastic calculus, Quantum Theory and Harmonic analysis.
5. establish relation to graduate attributes: The above outcomes are related to the development of the Science Faculty Graduate Attributes, in particular: Research, inquiry and analytical thinking abilities, Communication, and Information literacy

RPS Degree College, Balana (Mahendergarh)

Department of Mathematics

Learning Objective & Outcomes

M.Sc. (Mathematics) Ist Semester

Subject : Mechanics

Learning Objective

1. To demonstrate knowledge and understanding of the following fundamental concepts in the dynamics of system of particles,
2. To demonstrate knowledge and understanding of the following fundamental concepts in motion of rigid body,
3. To demonstrate knowledge and understanding of the following fundamental concepts in Lagrangian and Hamiltonian formulation of mechanics
4. To represent the equations of motion for complicated mechanical systems using the Lagrangian and Hamiltonian formulation of classical mechanics.
5. To develop math skills.

Learning Outcomes

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

1. define and understand basic mechanical concepts related to discrete and continuous mechanical systems,
2. describe and understand the vibrations of discrete and continuous mechanical systems,
3. describe and understand planar and spatial motion of a rigid body,
4. describe and understand the motion of a mechanical system using Lagrange-Hamilton formalism.

RPS Degree College, Balana (Mahendergarh)

Department of Mathematics

Learning Objective & Outcomes

M.Sc. (Mathematics) Ist Semester

Subject : Ordinary Differential Equation

Learning Objective

1. To aware the students about initial value and boundary value problems and their corresponding equivalent integral equations.
2. To aware the students about concepts of approximate solution and existence theorem.
3. To familiarize the students about Adjoint system in detail.
4. Detailed study of Fundamental Set and matrix.
5. To demonstrate knowledge and understanding of Critical points in Autonomous system and their stability.

Learning Outcomes

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

1. Solve problems in ordinary differential equations, dynamical systems, stability theory, and a number of applications to scientific and engineering problems.
2. Demonstrate their ability to write coherent mathematical proofs and scientific arguments needed to communicate the results obtained from differential equation models.
3. Demonstrate their understanding of how physical phenomena are modelled by differential equations and dynamical systems.
4. Implement solution methods using appropriate technology, and
5. Investigate the qualitative behavior of solutions of systems of differential equations

RPS Degree College, Balana (Mahendergarh)

Department of Mathematics

Learning Objectives & Outcomes

M.Sc. (Mathematics) 1st Semester

Subject: Communication Skills

Learning Objectives

1. Students will demonstrate competency in research skills related to the use of the field's professional literature and in systematic research design and implementation.
2. Students will demonstrate an understanding of multiple theoretical perspectives and diverse intellectual traditions in Communication.
3. Students will demonstrate competency in human relational interaction.
4. Students will demonstrate competency in the analysis and practice of ethical communication.
5. Students will demonstrate an understanding of the importance of free expression and the responsibilities it entails.
6. Students will demonstrate competency in effective communication with diverse others and an understanding of the impact of culture on communication

Learning outcomes

After completion of the course Students will be able to

1. Demonstrate critical and innovative thinking
2. Display competence in oral, written, and visual communication.
3. Apply communication theories.
4. Show an understanding of opportunities in the field of communication.

RPS Degree College, Balana (Mahendergarh)

Department of Mathematics

Learning Objective & Outcomes

M.Sc. (Mathematics) 2nd Semester

Subject: Abstract Algebra-II

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,

1. Student will be able to understand the relationships between abstract algebraic structures with familiar numbers systems such as the integers and real numbers.
2. Student will be able to verify relationships between operations satisfying various properties (e.g. commutative property).
3. Student will be able to work within various algebraic structures.
4. Students will have a working knowledge of important mathematical concepts in abstract algebra such as definition of a module, properties of module and application of module.
5. Students will be knowledgeable of different types of modules such as noetherian module, artinian module and understand the structure and characteristics of these modules.
6. Students will be introduced to and have knowledge of many mathematical concepts studied in abstract mathematics such as Nil ideal and Nilpotent ideal.

RPS Degree College, Balana (Mahendergarh)

Department of Mathematics

Learning Objective & Outcomes

M.Sc. (Mathematics) 2nd Semester

Subject: Complex Analysis

Learning Objective

1. To provide an introduction to the theories for functions of a complex variable.
2. To explore algebraic, geometric and topological structures of the complex number field.
3. To introduce the concepts of analyticity, Cauchy-Riemann relations and harmonic functions.
4. To present Complex integration and complex power series.
5. To discuss the classification of isolated singularities and examine the theory and illustrate the applications of the calculus of residues in the evaluation of integrals.

Learning Outcomes

After the completion of the course,

1. Student will have introduced to the fundamental concepts of complex analysis and their role in modern mathematics and applied contexts.
2. Student will demonstrate to accurate and efficient use of complex analysis techniques.
3. Student will be able to understand capacity for mathematical reasoning through analyzing, proving and explaining concepts from complex analysis
4. Student will be able to apply problem-solving using complex analysis techniques applied to diverse situations in physics, engineering and other mathematical contexts.
5. Student will be able to apply problem-solving using evaluation of improper integral by Cauchy Residue Theorem.

RPS Degree College, Balana (Mahendergarh)

Department of Mathematics

Learning Objective & Outcomes

M.Sc.(Mathematics) 2nd Semester

Subject : Partial Differential Equation.

Learning Objectives

1. Introduce students to partial differential equations.
2. Introduce students to how to solve linear Partial Differential with different methods.
3. Introduce students to some physical problems in Engineering and Biological models that results in partial differential equations. Partial differential equations allow deterministic mathematical formulations of phenomena in physics and engineering as well as biological processes among many other scenarios.
4. The objective of this course is to present the main results in the context of partial differential equations that allow learning about these models and to study numerical methods for the approximation of their solution.
5. To discuss some methods to solve Laplace Heat and Wave Equations.

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 specific methodologies, techniques and resources to conduct research and produce innovative results in the area of specialisation.
4. Extract information from partial derivative models in order to interpret reality. Identify real phenomena as models of partial derivative equations.
5. Solve complex problems of Heat, Wave and Laplace Equations by applying the knowledge acquired to areas that are different to the original ones. Solve real problems by identifying them appropriately from the perspective of partial derivative equations.

RPS Degree College, Balana (Mahendergarh)

Department of Mathematics

Learning Objective & Outcomes

M.Sc.(Mathematics) 2nd Semester

Subject : Numerical Analysis

Learning Objective

The objectives of this course are to:

1. Derive appropriate numerical methods to solve algebraic and transcendental equations & approximating the solution of problems.
2. Analyze the error incumbent in any such numerical approximation.
3. Study different techniques of interpolation.
4. Derive appropriate numerical methods to evaluate a derivative at a value.
5. Derive appropriate numerical methods to solve a linear system of equations.
6. Perform an error analysis for various numerical methods.
7. Study various concepts of difference equations.
8. Derive appropriate numerical methods to calculate a definite integral.

Learning Outcomes

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

1. Solve an algebraic or transcendental equation using an appropriate numerical method.
2. Approximate a function using an appropriate numerical method.
3. Solve a differential equation using an appropriate numerical method.
4. Evaluate a derivative at a value 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.
7. Prove results for numerical root finding methods.
8. Calculate a definite integral using an appropriate numerical method.

RPS Degree College, Balana (Mahendergarh)

Department of Mathematics

Learning Objective & Outcomes

M.Sc.(Mathematics) 2nd Semester

Subject : Mathematical Statistics

Learning Objective

The objectives of this course are to:

1. Understand the theory of statistics and their applications.
2. Understand the concepts of Probability.
3. To analyse different distributions along with their properties.
4. Aware the students about mathematical expectation, variance, moment generating function and moment about mean & about origin.
5. To understand the concepts of testing hypothesis.

Learning Outcomes

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

1. Differentiate between discrete and continuous random variables.
2. Solve the problems related to Bay's theorem.
3. Calculate mean, variance, Standard deviation of different types of theoretical distribution.
4. Apply different types of tests of significance.
5. Differentiate between types of error.
6. Understand Null & alternative hypothesis for testing.

RPS Degree College, Balana (Mahendergarh)

Department of Mathematics

Learning Objective & Outcomes

M.Sc. (Mathematics) 3rd Semester

Subject: Functional Analysis

Learning Objective

1. To know and be able to use the elementary properties of normed and inner product spaces.
2. To be able to check whether a linear operator is bounded, to find its adjoint and determine whether operators are normal, self adjoint, unitary or positive.
3. To determine whether a bounded operator is invertible and understand the importance of the spectrum of a bounded linear operator.
4. To study normed linear spaces and some of the linear operators between them and give some applications of their use.
5. To introduce the theory of Lebesgue integration with the aim of providing examples of complete normed linear spaces of integrable functions.

Learning Outcomes

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

1. improve abilities in mathematical reasoning and in expressing themselves accurately in writing by producing correct mathematical proofs.
2. use logical reasoning to prove theorems.
3. introduced to the concept of continuity and be familiar with the statements and proofs of the standard results about continuous real functions;
4. 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.
5. understand the concept of Signed measure, Baire measure and continuous function with compact support.

RPS Degree College, Balana (Mahendergarh)

Department of Mathematics

Learning Objective & Outcomes

M.Sc. (Mathematics) 3rd Semester

Subject : Elementary Topology

Learning Objective

1. Students will learn the fundamentals of point-set topology
2. Students will learn the fundamentals of algebraic topology
3. Students will be prepared to begin thesis research.
4. Have the knowledge of basic properties of the field of real numbers.
5. Studying Bolzano –Weirstrass theorem and Cauchy criteria.
6. Studying the basic topological properties of the real numbers
7. Studying the notion of continuous functions and their properties

Learning Outcomes

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

1. Define and recognize the basic topological properties of R
2. Students will know the definitions of standard terms in topology.
3. Students will know how to read and write proofs in topology.
4. Students will know a variety of examples and counter examples in topology.
5. Students will know about the fundamental group and covering spaces.
6. Define and recognize the continuity of real functions.

RPS Degree College, Balana (Mahendergarh)

Department of Mathematics

Learning Objective & Outcomes

M.Sc.(Mathematics) 3rd Semester

Subject : Fluid Dynamics

Learning Objectives

1. The student will learn analytical solution techniques for diverse fluid problems, including lubrication flows, boundary layers, and Stokes flow, in steady and unsteady conditions.
2. learn analytical techniques required to solve fluid flow equations for different geometries and flow conditions.
3. learn the fundamentals physics involved in modelling fluids and hydrodynamic phenomena .
4. Through learned analytical methods and basic numerical techniques presented in this course the students will be able to determine volumetric flow rates, shear and pressure drag, and lift forces for different geometric configurations.
5. The course provides fundamental tools for professional engineers working in fluid mechanics.

Learning Outcomes

1. Identify the relevant parameters that govern a fluid system and use dimensional analysis to identify the fundamental variables that define flow [SO1].
2. Analyze microscopic continuum fluid mechanics where flow is governed by the continuity equation and Navier-Stokes equation (differential forms of conservation equations). Evaluate a problem and arrive at reasonable approximations to put the equations in a more soluble form [SO1].
3. Analyze systems using macroscopic fluid mechanics, using the integral form of the conservation equations (Bernoulli's equation) [SO1,SO3].
4. Explain the fundamental properties of fluids, including viscosity, Newtonian and non Newtonian rheology, and viscoelasticity [SO1].
5. Evaluate pressure distributions in a static fluid, taking account of hydrostatic pressure, buoyancy force, and interfacial tension (Laplace pressure and capillary action) [SO1].

RPS Degree College, Balana (Mahendergarh)

Department of Mathematics

Learning Objective & Outcomes

M.Sc.(Mathematics) 3rd Semester

Subject : Mech. Of Solids

Learning Objectives

1. The main objective of the course will be to show how to determine the stress, strain, and deflection suffered by bi-dimensional (and simple tridimensional) structural elements when subjected to different loads (e.g. normal, shear, torsion, bending and combined loads).
2. Once the state of stresses and strains has been established for a particular structure type, the student will be able to evaluate the allowable loads and associated allowable stresses before mechanical failure.
3. Understanding the adequacy of mechanical and structural elements under different loads is essential for the design and safe evaluation of any kind of structure.
4. This course is a major subject in many different engineering careers (Aeronautics, civil engineering, antennas, etc.).

Learning Outcomes

1. Understand the fundamental concepts of stress and strain and the relationship between both through the strain-stress equations in order to solve problems for simple tridimensional elastic solids.
2. Calculate and represent the stress diagrams in bars and simple structures.
3. Solve problems relating to pure and non-uniform bending of beams and other simple structures .
4. Solve problems relating to torsional deformation of bars and other simple tri-dimensional structures.
5. Understand the concept of buckling and be able to solve the problems related to isolated bars.
6. Distinguish between isostatic and hiperstatic problems and be able to use various methods for the resolution of both.
7. Be familiar with at least one software program for the evaluation of structures

RPS Degree College, Balana (Mahendergarh)

Department of Mathematics

Learning Objective & Outcomes

M.Sc. (Mathematics) 3rd Semester

Subject: Advance Complex Analysis

Learning Objective

1. To provide an introduction to the theories for functions of a complex variable.
2. To explore algebraic, geometric and topological structures of the complex number field.
3. To introduce the concepts of integral function, Gamma function and its properties.
4. To present analytic continuation, Germ of an analytic function.
5. To discuss the classification of canonical product, growth and order of an entire function, an estimate of number of zeros.
6. To discuss the range of an analytic function.

Learning Outcomes

After the completion of the course,

1. Student will have introduced to the fundamental concepts of complex analysis and their role in modern mathematics and applied contexts.
2. Student will demonstrate to accurate and efficient use of complex analysis techniques.
3. Student will be able to understand capacity for mathematical reasoning through analyzing, proving and explaining concepts from complex analysis
4. Student will be able to apply problem-solving using complex analysis techniques applied to diverse situations in physics, engineering and other mathematical contexts.
5. Student will be able to solve application of Green function, Poisson-Jensen formula and Borel Theorem.

RPS Degree College, Balana (Mahendergarh)

Department of Mathematics

Learning Objective & Outcomes

M.Sc. (Mathematics) 4th Semester

Subject: Inner Product Space & Measure Theory

Learning Objective

1. To know and be able to use the elementary properties of normed and inner product spaces.
2. To be able to check whether a linear operator is bounded, to find its adjoint and determine whether operators are normal, self adjoint, unitary or positive.
3. To determine whether a bounded operator is invertible and understand the importance of the spectrum of a bounded linear operator.
4. To study normed linear spaces and some of the linear operators between them and give some applications of their use.
5. To introduce the theory of Lebesgue integration with the aim of providing examples of complete normed linear spaces of integrable functions.

Learning Outcomes

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

1. improve abilities in mathematical reasoning and in expressing themselves accurately in writing by producing correct mathematical proofs.
2. use logical reasoning to prove theorems.
3. introduced to the concept of continuity and be familiar with the statements and proofs of the standard results about continuous real functions;
4. 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.
5. understand the concept of Signed measure, Baire measure and continuous function with compact support.

Department of Mathematics

Learning Objective & Outcomes

M.Sc. (Mathematics) 4th Semester

Subject : Classical Mechanics

Learning Objective

1. To demonstrate knowledge and understanding of the following fundamental concepts in the dynamics of system of particles,
2. To demonstrate knowledge and understanding of the following fundamental concepts in motion of rigid body,
3. To demonstrate knowledge and understanding of the following fundamental concepts in Lagrangian and Hamiltonian formulation of mechanics
4. To represent the equations of motion for complicated mechanical systems using the Lagrangian and Hamiltonian formulation of classical mechanics.
5. To develop math skills.

Learning Outcomes

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

1. define and understand basic mechanical concepts related to discrete and continuous mechanical systems,
2. describe and understand the vibrations of discrete and continuous mechanical systems,
3. describe and understand planar and spatial motion of a rigid body,
4. describe and understand the motion of a mechanical system using Lagrange-Hamilton formalism.

Department of Mathematics

Learning Objective & Outcomes

M.Sc.(Mathematics) 4th Semester

Subject : Viscous Fluid Dynamics

Learning Objectives:

1. Learn the fundamentals physics involved in modelling fluids and hydrodynamic phenomena.
2. Learn analytical techniques required to solve fluid flow equations for different geometries and flow conditions.
3. The student will learn analytical solution techniques for diverse fluid problems, including lubrication flows, boundary layers, and Stokes flow, in steady and unsteady conditions.
4. Through learned analytical methods and basic numerical techniques presented in this course the students will be able to determine volumetric flow rates, shear and pressure drag, and lift forces for different geometric configurations.
5. The course provides fundamental tools for professional engineers working in fluid mechanics.

Learning Outcomes

1. Explain the fundamental properties of fluids, including viscosity, Newtonian and non Newtonian rheology, and viscoelasticity [SO1].
2. Analyze microscopic continuum fluid mechanics where flow is governed by the continuity equation and Navier-Stokes equation (differential forms of conservation equations). Evaluate a problem and arrive at reasonable approximations to put the equations in a more soluble form [SO1].
3. Analyze systems using macroscopic fluid mechanics, using the integral form of the conservation equations (Bernoulli's equation) [SO1,SO3].
4. Identify the relevant parameters that govern a fluid system and use dimensional analysis to identify the fundamental variables that define flow [SO1].
5. Evaluate pressure distributions in a static fluid, taking account of hydrostatic pressure, buoyancy force, and interfacial tension (Laplace pressure and capillary action) [SO1].
6. Identify conditions under which flows are turbulent and derive equations that approximate its properties (time averages and fluctuations). Compare turbulent flow with those of laminar flow [SO1].

Department of Mathematics

Learning Objective & Outcomes

M.Sc.(Mathematics) 4th Semester

Subject : Graph Theory

Learning Objective

The objectives of this course are to:

1. Introduce the concepts of Graph and their different types as well as the isomorphism between them.
2. Introduce the classes of Eulerian and Hamiltonian graphs, trees and weighted graphs.
3. Illustrate how to find minimal walks in graphs.
4. Introduce vertex and edge colourings of graphs.
5. Find out the different methods of searching tree.

Learning Outcomes

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

1. Understand the theoretical base of the subject.
2. Identify different types of the graphs and be able to apply different operations on them.
3. Identify Eulerian and Hamiltonian graphs.
4. Apply special algorithms to find minimal walks in weighted graphs.
5. Apply special algorithms to find spanning trees in graphs.
6. Find chromatic numbers and be able to find out planer graphs.

Learning Objective & Outcomes

M. Sc. (Maths) 4th Semester

Subject: Information and Communication Technology

Learning Objective

This paper's scope is to propose one possible set of objectives that could realize above defined aim. For each objective a set of applications, change drivers, requirements and possible leaders will be identified.

Education processes differ among themselves because of the subject of learning, required learning outcomes, previous knowledge, learning styles, culture, industry and many other factors. On the other hand, ICT can be used in a variety of ways in any traditional or new activity.

These two factors combined derive numerous activities in educational process in which ICT is or can be implemented. In order to streamline them and to try to identify some common points and shared resources, it is proposed to group them in three sets of objectives:

- Support functions: administrative, technical and supportive functions ,
- Learning assistance: assistance and support for learning and teaching,
- New learning: new teaching and learning methods, techniques and tools.

Learning Outcomes

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

1. understand the meaning of all the terms highlighted in the text
2. demonstrate an awareness of the main processes in an ICT system (sending, receiving, storing, retrieving, manipulating, conveying)
3. demonstrate an awareness of some of the hardware, software and communication components used in ICT systems
4. use a system map or a block diagram to identify the components of an ICT system

Learning Objective & Outcomes

M.sc (MATH) 4th

Subject : VISCOUS FLUID DYANIMICS

Learning Objective

1. The cource on fluid dynamics is devised to introduce fundamental aspects of fluid flow behaviour.
2. Students will learn to develop steady state energy balance equation for fluid flow system,and determine performance characteristic of fluid dynamics.
3. Develop an appreciation for the properties of Newtonian fluids.
4. Grasp the basic ideas of turbulence.

Learning Outcomes

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

1. The students will understands stress-strain relationship in fluids .
2. Students will be able to apply Bernouli principle and compute pressure drop in flow system of different configuration.
3. To understand the pressure force at any liquid.
4. Give solution of problems related to Bernoulli equation and pressure equation.

RPS Degree College, Balana (Mahendergarh)

Department of Mathematics

Learning Objective & Outcomes

(2019-20) ODD

M.Sc. (Mathematics) 3rd Semester

Subject: Analytical Number Theory **Subject Code: 18MAT23DE5**

Learning Objective

The main goals of the course are to help students develop an understanding of:

1. Arithmetic functions and their utility in the analytic theory of numbers including the distribution of primes
2. The use of generating functions as an essential tool in understanding a variety of combinatorial phenomena that arise in the additive theory of numbers and elsewhere
3. The relationship between combinatorial and analytic aspects of the theory of numbers
4. How to apply these concepts and techniques in various applications.
5. Analytic Number Theory and some of its important applications.
6. To use the theory in specific examples

Learning Outcomes

After the completion of the course, students should be able to:

1. Precisely define mathematical terms relevant to the course
2. State and prove many of the fundamental theorems in the analytic theory of numbers
3. Perform calculations that will allow them to derive identities
4. Apply the above mentioned concepts, techniques and skills in various applications.
5. Find quotients and remainders from integer division
6. Apply Euclid's algorithm and backwards substitution
7. Understand the definitions of congruences, residue classes and least residues
8. Add and subtract integers, modulo n, multiply integers and calculate powers, modulo n
9. Determine multiplicative inverses, modulo n and use to solve linear congruences.
10. Prove results involving divisibility and greatest common divisors.
11. Solve systems of linear congruences.
12. Find integral solutions to specified linear Diophantine Equations.
13. Apply Euler-Fermat's Theorem to prove relations involving prime numbers;
14. Apply the Mobius inversion formula and Mobius function.
15. Find out the order and average order of the functions.
16. Understand Riemann Zeta function and its convergence.

RPS Degree College Balana, Mahendergarh

Department of Mathematics

2019-20(odd)

Learning Objective & Outcomes

M.sc Mathematics

Subject: Advanced Topology **Subject Code-**18MAT23CC2

Learning Objective

The student will:

1. The motivating insight behind topology is that some geometric problems depend not on the exact shape of the objects involved, but rather on the way they are put together.
2. Define Product topological spaces, Covering of a space.
3. Define the mapping between topological spaces.
4. Finding multi-scale topological structure in point cloud data.
5. Algorithmic considerations emphasized. .

Learning Outcomes

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

1. Describe fundamental properties of the Topology that lead to the formal development of Topology.
2. Comprehend rigorous arguments developing the theory underpinning Topology.

3 Demonstrate an understanding of Continuous functions and homeomorphisms

4 Appreciate how abstract ideas and rigorous methods in topological spaces can be applied to important practical problems.

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.

Learning Objective & Outcomes

B.Sc. 1st Semester

Subject: Calculus **Subject Code: MA01(2)**

Faculty: Akshay

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.

RPS Degree College Balana, Mahendergarh

Department of Mathematics

2019-20(odd)

Learning Objective & Outcomes

B.Sc. Hon. Maths. 1st Semester

Subject: Descriptive Statistics **Subject Code : BHM - 115**

Learning Objectives

The subject matter is designed to achieve the following learning objectives:

1. To make the students aware about data collection process and various types of data.
2. To enable the students to apply various data representation methods.
3. To study the measures of central tendency of any data set.
4. To study measures of dispersion.
5. To introduce the concept of skewness and kurtosis.
6. To make the students familiar with the theory of attributes and correlation among variables.

Learning Outcomes

On successful completion of the course the students are expected to be capable of attaining the following skills:

1. The students should be able to represent qualitative and quantitative data in the tabular and graphical forms.
2. The students should be familiar with the arithmetic mean, harmonic mean, geometric mean, mode and median.
3. The students should be able to implement standard deviation, variance , range, quartile deviation, mean deviation and coefficient of variation.
4. To make the students familiar with the concept of bivariate data and correlation.
5. To make students familiar with rank correlation coefficient.

MATH M21: Discrete Mathematics

Course Objectives (COR)

- Simplify and evaluate basic logic statements including compound statements, implications, inverses, converses, and contrapositives using truth tables and the properties of logic.
- Express a logic sentence in terms of predicates, quantifiers, and logical connectives
- Apply the operations of sets and use Venn diagrams to solve applied problems; solve problems using the principle of inclusion-exclusion.
- Determine the domain and range of a discrete or non-discrete function, graph functions, identify one-to-one functions, perform the composition of functions, find and/or graph the inverse of a function, and apply the properties of functions to application problems.
- List the terms in a sequence, write a sequence in closed form, compute the sum of a finite sequence, compute the product of a finite sequence, and express sequences in terms of recursive or non-recursive forms.
- Analyze the growth of elementary functions and determine their Big-O value; analyze simple algorithms and compare two algorithms based on computational complexity.
- Use elementary number theory including the divisibility properties of numbers to determine prime numbers and composites, the greatest common divisor, and the least common multiple; perform modulo arithmetic and computer arithmetic.
- Apply algorithms to problems including searching algorithms, base conversion algorithms, and the Euclidean algorithm.
- Perform basic matrix operations including sums, products, and transpose and perform 0-1 matrix operations.
- Apply rules of inference, tests for validity, and methods of proof including direct and indirect proof forms, proof by contradiction, proof by cases, and mathematical induction and write proofs using symbolic logic and Boolean Algebra.
- Identify the base step and the recursive or inductive step in applied problems and give a recursive and a non-recursive definition for an iterative algorithm.
- Verify that a simple program segment with given initial and final assertions is correct using the rule of inference for verification of partial correctness and loop invariants.
- Solve counting problems by applying elementary counting techniques using the product and sum rules, permutations, combinations, the pigeon-hole principle, and binomial expansion.
- Solve discrete probability problems and use sets to solve problems in combinatorics and probability theory.
- Solve problems using recurrence relations and recursion to analyze algorithms and programs such as finding Fibonacci numbers, the Ackerman function and Tower of Hanoi problems.
- Solve problems using divide-and-conquer recurrence relations such as the fast multiplication algorithm and binary search.
- Describe binary relations between two sets; determine if a binary relation is reflexive, symmetric, or transitive or is an equivalence relation; combine relations using set operations and composition.
- Describe N-ary relations between N sets and apply basic database operations such as projections to N-ary relations.
- Determine if a given graph is simple or a multigraph, directed or undirected, cyclic or acyclic, and determine the connectivity of a graph.

- Represent a graph using an adjacency list and an adjacency matrix and apply graph theory to application problems such as computer networks.
- Determine if a graph has an Euler or a Hamilton path or circuit.
- Determine if a graph is a binary tree, N-ary tree, or not a tree; use the properties of trees to classify trees, identify ancestors, descendants, parents, children, and siblings; determine the level of a node, the height of a tree or subtree and apply counting theorems to the edges and vertices of a tree.
- Perform tree traversals using preorder, inorder, and postorder traversals and apply these traversals to application problems; use binary search trees or decision trees to solve problems.
- Evaluate Boolean functions and simplify expression using the properties of Boolean algebra; apply Boolean algebra to circuits and gating networks.
- Use finite-state machines to model computer operations

Course Learning Outcomes (CLO)

- Students completing this course will be able to express a logic sentence in terms of predicates, quantifiers, and logical connectives.
- Students completing this course will be able to apply the rules of inference and methods of proof including direct and indirect proof forms, proof by contradiction, and mathematical induction.
- Students completing this course will be able to use tree and graph algorithms to solve problems.
- Students completing this course will be able to evaluate Boolean functions and simplify expressions using the properties of Boolean algebra.

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.

COURSE LEARNING OUTCOMES

Students will be able to:

1. Write an argument using logical notation and determine if the argument is or is not valid.
2. Demonstrate the ability to write and evaluate a proof or outline the basic structure of and give examples of each proof technique described.
3. Understand the basic principles of sets and operations in sets.
4. Prove basic set equalities.
5. Apply counting principles to determine probabilities.
6. Demonstrate an understanding of relations and functions and be able to determine their properties.
7. Determine when a function is 1-1 and "onto".
8. Demonstrate different traversal methods for trees and graphs.
9. Model problems in Computer Science using graphs and trees

RPS degree College, Balana Mahendergarh

Department of Mathematics

2019-20(Even)

Learning Objective & Outcomes

B.Sc.(Mathematics) 2nd Semester

Subject : Vector Calculus **Subject Code : 12BSM123**

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.

RPS Degree College, Balana (Mahendergarh)

Department of Mathematics 2019-20(Even)

Learning Objective & Outcomes

B.Sc.(Mathematics) 2nd Semester

Subject: Ordinary Differential Equations **Subject Code: 12BSM 122**

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.

RPS DEGREE COLLEGE, BALANA MAHENDERGARH

Learning Objective & Outcomes

B.Sc. 2nd Semeter **Session 2019-2020**

Subject :Number Theory And Trigonometry **Subject Code : BM-121**

Learning Objective

- Define and interpret the concepts of divisibility, congruence, greatest common divisor, prime, and prime-factorization.
- Apply the Law of Quadratic Reciprocity and other methods to classify numbers as primitive roots, quadratic residues, and quadratic non-residues.
- Formulate and prove conjectures about numeric patterns.
- 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.
- Evaluate trigonometric and inverse trigonometric functions.
- Solve trigonometric equations and applications.
- Apply and prove trigonometric identities.

Learning Outcomes

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

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

RPS DEGREE COLLEGE, BALANA MAHENDERGARH

Learning Objective & Outcomes

B.Sc. 2nd Semester **Session 2019-2020**

Subject: Ordinary Differential Equations **Subject Code: BM-122**

Learning Objective

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

Learning Outcomes

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

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

RPS DEGREE COLLEGE, BALANA MAHENDERGARH

Learning Objective & Outcomes

B.Sc. 6th Semester **Session 2019-2020**
Subject: Real & Complex Analysis **Subject Code: BM-361**

Learning Objective

- Understand how complex numbers provide a satisfying extension of the real numbers;
- Learn techniques of complex analysis that make practical problems easy (e.g. graphical rotation and scaling as an example of complex multiplication);
- Appreciate how mathematics is used in design (e.g. conformal mapping);
- Unlearn (if ever learned) the notion that mathematics is all about getting "the right answer";
- 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.
- 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

- 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;
- 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;
- 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.
- Student will have a working knowledge of differentiability for complex functions and be familiar with the Cauchy-Riemann equations;
- Student will evaluate integrals along a path in the complex plane and understand the statement of Cauchy's Theorem.

RPS Degree College Balana, Mahendergarh

Department of Mathematics

2019-20(Even Semester)

Learning Objective & Outcomes

B.Sc. Hon. Maths. 2nd Semester

Subject: Regression analysis and Probability **Subject Code : BHM - 125**

Learning Objectives

The subject matter is designed to achieve the following learning objectives:

1. To make the students aware about making sense of data by using scatter diagram and fitting various regression lines to the data.
2. To enable the students to apply principle of least squares for curve fitting.
3. To study the various definitions of probability along with their limitations.
4. To study additive and multiplicative laws of probability and their uses.
5. To introduce the concept random and variables their types and distribution functions, concept of bivariate data and correlation.
6. To make students familiar with the concept of mathematical expectation.

Learning Outcomes

On successful completion of the course the students are expected to be capable of attaining the following skills:

1. The students should be able to represent bivariate data and fitting regression lines and different forms of regression curves to the data.
2. The students should be familiar with various probabilities of probability and their applications to specific probabilistic problems.
3. The students should be able to implement additive and multiplicative laws of probability and Baye's theorem.
4. The students should be familiar with the concept of bivariate data and correlation.
5. The students should be familiar with the concept of mathematical expectation, its properties and applications.

RPS Degree College, Balana (Mahendergarh)

Department of Mathematics

Learning Objective & Outcomes

B.Sc.(Mathematics) 3rd Semester

Subject : Differential Geometry

Learning Objective and Outcomes

- Define the equivalance of two curves.
  - find the derivative map of an isometry.
  - analyse the equivalence of two curves by applying some theorems.
- defines surfaces and their properties
  - express definition and parametrization of surfaces.
  - express tangent spaces of surfaces.
  - explain differential maps between surfaces and find derivatives of such maps.
  - integrate differential forms on surfaces.
- list topological aspects of surfaces.
  - define the concept of manifolds.
  - give examples of manifolds and investigate their properties.

RPS Degree College, Balana (Mahendergarh)

Department of Mathematics

Learning Objective & Outcomes

B.Sc.(Mathematics) 3rd Semester

Subject : Partial Differential Equation.

Learning Objectives

1. Introduce students to partial differential equations.
2. Introduce students to how to solve linear Partial Differential with different methods.
3. Introduce students to some physical problems in Engineering and Biological models that results in partial differential equations. Partial differential equations allow deterministic mathematical formulations of phenomena in physics and engineering as well as biological processes among many other scenarios.
4. The objective of this course is to present the main results in the context of partial differential equations that allow learning about these models and to study numerical methods for the approximation of their solution.
5. To discuss some methods to solve Laplace Heat and Wave Equations.

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 specific methodologies, techniques and resources to conduct research and produce innovative results in the area of specialisation.
4. Extract information from partial derivative models in order to interpret reality. Identify real phenomena as models of partial derivative equations.
5. Solve complex problems of Heat, Wave and Laplace Equations by applying the knowledge acquired to areas that are different to the original ones. Solve real problems by identifying them appropriately from the perspective of partial derivative equations.

RPS Degree College Balana, Mahendergarh

Department of Mathematics

2019-20(odd)

Learning Objective & Outcomes

B.Sc. Hon. Maths. 3rd Semester

Subject: Probability Distributions **Subject Code : BHM - 235**

Learning Objectives

The subject matter is designed to achieve the following learning objectives:

1. To make the students aware about the concept of generating functions like moment generating function and cumulant generating function.
2. To discuss the laws of large numbers and concept of convergence in probability.
3. To discuss discrete distributions like Bernoulli distribution, Binomial, Poisson, Geometric and hyper-geometric distributions along with their properties.
4. To study continuous probability distributions like Uniform, Beta, Gamma, Exponential and normal distributions along with their properties.
5. To discuss in detail the properties of Normal distribution.

Learning Outcomes

On successful completion of the course the students are expected to be capable of attaining the following skills:

1. The students should be able to use moment generating function to explain various features of distributions.
2. The students should be able to explain various properties of discrete distributions and their applications.
3. The students should be able to use properties of Normal distribution in solving probabilistic problems related to wide variety of practical problems.
4. The students should be able to explain the properties of continuous probability distributions.
5. The students should be able to transform one variable to another by using change of scale and change of origin parameters.

COURSE LEARNING OUTCOMES

Students will be able to:

1. solve hydrostatic problems.
2. escribe the physical properties of a fluid.
3. calculate the pressure distribution for incompressible fluids.
4. calculate the hydrostatic pressure and force on plane and curved surfaces.
5. demonstrate the application point of hydrostatic forces on plane and curved surfaces.
6. formulate the problems on buoyancy and solve them.
7. describe the motion of fluids.
8. describe the principles of motion for fluids.
9. describe the areas of velocity and acceleration.
10. formulate the motion of fluid element.
11. identify derivation of basic equations of fluid mechanics and apply
12. identify how to derive basic equations and know the related assumptions.

RPS Degree College Balana, Mahendergarh

Department of Mathematics

2019-20(Even Semester)

Learning Objective & Outcomes

B.Sc. Hon. Maths. 4th Semester

Subject: Elementary Inference **Subject Code : BHM - 245**

Learning Objectives

The subject matter is designed to achieve the following learning objectives:

1. To make the students aware about the concept of sampling distribution and its measures like standard error, mean etc.
2. To discuss the process of estimation and types of estimation: Point and Interval estimation, unbiased, consistent, sufficient and efficient estimators.
3. To discuss hypothesis testing and errors in testing procedures.
4. To study testing and interval estimation for single mean, proportion and comparison of two populations based on mean and proportion.
5. To discuss sampling distributions like t, f and Chi-square and their uses. To study ANOVA one-way and two-way.

Learning Outcomes

On successful completion of the course the students are expected to be capable of attaining the following skills:

1. The students should be able to find point and interval estimates for population parameters.
2. The students should be able to use hypothesis testing to compare various populations for their parameters.
3. The students should be able to use large sample theory for hypothesis testing.
4. The students should be able to use small sample theory of hypothesis testing and using the t, f and Chi-square statistics.

5. The students should be able use analysis of variance technique involved in experimentation for invention and innovation.

RPS Degree College, Balana (Mahendergarh)

Lesson Plan

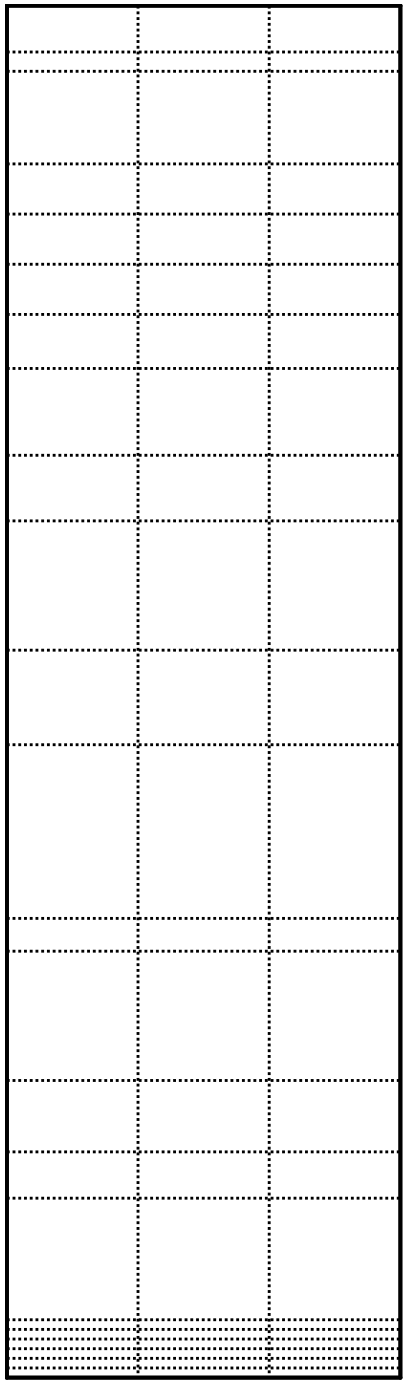
2020-21 (Even Semester)

Class and Section: B.Sc.(N.M)4th (A,C)

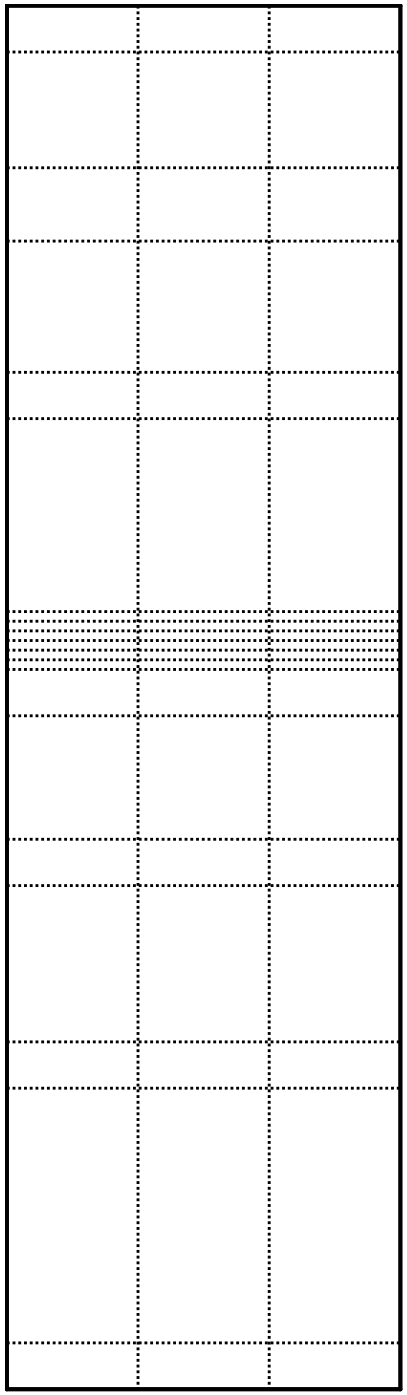
Subject: Numerical methods

Name of the Faculty : Anuradha Yadav

Week	Lecture	Date	Topics
1	7	16/01/20 to 24/01/20	Algebraic and transcendental equation, Descarte's rule of signs, Location of roots, bisection method
2	5	27/01/20 to 31/01/20	Regula- falsi method and its order of convergence.
3	5	03/02/20 to 07/02/20	Secant method and Newton- Raphson's method
4	5	10/02/20 to 14/02/20	Newton's iterative method for finding pth root of a number. order of convergence of Newton-Raphson method
5	5	17/02/20 to 21/02/20	Gauss- elimination method and Gauss Jordan method
6			1st Class Test



7	5	24/02/20 to 28/02/20	Triangularisation method	
8	5	02/03/20 to 06/03/20	Crout's method	
9	5	09/03/20 to 13/03/20	Cholesky decomposition method	
10			2nd Class Test	
11	5	16/03/20 to 20/03/20	Jacobi's method	
12	5	23/03/20 to 27/03/20	Gauss- Seidal's method	
13	5	30/03/20 to 03/04/20	Relaxation method	



14	5	06/04/20 to 10/04/20	Revision	
15	5	13/04/20 to 17/04/20		
16			Final Sessional Test	

Learning Objective & Outcomes

B.Sc.(Mathematics) 4th Semester

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.

Learning Objective & Outcomes

B.Sc. 4th Semester

Subject: Special Function &IntegralTransforms Subject Code:MA04(2)

Learning Objective

- To analyze properties of special functions by their integral representations and symmetries.
- To determine properties of Fourier Transform which may be solved by application of specialfunctions.
- To determine properties of Laplace Transform which may be solved by application of specialfunctions.
- To determine properties of Legendre Polynomial which may be solved by application of specialfunctions.
- To examine behaviour of function in terms of regularity.

Learning Outcomes

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

- understand integral calculus and special functions of various engineering problem and to known the application of some basic mathematical methods via all these special functions.
- explain the applications and the usefulness of these specialfunctions.
- classify and explain the functions of different types of differentialequations.
- understand purpose and functions of the gamma and beta functions, Fourier series and Transformation.
- use the gamma function, beta function and special functions to: evaluate different types of integral calculus problems and Fourier series to solve differentialequations.

Course Objectives of Groups and Rings

This course introduces the basic concepts of modern algebra such as groups and rings. The philosophy of this course is that modern algebraic notions play a fundamental role in mathematics itself and in applications to areas such as physics, computer science, economics and engineering. This course emphasizes the application of techniques.
Topics to be covered include:

- Group Theory - permutation groups; abstract groups, subgroups, cyclic and dihedral groups; homomorphisms; cosets, Lagrange's Theorem, quotient groups, group actions; Sylow theory.
- Ring Theory - rings and fields, polynomial rings, factorisation; homomorphisms, factor rings.
- Linear algebra - unitary matrices, Hermitian matrices, canonical forms.

Note: Graduate students attend joint classes with undergraduates but are required to have a deeper understanding of the material, are expected to do extra work of a more theoretical nature and are assessed separately

Learning Outcomes

Upon successful completion, students will have the knowledge and skills to:
On satisfying the requirements of this course, students will have the knowledge and skills to:
1. Explain the fundamental concepts of advanced algebra such as groups and rings and their role in modern mathematics and applied contexts
2. Demonstrate accurate and efficient use of advanced algebraic techniques
3. Demonstrate capacity for mathematical reasoning through analyzing, proving and explaining concepts from advanced algebra
4. Apply problem-solving using advanced algebraic techniques applied to diverse situations in physics, engineering and other mathematical contexts

RPS Degree College Balana, Mahendergarh

Department of Mathematics

2019-20(odd)

Learning Objective & Outcomes

B.Sc. Hon. Maths. 5th Semester

Subject : Operations Research - I **Subject Code : BHM - 356**

Learning Objectives

The subject matter is designed to achieve the following learning objectives :

1. To enable the students understand the techniques and methodologies of Operations Research.
2. To discuss the Linear Programming Problems and their solutions.
3. To help the students in solving LPP by graphical method and simplex method.
4. To guide students towards the concept of artificial variable technique in LPP.
5. Enhancing the concept of LPP to fit to the transportation problems.
6. To use the concept of LPP in solving Assignment problems.
7. To discuss the concept of game theory and solution of games.

Learning Outcomes

On successful completion of the course the students are expected to be capable of attaining the following skills:

1. The students should be able to form business problems in the form of Linear Programming Problems.
2. Students should be able to solve LPP by graphical method and by simplex method.
3. Students should grab the concept of simplex method and artificial variable techniques of solving LPP.
4. The students attain enough knowledge to apply the concept of LPP in the transportation problems and assignment problems.
5. The students have an overview of the game theory concepts and solution of games.

RPS Degree College Balana, Mahendergarh

Department of Mathematics

2019-20(odd)

Learning Objective & Outcomes

B.Sc. Hon. Maths. 3rd Semester

Subject: Probability Distributions **Subject Code : BHM - 235**

Learning Objectives

The subject matter is designed to achieve the following learning objectives:

1. To make the students aware about the concept of generating functions like moment generating function and cumulant generating function.
2. To discuss the laws of large numbers and concept of convergence in probability.
3. To discuss discrete distributions like Bernoulli distribution, Binomial, Poisson, Geometric and hyper-geometric distributions along with their properties.
4. To study continuous probability distributions like Uniform, Beta, Gamma, Exponential and normal distributions along with their properties.
5. To discuss in detail the properties of Normal distribution.

Learning Outcomes

On successful completion of the course the students are expected to be capable of attaining the following skills:

1. The students should be able to use moment generating function to explain various features of distributions.
2. The students should be able to explain various properties of discrete distributions and their applications.
3. The students should be able to use properties of Normal distribution in solving probabilistic problems related to wide variety of practical problems.
4. The students should be able to explain the properties of continuous probability distributions.
5. The students should be able to transform one variable to another by using change of scale and change of origin parameters.

RPS Degree College Balana, Mahendergarh

Department of Mathematics

2019-20(odd)

Learning Objective & Outcomes

B.Sc. Hon. Maths. 1st Semester

Subject: Descriptive Statistics **Subject Code : BHM - 115**

Learning Objectives

The subject matter is designed to achieve the following learning objectives:

1. To make the students aware about data collection process and various types of data.
2. To enable the students to apply various data representation methods.
3. To study the measures of central tendency of any data set.
4. To study measures of dispersion.
5. To introduce the concept of skewness and kurtosis.
6. To make the students familiar with the theory of attributes and correlation among variables.

Learning Outcomes

On successful completion of the course the students are expected to be capable of attaining the following skills:

1. The students should be able to represent qualitative and quantitative data in the tabular and graphical forms.
2. The students should be familiar with the arithmetic mean, harmonic mean, geometric mean, mode and median.
3. The students should be able to implement standard deviation, variance , range, quartile deviation, mean deviation and coefficient of variation.
4. To make the students familiar with the concept of bivariate data and correlation.
5. To make students familiar with rank correlation coefficient.

RPS Degree College Balana, Mahendergarh

Department of Mathematics

2019-20(odd)

Learning Objective & Outcomes

B.Sc. Hon. Physics. 3rd Semester

Subject: Mathematics-III **Subject Code : Phy-305**

Learning Objectives

The subject matter is designed to achieve the following learning objectives:

1. To discuss sequences and series of functions and laws of convergence.
2. To discuss power series and its convergence.
3. To study the convergence of improper integrants and their convergence.
4. To discuss Beta and Gamma integrals along with their properties.
5. To discuss various definitions of probability for probabilistic experiments.
6. To study the laws of total probability and conditional probability.
7. To study the concept of moment generating functions and their uses.

Learning Outcomes

On successful completion of the course the students are expected to be capable of attaining the following skills:

1. The students should be able to implement the laws of convergence of sequences and series of functions.
2. The students should be able to describe the convergence of power series.
3. The students should be able to use the Beta and Gamma functions.
4. The learners should have an overview of probability and associated theorems.
5. The students should be able to use moment generating functions to explain various properties of random variables.

RPS Degree College Balana, Mahendergarh

Department of Mathematics

2019-20(odd)

Learning Objective & Outcomes

M.Sc. Maths 1st Semester

Subject: Mathematical Statistics **Subject Code : 16MAT21C5**

Learning Objectives

The subject matter is designed to achieve the following learning objectives:

1. To discuss the concept of probabilities and associated results for union and intersection of events.
2. To define random variable and associated distribution functions.
3. To discuss discrete distributions and their properties and applications.
4. To study the continuous distributions and associated properties.
5. To elaborate the concept of hypothesis testing and large sample tests and small sample tests.
6. To study the concept of level of significance.

Learning Outcomes

On successful completion of the course the students are expected to be capable of attaining the following skills:

1. The students should be able to apply the concepts of probability to real life problems.
2. The students should be able to use the concepts of random variables and distributions functions.
3. The students should be able to elaborate the discrete distributions and their properties.
4. The students should be able to use the concept of continuous distributions and their properties.
5. The students should be able to use principal of hypothesis testing.
6. The students should be able to apply various statistical tests to real life problems.

RPS Degree College Balana Mahendergarh

Department of Mathematics

2019-20(odd)

Learning Objective & Outcomes

B.Sc. (Mathematics) 5th Semester

Subject: Real Analysis **Subject Code: 12BSM351**

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.

RPS Degree College College, Bahal (Bhiwani)

Department of Mathematics

2019-20(Odd)

Learning Objective & Outcomes

B.Sc. 5th Semester

Subject: Numerical Analysis **Subject Code:**

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.

Learning Objective & Outcomes

B.Sc. HM 6th sem

BHM- 365

Subject : FLUID DYNAMICS

Learning Objective

1. The cource on fluid dynamics is devised to introduce fundamental aspects of fluid flow behaviour.
2. Students will learn to develop steady state energy balance equation for fluid flow system,and determine performance characteristic of fluid dynamics.
3. Develop an appreciation for the properties of Newtonian fluids.
4. Grasp the basic ideas of turbulence.

Learning Outcomes

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

1. The students will understands stress-strain relationship in fluids .
2. Students will be able to apply Bernouli principle and compute pressure drop in flow system of different configuration.
3. To understand the pressure force at any liquid.
4. Give solution of problems related to Bernoulli equation and pressure equation.

COURSE LEARNING OUTCOMES

Students will be able to:

1. formulate pure, mixed, and binary integer programming models.
2. solve the integer programming models using branch-and-bound method.
3. explain why heuristics are used to solve some large-sacle integer programming problems.
4. set up decision models and use some solution methods for nonlinear optimization problems.
5. analyse the general nonlinear programming problems.
6. formulate the nonlinear programming models.
7. use some solution methods for solving the nonlinear optimization problems.
8. explain the lagrange multipliers.

B.Sc.(Mathematics) 6th Semester

Subject :Linear Algebra **Subject Code : MA06(2)**

Learning Objective

1. Solve systems of linear equations,
2. Analyze vectors in 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.

Department of Mathematics
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Learning Objective &Outcomes

B.Sc. — 6^{lh} Semester

Subject- Dynamics

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.

RPS DEGREE COLLEGE, BALANA MAHENDERGARH

Learning Objective & Outcomes

B.Sc. 6th Semester **Session 2019-2020**

Subject: Real & Complex Analysis **Subject Code: BM-361**

Learning Objective

- Understand how complex numbers provide a satisfying extension of the real numbers;
- Learn techniques of complex analysis that make practical problems easy (e.g. graphical rotation and scaling as an example of complex multiplication);
- Appreciate how mathematics is used in design (e.g. conformal mapping);
- Unlearn (if ever learned) the notion that mathematics is all about getting "the right answer";
- 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.
- 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

- 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;
- 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;
- 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.
- Student will have a working knowledge of differentiability for complex functions and be familiar with the Cauchy-Riemann equations;
- Student will evaluate integrals along a path in the complex plane and understand the statement of Cauchy's Theorem.