**Government PG College, Ambala Cantt**

**Course File (Session 2023-24)**

**Name of Associate Professor: Dr. Rajani Saini**

B.A./B.Sc. **Semester-V,** (Non Medical and Computer Science)

**BM -353** : **NUMERICAL ANALYSIS**

**Time : 3 Hours (Theory)**

**B.Sc. Theory : 30**

**BA Theory : 20**

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**SECTION-I**

Finite Differences operators and their relations. Finding the missing terms and effect of

error in a difference tabular values, Interpolation with equal intervals: Newton’s forward

and Newton’s backward interpolation formulae. Interpolation with unequal intervals:

Newton’s divided difference, Lagrange’s Interpolation formulae, Hermite Formula.

**SECTION-II**

Central Differences: Gauss forward and Gauss’s backward interpolation formulae,

Sterling, Bessel Formula. Probability distribution of random variables, Binomial distribution, Poisson’s distribution, Normal distribution: Mean, Variance and Fitting.

**SECTION-III**

Numerical Differentiation: Derivative of a function using interpolation formulae as

studied in Sections –I & II. Eigen Value Problems: Power method, Jacobi’s method, Given’s method, House-Holder’s method, QR method, Lanczos method.

**SECTION-IV**

Numerical Integration: Newton-Cote’s Quadrature formula, Trapezoidal rule, Simpson’s

one- third and three-eighth rule, Chebychev formula, Gauss Quadrature formula.

Numerical solution of ordinary differential equations: Single step methods-

Picard’s method. Taylor’s series method, Euler’s method, Runge-Kutta Methods.

Multiple step methods; Predictor-corrector method, Modified Euler’s method,

Milne-Simpson’s method.

**Books Recommended:**

1. M.K. Jain, S.R.K.Lyengar, R.K. Jain : Numerical Method, Problems and

Solutions, New Age International (P) Ltd., 1996

2. M.K. Jain, S.R.K. Lyengar, R.K. Jain : Numerical Method for Scientific and

Engineering Computation, New Age International (P) Ltd., 1999

3. C.E. Froberg : Introduction to Numerical Analysis (2nd Edition).

4. Melvin J. Maaron : Numerical Analysis-A Practical Approach, Macmillan

Publishing Co., Inc., New York

5. R.Y. Rubnistein : Simulation and the Monte Carlo Methods, John Wiley, 1981

6. Computer Oriented Numerical Methods, Practice Hall of India Pvt. Ltd.

COURSE OUTCOMES

**CO 1 :** Numerical analysis deals with the study of various numerical methods. As many of the non linear problems does not have an exact solution and in particular, it is too difficult to find the exact solution. So, in such cases, only approximate solution can be obtain with the hel of numerical methods.

**CO 2:** The course aims at familiarizing the students with difference operators, interpolation with equal and unequal intervals, central difference interpolation, probability distribution of random variables, numerical integration, numerical solution of ordinary differential equations.

**CO 3:** The students should be shown the ability of working independently and with groups.

**LESSON PLAN**

| **WEEK NO** | **SCHEDULED DATES** | **TOPICS TO BE COVERED** |
| --- | --- | --- |
| **1** | **1-7AUGUST** | Numerical Differentiation |
| **2** | **8-14AUGUST** | Numerical Differentiation |
| **3** | **15-21 AUGUST** | Derivative of a function using interpolation formulae as studied in Sections –I & II. |
| **4** | **22-28AUGUST** | Derivative of a function using interpolation formulae As studied in Sections –I & II. |
| **5** | **29-4 SEPTEMBER** | Eigen Value Problems: |
| **6** | **5-11 SEPTEMBER** | Power method, Jacobi’s method, |
| **7** | **12-18 SEPTEMBER** | Given’s method |
| **8** | **13-25 SEPTEMBER** | House-Holder’s method |
| **9** | **26-2 OCTOBER** | QR method, Lanczos method. |
| **10** | **3-9 OCTOBER** | Numerical Integration: Newton-Cote’s Quadrature formula, Trapezoidal rule, |
| **11** | **10-16 OCTOBER** | Simpson’s one- third and three-eighth rule, Chebychev formula |
| **12** | **17-23 OCTOBER** | Gauss Quadrature formula.  Numerical solution of ordinary differential equations: |
| **13** | **24-30 OCTOBER -** | Picard’s method. Taylor’s series method, |
| **14** | **31-6 NOVEMBER** | Runge-Kutta Methods.; |
| **15** | **7-13 NOVEMBER** | Predictor-corrector method, Modified Euler’s method, Milne-Simpson’s method. |
| **16** | **14-20 NOVEMBER** | **Revision** |
| **17** | **21-27 NOVEMBER** | **Revision** |
| **18** | **28 NOVEMBER ONWARDS** | **Revision** |

**Government PG College, Ambala Cantt**

**Course File (Session 2023-24)**

**Name of Associate Professor: Dr. Rajani Saini**

B.A./B.Sc.(Non Medical and Computer Science) 3rd Sem

Subject code and Name: BM232 / Partial Differential Equation

**SYLLABUS**

**Time : 3 Hours**

**B.Sc. Theory 40, Internal Assessment 10**

**B.A. Theory 26. Internal Assessment 7**

**SECTION-I**

Partial differential equations: Formation, order and degree, Linear and Non-Linear Partial

differential equations of the first order: Complete solution, singular solution, General

solution, Solution of Lagrange’s linear equations, Charpit’s general method of solution.

Compatible systems of first order equations, Jacobi’s method.

**SECTION-II**

Linear partial differential equations of second and higher orders, Linear and non-linear

homogenious and non-homogenious equations with constant co-efficients, Partial

differential eqution with variable co-efficients reducible to equations with constant

coefficients, their complimentary functions and particular Integrals, Equations reducible

to linear equations with constant co-efficients.

**SECTION-III**

Classification of linear partial differential equations of second order, Hyperbolic,

parabolic and elliptic types, Reduction of second order linear partial differential equations

to Canonical (Normal) forms and their solutions, Solution of linear hyperbolic equations,

Monge’s method for partial differential equations of second order.

**SECTION-IV**

Cauchy’s problem for second order partial differential equations, Characteristic

equations and characteristic curves of second order partial differential equation, Method

of separation of variables: Solution of Laplace’s equation, Wave equation (one and two

dimensions), Diffusion (Heat) equation (one and two dimension) in Cartesian Coordinate

system.

**Books Recommended:**

1. D.A.Murray: Introductory Course on Differential Equations, Orient Longman,

(India), 1967

2. Erwin Kreyszing : Advanced Engineering Mathematics, John Wiley &

Sons, Inc., New York, 1999

3. A.R. Forsyth : A Treatise on Differential Equations, Macmillan and Co.

Ltd.

4. Ian N.Sneddon : Elements of Partial Differential Equations, McGraw Hill

Book Company, 1988

5. Frank Ayres : Theory and Problems of Differential Equations, McGraw Hill

Book Company, 1972

6. J.N. Sharma & Kehar Singh : Partial Differential Equations

**COURSE OUTCOMES**

**BM – 232 Partial Differential Equations**

**CO 1:** After completing this course, students will be able to understand Partial differential equations, Formation, order and degree, Linear and Non-Linear Partial differential equations.

**CO 2:** The students learn different type of techniques for investigating the linear partial differential equations in one and two dimensions such as Laplace’s equation, Wave equation (one and two dimensions), Diffusion (Heat) equation (one and two dimension) in Cartesian Co-ordinate system.

**CO 3:** Students will be able to expand one variable functions in series along basis of orthogonal functions.

**LESSON PLAN**

| **WEEK NO** | **SCHEDULED DATES** | **TOPICS TO BE COVERED** |
| --- | --- | --- |
| **1** | **1-7AUGUST** | Partial differential equations: Formation, order and degree, |
| **2** | **8-14AUGUST** | Linear and Non-Linear Partial  differential equations of the first order: |
| **3** | **15-21 AUGUST** | Complete solution, singular solution, General  solution, Solution of Lagrange’s linear equations |
| **4** | **22-28AUGUST** | Charpit’s general method of solution.  Compatible systems of first order equations, Jacobi’s method |
| **5** | **29-4 SEPTEMBER** | Linear partial differential equations of second and higher orders |
| **6** | **5-11 SEPTEMBER** | Linear and non-linear  homogenious and non-homogenious equations with constant co-efficients |
| **7** | **12-18 SEPTEMBER** | Partial differential elution with variable co-efficients reducible to equations with constant  coefficients, |
| **8** | **13-23 SEPTEMBER** | their complimentary functions and particular Integrals, |
| **9** | **26-2 OCTOBER** | Classification of linear partial differential equations of second order, Hyperbolic,  parabolic and elliptic types, |
| **10** | **3-9 OCTOBER** | Reduction of second order linear partial differential equations to Canonical (Normal) forms and their solutions |
| **11** | **10-16 OCTOBER** | , Solution of linear hyperbolic equations,  Monge’s method for partial differential equations of second order |
| **12** | **17-23 OCTOBER** | Cauchy’s problem for second order partial differential equations |
| **13** | **24-30 OCTOBER -** | Characteristic equations and characteristic curves of second order partial differential equation, |
| **14** | **31-6 NOVEMBER** | Method of separation of variables: Solution of Laplace’s equation, Wave equation |
| **15** | **7-13 NOVEMBER** | Diffusion (Heat) equation (one and two dimension) in Cartesian Coordinate system. |
| **16** | **14-20 NOVEMBER** | **Revision** |
| **17** | **21-27 NOVEMBER** | **Revision** |
| **18** | **28 NOVEMBER ONWARDS** | **Revision** |

**Government PG College, Ambala Cantt**

**Course File (Session 2023-24)**

**Name of Associate Professor: Dr. Rajani Saini**

B Com I Subject code B23-COM-104

Paper Name- Business Mathematics

**SYLLABUS**

**Time : 3 Hours**

**Theory 35, Internal Assessment 15**

**SECTION-I**

**Set Theory:** Representation of sets, power sets, Complement of a set , Venn Diagrams, union and Intersection, De-Morgan's laws; Logical statements and truth tables .

**SECTION-II**

Logarithms: Laws of operation, log tables; Arithmetic and geometric progression.

**SECTION-III**

Matrices and Determinants: Definition of a matrix, order, equality, types of matrices; Operations on matrices: Addition, multiplication and multiplication with a scalar and their simple properties. Determinant of a square matrix (upto 3x 3 order): Properties of determinants, minors, co-factors and applications of determinants in finding the area of triangle, adjoint and inverse of a square matrix, solutions of a system of linear equations by examples.

**SECTION-IV**

Compound interest and annuities: Different types of interest rates, types of annuities, present value and amount of an annuity (including the case of continuous compounding), valuation of simple loans and debentures, problems related to sinking

**Books Recommended**

1. D.C. Sancheti and V.K. Kapoor, Business Mathematics, Sultan Chand and Sons.

2. E. Don and J. Lerner (2009). Schaum outlines of Basic Business Mathematics, McGraw Hill.

3. Holden, Mathematics for Business and Economics, Macmillan India, New Delhi.

4. S.C. Gupta and V.K. Kapoor, Fundamentals of Mathematical Statistics, S. Chand & Sons, Delhi.

**COURSE OUTCOMES**

1. Understand the basics of personal finance and personal financial planning.

2. Gain the knowledge of investment and different investment avenues available for managing finance.

3. Understand the relationship between investment risk and return and the role of regulatory environment in managing personal finance.

4. Do insurance planning, tax and estate planning and retirement planning.

**LESSON PLAN**

| **WEEK NO** | **SCHEDULED DATES** | **TOPICS TO BE COVERED** |
| --- | --- | --- |
| **1** | **1-7AUGUST** | Representation of sets, power sets, Complement of a set , Venn Diagrams, union and Intersection, |
| **2** | **8-14AUGUST** | Representation of sets, power sets, Complement of a set , Venn Diagrams, union and Intersection, |
| **3** | **15-21 AUGUST** | Logical statements and truth tables . |
| **4** | **22-28AUGUST** | Logical statements and truth tables . |
| **5** | **29-4 SEPTEMBER** | Logarithms: Laws of operation, log tables |
| **6** | **5-11 SEPTEMBER** | Logarithms: Laws of operation, log tables |
| **7** | **12-18 SEPTEMBER** | Arithmetic and geometric progression. |
| **8** | **13-23 SEPTEMBER** | Arithmetic and geometric progression. |
| **9** | **26-2 OCTOBER** | Definition of a matrix, order, equality, types of matrices; Operations on matrices: Addition, multiplication and multiplication with a scalar and their simple properties. |
| **10** | **3-9 OCTOBER** | Definition of a matrix, order, equality, types of matrices; Operations on matrices: Addition, multiplication and multiplication with a scalar and their simple properties. |
| **11** | **10-16 OCTOBER** | Determinant of a square matrix (upto 3x 3 order): Properties of determinants, minors, co-factors |
| **12** | **17-23 OCTOBER** | applications of determinants in finding the area of triangle, |
| **13** | **24-30 OCTOBER -** | solutions of a system of linear equations by examples. |
| **14** | **31-6 NOVEMBER** | Different types of interest rates, types of annuities, present value and amount of an annuity |
| **15** | **7-13 NOVEMBER** | Different types of interest rates, types of annuities, present value and amount of an annuity |
| **16** | **14-20 NOVEMBER** | valuation of simple loans and debentures, problems related to sinking |
| **17** | **21-27 NOVEMBER** | valuation of simple loans and debentures, problems related to sinking |
| **18** | **28 NOVEMBER ONWARDS** | **Revision** |

**Government PG College, Ambala Cantt**

**Course File (Session 2023-24)**

**Name of Associate Professor: Dr. Rajani Saini**

B Com Ii Sem Subject code B23-COM-204

Paper Name- Business Mathematics

**SYLLABUS**

**Time : 3 Hours**

**Theory 35, Internal Assessment 15**

**SECTION-I**

Differentiation; derivative of simple functions and other functions (excluding trigonometric functions) having applications in business studies; Maxima and minima of Revenue, Cost, Demand, Production, Profit functions and other functions related to business and commerce.

**SECTION-II**

Integration: Definite and indefinite (simple functions excluding trigonometric functions), basic rules of integration, application of integration in commercial and business problems

**SECTION-III**

Binomial Theorem, Permutations and Combinations.

**SECTION-IV**

Linear programming: Formulation of linear programming problems (LPP) and their solution by graphical and simplex methods, Applications of linear programming in solving problems related to business and commerce.

**Books Recommended**

1. E.T. Dowling, Schaum outlines of Calculus for Business, Economics and the Social

Sciences. McGraw Hill.

2. Holden, Mathematics for Business and Economics, Macmillan India, New Delhi.

3. S.C. Gupta and V.K. Kapoor, Fundamentals of Mathematical Statistics, S. Chand & Sons, Delhi.

**COURSE OUTCOMES**

1. Gain the knowledge to find derivatives simple functions related to commerce problems, attain skills to use application of derivatives in evaluating maxima and minima.

2. Learn to find integration of simple functions related to commerce and economic problems, attain skills to use application of integration in business and commerce problems.

3. Apply binomial theorem, learn the concept and applications of permutations and combinations.

4. Learn the concept of Linear programming and formulation of linear programming problems related to business and commerce.

**LESSON PLAN**

| **WEEK NO** | **SCHEDULED DATES** | **TOPICS TO BE COVERED** |
| --- | --- | --- |
| **1** | **10-16 APRIL** | Binomial Theorem |
| **2** | **17-13 APRIL** | Binomial Theorem |
| **3** | **14-20 APRIL** | Permutations and Combinations. |
| **4** | **21-27 APRIL** | Permutations and Combinations. |
| **5** | **28-3 MAY** | **REVISION** |
| **6** | **4-10 MAY** | **REVISION** |

**Government PG College, Ambala Cantt**

**Course File (Session 2023-24)**

**Name of Associate Professor: Dr. Rajani Saini**

B Com Ii Sem Subject code B23-COM-204

Paper Name- Business Mathematics

**SYLLABUS**

**Time : 3 Hours**

**Theory 35, Internal Assessment 15**

**SECTION-I**

Differentiation; derivative of simple functions and other functions (excluding trigonometric functions) having applications in business studies; Maxima and minima of Revenue, Cost, Demand, Production, Profit functions and other functions related to business and commerce.

**SECTION-II**

Integration: Definite and indefinite (simple functions excluding trigonometric functions), basic rules of integration, application of integration in commercial and business problems

**SECTION-III**

Binomial Theorem, Permutations and Combinations.

**SECTION-IV**

Linear programming: Formulation of linear programming problems (LPP) and their solution by graphical and simplex methods, Applications of linear programming in solving problems related to business and commerce.

**Books Recommended**

1. E.T. Dowling, Schaum outlines of Calculus for Business, Economics and the Social

Sciences. McGraw Hill.

2. Holden, Mathematics for Business and Economics, Macmillan India, New Delhi.

3. S.C. Gupta and V.K. Kapoor, Fundamentals of Mathematical Statistics, S. Chand & Sons, Delhi.

**COURSE OUTCOMES**

1. Gain the knowledge to find derivatives simple functions related to commerce problems, attain skills to use application of derivatives in evaluating maxima and minima.

2. Learn to find integration of simple functions related to commerce and economic problems, attain skills to use application of integration in business and commerce problems.

3. Apply binomial theorem, learn the concept and applications of permutations and combinations.

4. Learn the concept of Linear programming and formulation of linear programming problems related to business and commerce.

**LESSON PLAN**

| **WEEK NO** | **SCHEDULED DATES** | **TOPICS TO BE COVERED** |
| --- | --- | --- |
| **1** | **10-16 APRIL** | Binomial Theorem |
| **2** | **17-13 APRIL** | Binomial Theorem |
| **3** | **14-20 APRIL** | Permutations and Combinations. |
| **4** | **21-27 APRIL** | Permutations and Combinations. |
| **5** | **28-3 MAY** | **REVISION** |
| **6** | **4-10 MAY** | **REVISION** |

**Government PG College, Ambala Cantt**

**Course File (Session 2023-24)**

**Name of Associate Professor: Dr. Rajani Saini**

B Com Ii Sem Subject code B23.MAT-201

Paper Name-

**SYLLABUS**

**Time : 3 Hours**

**Theory 35, Internal Assessment 15**

**SECTION—I**

Symmetric, Skew symmetric, Hermitian and skew Hermitian matrices. Elementary

Operations on matrices. Rank of a matrices. Inverse of a matrix. Linear dependence and

independence of rows and columns of matrices. Row rank and column rank of a matrix.

Eigenvalues, eigenvectors and the characteristic equation of a matrix. Minimal

polynomial of a matrix. Cayley Hamilton theorem and its use in finding the inverse of a

matrix.

**SECTION-II**

Relations between the roots and coefficients of general polynomial equation in one

variable. Solutions of polynomial equations having conditions on roots. Common roots

and multiple roots. Transformation of equations. Descarte’s rule of signs

**SECTION-III**

Solutions of cubic equations (Cardon’s method). Biquadratic equations and their solutions.Divisibility, G.C.D.(greatest common divisors), L.C.M.(least common multiple)

Primes, Fundamental Theorem of Arithemetic.

**SECTION-IV**

Linear Congruences, Fermat’s theorem.Wilson’s theorem and its converse. Linear Diophanatine equations in two variables Binomial Theorem, Permutations and Combinations.

**Books Recommended**

1. .S. Hall and S.R. Knight : Higher Algebra, H.M. Publications 1994.
2. Shanti Narayan : A Text Books of Matrices.
3. Chandrika Prasad : Text Book on Algebra and Theory of Equations.

Pothishala Private Ltd., Allahabad.

4. S.L. Loney : Plane Trigonometry Part – II, Macmillan and Company, London.

5. R.S. Verma and K.S. Sukla : Text Book on Trigonometry, Pothishala Pvt. Ltd.

Allahabad.

6. Ivan Ninen and H.S. Zuckerman. An Introduction to the Theory of Numbers

**COURSE OUTCOMES**

**CO 1:** Algebra makes the students being able to understand and answer on the topics of matrices and their uses. Algebra helps the students transfer their mathematical knowledge to more algebraic generalizations.

**CO 2:** Students will solve problems using equations, graphs and tables to investigate linear relationships.

**CO 3:** it develops the ability of finding Relations between the roots and coefficients of general polynomial equation in one variable. And it deals with the solutions of quadratic, cubic and Biquadratic equations

CO 4 from this course, the students will be able to find quotients and remainders from integral divison.

**CO 5:** They will learn about different concepts of Congruence and related theorems.

**LESSON PLAN**

| **WEEK NO** | **SCHEDULED DATES** | **TOPICS TO BE COVERED** |
| --- | --- | --- |
| **1** | **10-16 APRIL** | Symmetric, Skew symmetric, Hermitian and skew Hermitian matrices. Elementary  Operations on matrices. |
| **2** | **17-13 APRIL** | Rank of a matrices. Inverse of a matrix. Linear dependence and  independence of rows and columns of matrices. Row rank and column rank of a matrix |
| **3** | **14-20 APRIL** | Relations between the roots and coefficients of general polynomial equation in one  variable |
| **4** | **21-27 APRIL** | Solutions of polynomial equations having conditions on roots. Common roots  and multiple roots. Transformation of equations. Descarte’s rule of signs |
| **5** | **28-3 MAY** | **REVISION** |
| **6** | **4-10 MAY ONWARDS** | **REVISION** |