| Class: B.A. - IIIrd Year (Hons.) | Semester-V(ODD) |
|---|---|

**Class: B.A. - IIIrd Year (Hons.)**          **Semester-V(ODD)**
**Subject: Mathematics**
**Paper:BM -351 : Real Analysis**
**Paper:I(UG)**

| S. No. | Course Outcomes |
|---|---|
| 1. | Students will be able to understand about Riemann integral, Integrabililty of continuous and monotonic functions, The Fundamental theorem of integral calculus. Mean value theorems of integral calculus |
| 2. | Students will be able to understand about Improper integrals and their convergence, Comparison tests, Abel's and Dirichlet's tests,Frullani's integral, Integral as a function of a parameter. Continuity, Differentiability and integrability of an integral of a function of a parameter. |
| 3. | Students would have the understanding of the following topics Definition and examples of metric spaces, neighborhoods, limit points, interior points,open and closed sets, closure and interior, boundary points, subspace of a metric space,equivalent metrics, Cauchy sequences, completeness, Cantor's intersection theorem, Baire's category theorem, contraction Principle. |
| 4. | Students will have the idea of the concept of Continuous functions, uniform continuity, compactness for metric spaces,sequential compactness, Bolzano-Weierstrass property, total boundedness, finite intersection property, continuity in relation with compactness, connectedness,components, continuity in relation with connectedness. |

**Class: B.A. - IIIrd Year(Hons.)**          **Semester-V(ODD)**
**Subject: Mathematics**
**Paper:BM -352 : Groups and Rings**
**Paper: II(UG)**

| S. No. | Course Outcomes |
|---|---|
| 1. | Define binary operations ,groups and subgroups , quotient groups .students will be able to identify whether a particular set under given binary operation forms group or not. |
| 2. | Homomorphism and some theorems of homomorphism , automorphism. Students will be able to identify whether a function between two groups is a homomorphism or not. |
| 3. | Rings and subrings,ideals and quotient rings. Students will be able to generalise when a given set under two binary operations forms a ring. |
| 4. | Integral domains, ed ,pid, ufd .student will be able to classify a given ring through which they will understand its properties. |

| **Class:  B.A. - IIIrd Year (Hons.)** | **Semester-V(ODD)** |
| :--- | ---: |

**Subject: Mathematics**
**Paper:BM -353 : Numerical Analysis**
**Paper: III(UG)**

| S. No. | Course Outcomes |
| :---: | :--- |
| 1 | Students will be able to understand about the operator, finite difference Operator, Backward Formula, Forward  Formula, Finite Difference Formula. |
| 2 | Students will be able to understand about the Probability, Probability Distribution, Poission Distribution, Normal Distribution. |
| 3 | Students will be able to understand about the Euler's Method, Euler Modified Method, Numerical Differentiation, |
| 4 | Students will be able to understand about the Numerical Integration , Runge's Kutta Method, Milne Method, Simpson Method, Simpson 1/3 Rule, Simpson 3/8 Rule. |

**Class: - B.A. IIIrd Year (Hons.)**                                     **Semester:- V (Odd)**
**Subject: Mathematics**
**Paper: BM-354 opt(i):Differential Geometry**
**Paper:IV(UG)**

| S.No. | Course Outcome |
| :--- | :--- |
| 1. | In Unit 1, students learn about Local theory of curves, Principal normal, Curvature, Binormal, Torsion, Serret- Frenet Formulae, Centre of Curvature, Spherical Curvature, Helices,  Spherical indicative of tangent. |
| 2. | In Unit 2, students learn about Involutes and Evolutes of curves, Bertrand curves tangent and normal envelopes Edges of Regression and Developable surfaces. |
| 3. | In Unit 3, students learn about First Fundamental form, Direction on a surface, Second order magnitude, Curvature of normal section, Meunier's Theorem. |
| 4. | In Unit 4, Students learn about Principal direction and curvature, First and Second curvature Gacession curvature, Euler's Theorem, Gauss formula, Gacess- Bonnet formula, equation of Geodesic, Torsion of Geodesic. |

| S.No. | Unit | Course Objectives |
|---|---|---|
| | | **Class: - B.A. IIIrd Year (Hons.)**     **Semester:- V (Odd)**<br>**Subject: Mathematics**<br>**Paper: BM-355 opt(i):Probability Theory**<br>**Paper:V(UG)** |
| 1 | I | Students will learn about the concept of Probability , Random Experiment, Sample Space, Favorable outcomes ,events, Mutually Exclusive events, Different Definitions of Probabilities: Classical ,Relative Frequency ,Statistical and Axiomatic approach. |
| 2 | II | Students will learn about the concept of Random Variable ,Discrete and Continuous, cumulative distributive function, expectations, its properties, to derive moments from moment generating function and its properties |
| 3 | III | Students will learn to find the measures for some important discrete distribution( Bernoulli, Binomial, Geometric and Poisson )And continuous distribution( uniform, experimental, gamma and normal)with their application, application of Baye's theorem. |
| 4 | IV | Students will learn computing expectations by conditioning, 37 laya's urn modal, concept of bivariate random variable: joint and conditional distribution and to calculate and give inference for correlation coefficient. |

| Class - B.A.IIIrd YEAR (Hons.)                                      Semester-VI (Even) |
| Subject-Mathematics |
| Paper-BM-361-Real and Complex Analysis |
| Paper: I(UG) |

| S.No. | Course Outcome |
|-------|----------------|
| 1 | Explained the Jacobian,Beta and Gamma Function,Double and Triple Integrals.<br> Students learnt about the Jacobian and to apply Beta and gamma function to find the value of integral. |
| 2 | Explained the fourier's Series, Properties of Fourier Cofficients,Dirichlet's Integral.<br>Students learnt about the fourier series and solve function. |
| 3 | Explained the stereographic projection, Analytic function, Cauchy Riemann equations, harmonic functions.<br> students learnt about the differentiability, meaning of analytic functions and check if the function is analytic or not. |
| 4 | Mobius transformation,Conformal mapping.<br> students learnt how to map a region under given transformation |

| Class - B.A. IIIrd YEAR (Hons.)                                      Semester-VI(Even) |
| Subject-Mathematics |
| Paper-BM-362-Linear Algebra |
| Paper: II(UG) |

| S.No. | Course Outcome |
|-------|----------------|
| 1 | Vector Spaces and Subspaces, Linear Span, Linear Independent and dependent subsets of vector space. Basis of a vector space, Finite dimensional vector spaces, Dimensions and Quotient spaces<br> The students will be able to learn about spaces and subspaces. |
| 2 | Vector spaces Linear transformations and Linear forms on vector spaces, Vector space of all the linear transformations. Dual spaces, Bidual spaces, Null space, Range space of linear transformation. Rank and Nullity theorem.<br>CO2:  The students will be able to use vector space in linear transformation. |
| 3 | Minimal Polynomial of a linear transformation, Singular and non – singular linear transformations, Matrix of a linear transformation, Change of basis. Eigen values and Eigen vectors of linear transformations.<br>CO3: The students will be able to find Eigen values and Eigen vectors of linear transformations. |
| 4 | Inner product spaces, Cauchy-Schwarz inequality, Orthogonal vectors, Orthogonal complements, Orthogonal sets and basis. Bessel's Inequality, Gram – Schmidt Orthogonalisation process, Ad joint and Unitary of a linear transformation.<br>CO4: The students will be able to analysis inner product space. |

| Class - B.A.IIIrd YEAR (HONS.) | Semester-VI (Even) |
|---|---|

**Class - B.A.IIIrd YEAR   (HONS.)**                                          **Semester-VI (Even)**
**Subject-Mathematics**
**Paper-BM-363:Dynamics**
**Paper: III(UG)**

| S.No. | Course Outcome |
|---|---|
| 1 | Explained the concept of velocity and acceleration, Relative motion and Simple harmonic motion.<br>CO1: The students were able to know the meaning of velocity and acceleration and solve the numerical based on velocity and simple harmonic motion |
| 2 | Explained Newton's law of motion, Work, Power and energy.<br>CO2: The students learnt about Newton's law of motion and were able to solve the problems related to Newton's law of motion, work, power and energy. |
| 3 | Explained the topic Projectiles, Motion of particle on smooth and rough plane curves.<br>CO3: The students have learnt the meaning of projectile and were able to solve the problems related to it. |
| 4 | Described the Central orbit and Kepler's law of planetary motion.<br>CO4: The students learned about central orbit and properties related to it. |

**Class:  B.A. IIIrd Year (Hons.)**              **Semester:VI(EVEN)**
 **Subject: Mathematics**
**Paper:BM-364 opt(i):Optimization**
**Paper (UG): IV**

| S. No. | Course Outcomes |
|---|---|
| 1. | In the unit 1,explanation about functions of random variables.<br>Students gets to know uncertainly, information and entropy, solution of certain logical problems. |
| 2. | In unit 2,students are made to learn about the linear programming problems.<br>Student gets to know graphical solution of linear programming problems. |
| 3. | In unit 3,students learn about the basic properties of cnvex sets,convex functions and concave functions.<br>Students gets to know theory and application of the simplex method of solution of LPP. |
| 4. | In unit 4,students are taught about charne's m-technique,principle of duality in LPP .<br>Students gets to know fundamental duality theorem and simple problems. |

| Class – B.A. IIIrd YEAR (HONS.) | | Semester-VI (Even) |
|---|---|---|
| Subject-Mathematics<br>Paper-BM-365 opt(1):Hydrostatic<br>Paper: III(UG) | | |
| **Sr. No.** | **Unit** | **Course Outcomes** |
| 1. | I | Students learn to find the pressure at any point of a fluid at rest, rate of variation of pressure, lines of force, homogeneous and heterogeneous fluids. They also learn about elastic fluids , surface of equal pressure and problems related to it. |
| 2. | II | Students learn to find fluid pressure on plane surfaces. How to find centre of pressure of any plane area, Resultant pressure on curved surfaces. |
| 3. | III | Students learn about Equilibrium of floating bodies, nature of equilibrium, Metacentre and stability of floating bodies. |
| 4. | IV | Students learn about equilibrium of gases, gas laws mixture of gases, Internal energy, Adiabatic expansion, Work done in compressing a gas, convective equilibrium, Atmospheric pressure and examples related to it. |