

MATDSCP2.1:

Practicals-II

1. Program to construct Cayley's table and test commutativity for a given finite set.
2. Program to find all possible cosets of the given finite group.
3. Program to find generators and corresponding possible subgroups of a cyclic group.
4. Program to verify Lagrange's theorem with suitable examples.
5. Program to verify Euler's ϕ Function for a given finite group.
6. Program to verify the given function is homomorphism and isomorphism.
7. Program to solve problems using reduction formulae.
8. Program to compute surface area.
9. Program to compute volume of revolution.
10. Finding the angle between the radius vector and tangent.
11. Finding the angle between two curves.
12. Finding the radius of curvature of the given curve.

Open Elective 1

MATOET 1: Mathematics - I	
Teaching Hours : 3 Hours/Week	Credits: 3
Total Teaching Hours: 42 Hours	Max. Marks: 100 (S.A.-60 + I.A. -40)

Course Learning Outcomes: This course will enable the students to

- Learn row and column operations, rank of matrix
- Learn to solve system of linear equations.
- Solve the system of homogeneous and non homogeneous m linear equations by finding eigenvalues and eigenvectors.
- Students will be familiar with the techniques of differentiation of function with real variables.
- Identify and apply the intermediate value theorems and L'Hospital's rule.
- Learn to evaluate integrals, find arc-lengths, areas and volume.

Unit-I: Matrices: :Recapitulation of Symmetric and Skew Symmetric matrices, Algebra of Matrices; Row and column reduction to Echelon form. Rank of a matrix; Finding rank of a matrix by reducing to row reduced echolen form and normal form ;Solution of system of linear equations; Criteria for existence of non-trivial solutions of homogeneous system of linear equations. Solution of non-homogeneous system of linear equations. Eigenvalues and Eigen vectors of square matrices, Cayley- Hamilton theorem(Without Proof), inverse of matrices by Cayley-Hamilton theorem.

14Hours

Unit-II: Differential Calculus: Limits, Continuity, Differentiability and properties. Intermediate value theorem(statement only with examples), Rolle’s Theorem(statement only with examples), Lagrange’s Mean Value eorem(statement only with examples), Cauchy’s Mean value theorem (statement only with examples) and examples. Taylor’s theorem(without proof), Maclaurian’s series and L’Hospital’s rule-problems.

14 Hours

Unit-III: Integral Calculus: Recapitulation of Definite integrals and its properties. Computation of length of arc, area of plane curves, surface area and volume of revolution in Cartesian form.

14 Hours

Open Elective 2

MATOET 1: Corporate Mathematics	
Teaching Hours : 3 Hours/Week	Credits: 3
Total Teaching Hours: 42 Hours	Max. Marks: 100 (S.A.- 60 + I.A.-40)

Course Learning Outcomes: This course will enable the students to

- Learn types of equations and methods to solve linear, quadratic equations.
- Learn how to represent data through graphs and analyze.
- Learn frequency distribution , mean, median and mode.
- Learn GM, HM, AM concepts
- Learn formation and solution of LPP through graphical methods.

Unit I:**Theory of Equations:**

Introduction meaning and types of equations. Simple linear equations, simultaneous equations (only two variables) elimination method, Substitution method and rule of cross multiplication (RCM). Quadratic equations, factorization method formula method and application problems.

14hours

Unit II:**Statistical Methods:**

Frequency distribution: Raw data, attributes and variables, Classification of data, frequency distribution, cumulative frequency distribution, Histogram. Requisites of ideal measures of central tendency, Arithmetic Mean, Median and Mode for ungrouped and grouped data. Combined mean, Merits and demerits of measures of central tendency, Geometric mean: definition, merits and demerits, Harmonic mean: definition, merits and demerits, Choice of A.M., G.M. and H.M. Concept of dispersion, Measures of dispersion: Range, Variance, Standard deviation (SD) for grouped and ungrouped data, combined SD, Measures of relative dispersion: Coefficient of range, coefficient of variation. Examples and problems.

14 hours

Unit IV:**Data Interpretation:**

Tabulation, Bar graphs, Pie charts, line graphs and application problems.

Linear Programming:

Meaning, linear inequalities and their graphs, Formation of LPP and solution of linear programming problems by graphical method.(only two variables)

14 hours

Open Elective 3

MATOET3: Mathematics –II	
Teaching Hours : 3 Hours/Week	Credits: 3
Total Teaching Hours: 42 Hours	Max. Marks: 100 (S.A.- 60 + I.A. -40)

Course Learning Outcomes: This course will enable the students to

- learn how to find the roots of equations.
- relation between roots and coefficients.
- Learn Descartes' rule of signs to find roots.
- Understand the concept of partial differentiation, Jacobians and Taylors and Meclaurin's expansion.
- Find the extreme values of functions of two variables.
- To understand the concepts of multiple integrals and their applications.

Unit-I: Theory of Equations- Euclid's Algorithm- Polynomials with integral coefficients- Remainder theorem- Factor theorem- Fundamental theorem of algebra(statement only) –Irrational and complex roots occurring in conjugate pairs – Relation between roots and coefficients of a polynomial equations, symmetric functions – Transformation- Reciprocal equations- Descartes' rule of signs- multiple roots.

14 Hours

Unit-II: Partial Differentiation-Functions of two or more variables-explicit and implicit functions, partial derivatives. Homogeneous functions- Euler's theorem, total derivatives, differentiation of implicit and composite functions, Jacobians, standard properties and illustrative examples. Taylor's and Maclaurin's series for functions of two variables, Maxima-Minima of functions of two variables.

14 Hours

Unit-III: Integral Calculus-Definition of line integral and basic Properties ,examples on evaluation of line integrals. Double integral- Definition of Double integrals and its conversion to iterated integrals. Computation of plane surface areas. Triple integral- Definition of triple integrals and evaluation, volume as triple integral.

14 Hours

Open elective 4

MATOET 4: Commercial Mathematics	
Teaching Hours : 3 Hours/Week	Credits:3
Total Teaching Hours: 42 Hours	Max. Marks: 100 (S.A.- 60 + I.A.-40)

Course Learning Outcomes: This course will enable the students to

- Learn concepts of set ,types of sets and Venn diagrams.
- Learn concepts of Relations and functions
- Learn concept of permutation and combination with application problems.
- Learn concept of probability, definitions of events , occurrences of events.
- Learn some rules of probability and application problems
- Learn to calculate percentage and ratios in application problems.
- learn definitions of proportions and properties.
- apply these concepts in commercial problems.

Unit-I: Set theory:

Sets, subset, empty set, power set, operations on sets, Venn diagrams, relations, types of relations, domain and range of a relations, functions, types of functions, binary operations.

14 hours

Unit - II: Permutation ,Combinations and probability

Fundamental principle of counting ,Factorial, permutation and combinations, simple applications. Random experiments,

Introduction to probability, sample spaces(Set representation),events; the probability of an event, some rules of probability .Occurrences of events. 'not', 'AND', 'OR' events, exhaustive events, mutually exclusive events. Axiomatic(set theoretic) probability ;probability of 'and', 'or', 'not', events and conditional probability.

14 Hours

Unit - III: Percentage, Ratio &Proportions: Percentage-Definition, Calculation of percentage, Ratios-Types of Ratios-Duplicate, Triplicate & Sub-duplicate of a ratio. Proportions-Definition &properties-cross product property &reciprocal property, united proportions-continued proportion-compound proportions, examples on commercial Mathematics.

14 Hours

Reference books for open electives:

1. Algebra, Natarajan, Manicavasagam pillay and Ganapathi
2. Differential Calculus, Shanti Narayan, S. Chand & Company, New Delhi.
3. Integral Calculus, Shanti Narayan and PK Mittal, S. Chand and Co. Pvt. Ltd.,
4. University Algebra - N.S. Gopala Krishnan, New Age International (P)
5. Theory of Matrices - B S Vatsa, New Age International Publishers.
6. M.K. Jain, S.R. K Iyengar and R.K .Jain, Numerical methods for Scientific and engineering Computations, 4thed.New Delhi, India, New age International,2012
7. John Kisulas,Numerical methods in engineering with python3, Cambridge University press,2013
8. Practical Business Mathematics, S. A. Bari New Literature Publishing Company, New Delhi
9. Mathematics for Commerce, K. Selvakumar Notion Press, Chennai
10. Business Mathematics with Applications, Dinesh Khattar& S. R. Arora S. Chand Publishing New Delhi
11. Business Mathematics and Statistics, N.G. Das &Dr. J.K. Das McGraw Hill New Delhi
12. Fundamentals of Business Mathematics, M. K. Bhowal, Asian Books Pvt.Ltd New Delhi
13. Statistical Methods, Gupta S. P.: Sultan Chand andSons, New Delhi.
14. Fundamentals of Statistics, Goon A. M., Gupta, M. K. and Dasgupta, B. World Press Calcutta.
15. Statistical methods: An introductory text, New Age.

OPEN ELECTIVE COURSE

(For students of Science stream who have not chosen Mathematics as one of the Core Course)

MATOET3.1(A) Ordinary Differential Equations	
Teaching Hours: 3 Hours/Week	Credits: 3
Total Teaching Hours: 42 Hours	Max. Marks: 100 (SEE - 60 + I.A. - 40)

Course Learning Outcomes: This course will enable the students:

1. To understand the concept of differential equation and their classification.
2. To know the meaning of the solution of a differential equation.
3. To solve exact differential equations
4. To Solve Bernoulli differential equations.
5. To find the solution to higher-order linear differential equations.

Unit I: Recapitulation of Differential Equations of first order and first degree, Exact Differential equations, Necessary and sufficient condition for the equations to be exact. 14 Hours

Unit II: Differential equations of the first order and higher degree: Equations solvable for p, x, y. Clairaut's equation and singular solution. Orthogonal trajectories of Cartesian and polar curves. 14 Hours

Unit III: Linear differential equations of the n^{th} order with constant coefficients. Particular integrals when the RHS is of the form e^{ax} , $\sin(ax+b)$, $\cos(ax+b)$, x^n , $e^{ax} V(x)$ and $xV(x)$ (with proofs). 14 Hours

Reference Books:

1. M. D. Raisinghania, Ordinary Differential Equations & Partial Differential Equations, S. Chand & Company, New Delhi.
2. J. Sinha Roy and S Padhy: A Course of Ordinary and Partial Differential Equation Kalyani Publishers, New Delhi.
3. D Murray, Introductory Course in Differential Equations, Orient Longman (India)
4. W T Reid, Ordinary Differential Equations, John Wiley, New Delhi
5. M. L. Khanna, Differential Equations, Jai Prakash Nath & Co. Meerut.
6. Shepley L. Ross, Differential Equations, 3rd Ed., John Wiley and Sons, 1984.
7. Kreyzig, Advanced Engineering Mathematics, John Wiley, New Delhi.

OPEN ELECTIVE COURSE

(For students of other than Science stream)

MATOET 3.1(B): Quantitative Mathematics	
Teaching Hours : 3 Hours/Week	Credits: 3
Total Teaching Hours: 42 Hours	Max. Marks: 100 (SEE - 60 + IA - 40)

Course Outcomes: This course will enable the students to:

- Understand number system and fundamental operations
- Understand the concept of linear, quadratic and simultaneous equations & their applications in real life problems
- Understand and solve the problems based on age.
- Solve speed and distance related problems.

Unit-I: Number System

Numbers, Operations on numbers, Tests on Divisibility, HCF and LCM of numbers. Decimals, Fractions, Simplification, Square roots and Cube roots - Problems thereon. Surds and Indices. Illustrations thereon. 14 Hours

Unit-II: Theory of equations

Linear equations, quadratic equations, simultaneous equations in two variables, simple application problems - Problems on ages, Problems on conditional age calculations, Present & Past age calculations. 14 Hours

Unit-III: Quantitative Aptitude

Percentage, Average, Average Speed-problems. Time and distance, problems based on trains, problems on-work and time, work and wages, clock and calendar. 14 Hours

Reference Books:

1. R.S. Aggarwal, Quantitative Aptitude, S. Chand and Company Limited, NewDelhi.
2. A. Guha, Quantitative Aptitude, 5th Edition, Mc.Grawhillpublications.2014.
3. R V Praveen, Quantitative Aptitude and Reasoning, PHI publishers.
4. R S Aggarwal, Objective Arithmetic, S. Chand & Company Ltd.
5. Q. Zameerddin, V. K. Khanna, S K Bhambri, Business Mathematics-II Edition.
6. S. K. Sharma and G. Kaur, Business Mathematics, Sultan Chand & Sons.
7. H. Padmalochan, A Text Book of Business mathematics for B.Com and BBA Course, Chand Publication.
8. J K Thukrol, Business Mathematics, abci book:2020 First Edition.
9. N. G. Das and J. K. Das, Business Mathematics and Statics, Mc Graw Hill Education, 2017.

OPEN ELECTIVE COURSE
(For Students of other than Science Stream)

MATOET 3.1(C): Vedic Mathematics	
Teaching Hours : 3 Hours/Week	Credits: 3
Total Teaching Hours: 42 Hours	Max. Marks: 100 (S.A.- 60 + I.A. – 40)

Course Outcomes: This course will enable the students to:

- Understand the vedic methods of arithmetic.
- Understand the vedic methods of division with two/three digit divisor.
- Understand the vedic methods of power and root power of two digit numbers.

Unit-I: Multiplication:

1. Ekadhikēpurven method (multiplication of two numbers of two digits).
2. Eknunenpurven method (multiplication of two numbers of three digits).
3. Urdhvatiragbhyam method (multiplication of two numbers of three digits).
4. Nikhīlam Navtashchramam Dashtaha (multiplication of two numbers of three digits).
5. Combined Operations. 14 Hours

Unit-II: Division and Divisibility

Part A: Division

1. Nikhīlam Navtashchramam Dashtaha (two digits divisor)
2. Paravartya Yojyet method (three digits divisor)

Part B: Divisibility

1. Ekadhikēpurven method (two digits divisor)
2. Eknunenpurven method (two digits divisor) 14 Hours

Unit-III: Power and Root Power:

1. Square two digit numbers)
2. Cube (two digit numbers).

Root:

1. Square root (four digit number)
2. Cube root (six digit numbers).
3. Solution of linear simultaneous equations. 14 Hours

Reference Books:

1. Vedic Mathematics, Motilal Banarsi Das, New Delhi.
2. Vedic Ganita: Vihangama Drishti-1, Siksha Sanskriti Uthana Nyasa, New Delhi.
3. Vedic Ganita Praneta, Siksha Sanskriti Uthana Nyasa, New Delhi.
4. Vedic Mathematics: Past, Present and Future, Siksha Sanskriti Uthana Nyasa, New Delhi.
5. Leelavati, Chokhambha Vidya Bhavan, Varanasi.
6. Bharatiya Mathematicians, Sharda Sanskrit Sansthan, Varanasi.

OPEN ELECTIVE COURSE

(For students of Science stream who have not chosen Mathematics as one of the Core Course)

MATOET4.1(A): Partial Differential Equations	
Teaching Hours: 3 Hours/Week	Credits: 3
Total Teaching Hours: 42 Hours	Max. Marks: 100 (SEE-60 + I.A. – 40)

Course Learning Outcomes: This course will enable the students to

- Understand the concept of the partial differential equation.
- Classify the partial differential equations concerning their order and linearity.
- Understand the meaning of the solution of a partial differential equation.
- Solve a partial differential equation by Charpits method.
- Find the solution to higher-order linear differential equations.

Unit I: Basic concepts–Formation of a partial differential equations by elimination of arbitrary constants and functions – Solution of partial differential equations –Direct integration, Lagrange’s linear equations of the form $Pp + Qq = R$. 14 Hours

Unit II: Standard types of first order non-linear partial differential equations, the integrals of the non-linear equation by Charpit’s method. Homogeneous linear partial differential equations with constant coefficients. 14 Hours

Unit III: Classification of second order linear equations as hyperbolic, parabolic and elliptic. Solutions of the Heat equation, Laplace equation and Wave equation using separation of variables. 14 Hours

Reference Books:

1. D.A. Murray, Introductory course in Differential Equations, Orient and Longman
2. H.T. H.Piaggio, Elementary Treatise on Differential Equations and their applications, C.B.S Publisher & Distributors, Delhi,1985.
3. G.F.Simmons, Differential Equations, Tata McGraw Hill 14
4. S.L. Ross, Differential Equations, 3rd Ed., John Wiley and Sons, India, 2004.
5. M.R. Speigel, Schaum’s outline of Laplace Transform
6. M. D. Raisinghania, Ordinary Differential equations & Partial differential equations, S. Chand & Company, New Delhi.
7. K.Sankara Rao, Introduction to Partial Differential Equations: PHI, Third Edition, 2015.
8. I. N. Snedden, Elements of Partial differential equations,

OPEN ELECTIVE COURSE
(For students of other than science stream)

MATOET4.1(B) : Mathematical Finance	
Teaching Hours: 3Hours/week	Credits: 3
Total Teaching Hours:42Hours	Max.Marks:100 (S.A-60+I.A.-40)

Course Learning Outcomes: This course will enable the students to:

- Understand how compute profit and loss, discount and Banker’s discount.
- Understand the concept of linear equations and inequalities and their use in the solving the linear programming problems.
- Formulation of transportation problem and its application in routing problem.

Unit-I: Commercial Arithmetic

Bill of exchange, Bill of discounting procedure. Basic formula related to profit, loss, discount and brokerage, Successive discount, True discount, Banker’s discount. 14 Hours

Unit-II: Linear Programming

Linear equations and inequalities- Rectangular coordinates, straight line, parallel and intersecting lines and linear inequalities, Introduction to linear programming, Mathematical formulation of LPP, Solution of a LPP by graphical method, special cases in graphical method. 14 Hours

Unit-III: Transportation Problem

Introduction, Formulation of Transportation problem, Initial basic feasible solution, Steps in solving a transportation problem, optimality check, special cases in Transportation problem. The traveling salesman problem (Routing Problem). 14 Hours

Reference Books:

1. R S Aggarwal, Objective Arithmetic, S. Chand & Company Ltd.
2. Mizrahi and Sullivan, Mathematics for Business and Social Sciences an Application approach.
3. Qazi Zameeruddin, Vijay K Khanna, S K Bhambri, Business Mathematics- II Edition, Vikas Publishing House.
4. S. Kalavathy, Operation Research, Fourth edition, Vikas publication house Pvt. Ltd.
5. Sreenivasa Reddy M, Operations Research 2nd edition, Sanguine Technical publishers, Bangalore.
6. S. D. Sharma, Operation Research,

OPEN ELECTIVE COURSE

(For students other than science stream)

MATOET 4.1 (C): Mathematics for Social Sciences	
Teaching Hours : 3 Hours/Week	Credits: 3
Total Teaching Hours: 42 Hours	Max. Marks: 100 (S.A.- 60 + I.A. – 40)

Course Learning Outcomes: This course will enable the students to:

- Understand the mathematical concept of sets and counting problems.
- Understand the concept of Probability and its applications in social sciences.
- Understand the concept of limits and continuity of functions and its applications in business and social sciences.

Unit-I

Sets, counting, permutations, combinations, counting problems, binomial theorem and problems thereon. Probability – Introduction, sample space and assignment of probabilities, properties of the probability of an event, probability of equally likely events, conditional probability, Baye's formula and examples thereon. 14 Hours

Unit II

Limit and continuity, Derivative- interpretation, derivative formulas, general derivatives for differentiation, composite functions, higher order derivatives and problems thereon. 14 Hours

Unit III

Applications of the derivative – Relative maxima and Relative minima, Absolute maximum and Absolute minimum, Applied problems, Concavity, Asymptotes, Marginal analysis, Models- Maximizing tax revenue, Optimal trade-in time, and minimizing inventory cost. 14 Hours

Reference books

1. Abe Mizrahi and Michael Sullivan, Mathematics for Business and Social Sciences and Applied Approach – Third Edition, Wiley.
2. Carl P. Simon and Lawrence Blume, Mathematics for Economists, Viva Books Private Limited, New Delhi, 2015.
3. L. Peccati, M. D'Amico and M. Cigola , Maths for Social Sciences, , Springer.