

DAVANGERE UNIVERSITY

SHIVAGANGOTHRI – 577 007, DAVANGERE



SYLLABUS FOR

I to IV Semesters

BACHULAR OF SCIENCE (B. SC.)

(SEMESTER SCHEME – NEP – 2020)

MATHEMATICS

(Major)

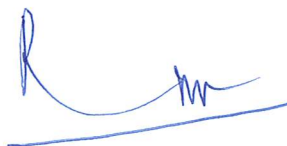

BoS-Chairman,

Department of Mathematics
Davangere University
Shiyagangotri, Davangere-577007.

Semeste	Course No.	Theory/ Practica I	Credits	Paper Title	Marks	
					S.A.	I.A.
I	MATDSCT1.1	Theory	4	Algebra - I and Calculus - I	60	40
	MATDSCP1.1	Practical	2	Theory based Practical's on Algebra - I and Calculus - I	25	25
	MATOET1.1	Theory	3	(A) Mathematics – I (B) Business Mathematics – I	60	40
II	MATDSCT2.1	Theory	4	Algebra - II and Calculus - II	60	40
	MATDSCP2.1	Practical	2	Theory based Practical's on Algebra - II and Calculus - II	25	25
	MATOET2.1	Theory	3	(A) Mathematics – II (B) Business Mathematics-II	60	40
III	MATDSCT3.1	Theory	4	Ordinary Differential Equations and Real Analysis-I	60	40
	MATDSCP3.1	Practical	2	Theory based Practical's on Ordinary Differential Equations and Real Analysis-I	25	25
	MATOET3.1	Theory	3	(A) Ordinary Differential Equations (B) Quantitative Mathematics (C) Vedic Mathematics	60	40
IV	MATDSCT4.1	Theory	4	Partial Differential Equations and Integral Transforms	60	40
	MATDSCP4.1	Practical	2	Theory based Practical's on Partial Differential Equations and Integral Transforms	25	25
	MATOET4.1	Theory	3	(A) Partial Differential Equations (B) Mathematical Finance (C) Mathematics for Social Sciences	60	40

36


BoS-Chairman,
Department of Mathematics
Davangere University
Shivagangotri, Davangere-577007.




Registrar
Davangere University
Shivagangotri, Davangere

Syllabus for B.Sc. Mathematics

I SEMESTER

MATDSCT 1.1: Algebra - I and Calculus - I	
Teaching Hours : 4 Hours/Week	Credits: 4
Total Teaching Hours: 56 Hours	Max. Marks: 100 (60 Sem End Exam + 40 IA)

UNIT – I: Matrices

(14 Hours)

Cayley- Hamilton theorem, inverse of matrices by Cayley-Hamilton theorem (Without Proof). Algebra of Matrices; Row and column reduction, Echelon form. Rank of a matrix; Inverse of a matrix by elementary operations; 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. Eigen values and Eigen vectors of square matrices, real symmetric matrices and their properties.

Unit-II: Polar Co-ordinates

(14 Hours)

Polar coordinates, angle between the radius vector and tangent. Angle of Intersection of curves, pedal equations. Derivative of an arc in Cartesian, parametric and polar forms, curvature of plane curve-radius of curvature formula in Cartesian, parametric and polar and pedal forms-center of curvature,

Unit-III: Differential Calculus-I

(14 Hours)

Limits (definition only), Continuity problems using LHL and RHL Concept, Differentiability, Rolle's Theorem only statement and problems, Lagrange's Mean Value theorem, Cauchy's Mean value theorem and examples. Taylor's theorem, Maclaurin's series, Indeterminate forms and examples.

Unit-IV: Successive Differentiation

(14 Hours)

Derivative of a function - Derivatives of higher order – n^{th} derivatives of the functions: e^{ax} , $(ax + b)^n$, $\log(ax + b)$, $\sin(ax + b)$, $\cos(ax + b)$, $e^{ax} \sin(bx + c)$, $e^{ax} \cos(bx + c)$ – Problems, Leibnitz theorem and its applications.

Books for References

1. Lipman Bers – Calculus, Volumes 1 and 2
2. B S Vatssa, Theory of Matrices, New Delhi: New Age International Publishers, 2005.
3. G B Thomas and R L Finney, Calculus and analytical geometry, Addison Wesley, 1995.
4. J Edwards, An elementary treatise on the differential calculus: with Applications and numerous example, Reprint. Charleston, USA BiblioBazaar, 2010.
5. N P Bali, Differential Calculus, India: Laxmi Publications (P) Ltd., 2010.
6. S Narayanan & T. K. Manicavachogam Pillay, Calculus.:S. Viswanathan Pvt. Ltd., vol. I & II 1996.
7. Frank Ayres and Elliott Mendelson, Schaum's Outline of Calculus, 5th ed.USA: Mc. Graw Hill., 2008.
8. Shanthy Narayan and P K Mittal, Differential Calculus, Reprint. New Delhi: S Chand and Co. Pvt. Ltd., 2014.

PRACTICALS

Mathematics Lab-I

MATDSCP 1.1: Practicals on Algebra - I and Calculus – I	
Practical Hours : 4 Hours/Week	Credits: 2
Total Practical Hours: 56 Hours	Max. Marks: 50 (25 Sem End Exam + 25 IA)

Practical/Lab Work to be performed in Computer Lab (FOSS)

Suggested Softwares: Maxima/Scilab/Maple/MatLab/Mathematica/Python/R.

Programs using Scilab/Maxima/Python:

1. Introduction to Scilab and commands connected with matrices.
2. Computation of addition and subtraction of matrices,
3. Computation of Multiplication of matrices.
4. Computation of Trace and Transpose of Matrix
5. Computation of Rank of matrix and Row reduced Echelon form.
6. Computation of Inverse of a Matrix using Cayley-Hamilton theorem.
7. Solving the system of homogeneous and non-homogeneous linear algebraic equations.
8. Finding the continuity of a function
9. Finding the differentiability of a function
10. Verification Cauchy's mean value theorem
11. Verification of Lagrange's mean value theorem
12. Evaluation of limits by L-Hospital rule.

Open Elective Course

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

MATOET 1.1: Mathematics - I	
Teaching Hours : 3 Hours/Week	Credits: 3
Total Teaching Hours: 42 Hours	Max. Marks: 100 (S.A.-60 + I.A. – 40)

UNIT – I: Matrices

(14 Hours)

Cayley- Hamilton theorem, inverse of matrices by Cayley-Hamilton theorem (Without Proof). Algebra of Matrices; Row and column reduction, Echelon form. Rank of a matrix; Inverse of a matrix by elementary operations; 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. Eigen values and Eigen vectors of square matrices, real symmetric matrices and their properties.

Unit-II: Differential Calculus-I

(14 Hours)

Limits (definition only), Continuity problems using LHL and RHL Concept, Differentiability, Rolle's Theorem only statement and problems, Lagrange's Mean Value theorem, Cauchy's Mean value theorem and examples. Taylor's theorem, Maclaurin's series, Indeterminate forms and examples.

Unit-III: Successive Differentiation

(14 Hours)

Derivative of a function - Derivatives of higher order – n^{th} derivatives of the functions: e^{ax} , $(ax + b)^n$, $\log(ax + b)$, $\sin(ax + b)$, $\cos(ax + b)$, $e^{ax} \sin(bx + c)$, $e^{ax} \cos(bx + c)$ – Problems, Leibnitz theorem and its applications.

Books for References

1. Lipman Bers – Calculus, Volumes 1 and 2
2. B S Vatssa, Theory of Matrices, New Delhi: New Age International Publishers, 2005.
3. G B Thomas and R L Finney, Calculus and analytical geometry, Addison Wesley, 1995.
4. J Edwards, An elementary treatise on the differential calculus: with Applications and numerous example, Reprint. Charleston, USA BiblioBazaar, 2010.
5. N P Bali, Differential Calculus, India: Laxmi Publications (P) Ltd., 2010.
6. S Narayanan & T. K. Manicavachogam Pillay, Calculus.:S. Viswanathan Pvt. Ltd., vol. I & II 1996.
7. Frank Ayres and Elliott Mendelson, Schaum's Outline of Calculus, 5th ed,USA: Mc. Graw Hill., 2008.
8. Shanthi Narayan and P K Mittal, Differential Calculus, Reprint. New Delhi: S Chand and Co. Pvt. Ltd., 2014.

Open Elective
(For Students of other than Science Stream)

MATOET 1.1: Business Mathematics-I	
Teaching Hours : 3 Hours/Week	Credits: 3
Total Teaching Hours: 42 Hours	Max. Marks: 100 (60 Sem End Exam + 40 IA)

Unit-I Algebra

14 Hours

Sets, relations, functions, indices, logarithms, permutations and combinations, Examples on commercial mathematics.

Unit-II: Matrices

14 Hours

Definition of a matrix; types of matrices; Algebra of matrices, Determinants, Properties of determinants; calculations of values of determinants up to third order. Adjoint of a matrix, elementary row and column operations; solution of a system of linear equations involving not more than three variables. Examples on commercial mathematics

Unit-III: Trigonometric Functions

14 Hours

Recapitulation of basic Definitions of trigonometric functions. Signs of trigonometric functions and sketch of their graphs. Trigonometric functions of sum and difference of two angles. Trigonometric ratios of multiple angles (Simple problems).

Books for References:

1. Allel R.G.A: Basic Mathematics: Macmilan, New Delhi.
2. Dowling, E.T. Mathematics for Economics: Schaum Series, McGraw Hill, London.
3. Soni R.S.: Business Mathematics: Pitamber Publishing House, Delhi
4. N. Rudraiah and Others: College Mathematics for B.Sc Series I and II SBS Publication Co. Bangalore.

II SEMESTER

MATDSCT 2.1: Algebra - II and Calculus - II	
Teaching Hours : 4 Hours/Week	Credits: 4
Total Teaching Hours: 56 Hours	Max. Marks: 100 (60 Sem End Exam + 40 IA)

Unit-I: Number Theory:

14 Hours

Divisibility and its properties, Euclidean algorithm, GCD (greatest common divisor) of two numbers and problems, LCM (least common multiple) of any two integers, Fundamental theorem of arithmetic (finding GCD and LCM of two positive integers), congruences and properties, solution of linear congruences, simultaneous linear congruences.

Unit-II: Groups

14 Hours

Definition of a group with examples and properties, problems. Subgroups, center of groups, order of an element of a group and its related theorems, cyclic groups, Coset decomposition, Factor groups, Lagrange's theorem, and its consequences. Fermat's theorem and Euler's function.

Unit-III: Partial Derivatives

14 Hours

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 and standard properties and illustrative examples. Maxima-Minima of functions of two variables.

Unit-IV: Integral Calculus

14 Hours

Recapitulation of definite integrals and its properties. Reduction formula $\sin^n x$, $\cos^n x$, $\tan^n x$, $\sec^n x$, $\operatorname{cosec}^n x$, $\cot^n x$, and $\sin^m x \cos^n x$. area of plane curves, volume of solids of revolutions, surfaces of revolutions.

Reference Books:

1. I N Herstein, Topics in Algebra, Wiley Eastern Ltd., New Delhi.
2. Bernard & Child, Higher algebra, Arihant, ISBN: 9350943199/ 9789350943199.
3. Sharma and Vasishta, Modern Algebra, Krishna Prakashan Mandir, Meerut, U.P.
4. Shanti Narayan, Differential Calculus, S. Chand & Company, New Delhi.
5. Shanti Narayan and P K Mittal, Integral Calculus, S. Chand and Co. Pvt. Ltd.,
6. Schaum's Outline Series, Frank Ayres and Elliott Mendelson, 5th ed. USA: Mc. Graw Hill., 2008.
7. S C Malik, Mathematical Analysis, Wiley Eastern.
8. Vijay K Khanna and S K Bhambri, A Course in Abstract Algebra, Vikas Publications.
9. G K Ranganath, Text Book of B.Sc. Mathematics, S Chand & Company.

PRACTICALS

Mathematics Lab-II

MATDSCP 2.1: Practical on Algebra -II and Calculus - II	
Practical Hours: 4 Hours/Week	Credits: 2
Total Practical Hours: 56 Hours	Max. Marks: 50 (25 Sem End Exam + 25 IA)

Suggested Softwares: Maxima/Scilab/Maple/MatLab/Mathematica/Python/R.

Programs using Scilab/Maxima/Python:

1. Program for verification of binary operations.
2. Programs to verification of Lagrange's theorem with suitable examples.
3. Finding all possible subgroups of a finite group.
4. Program to find first and second order partial derivatives
5. Program to verify the Euler's theorem and its extension.
6. Finding the Jacobians
7. Plotting of standard cartesian curves
8. Plotting of polar curves
9. Plotting of parametric curves
10. Program to find area of curves
11. Program to find surface area of a curve
12. Program to find volume of a curve

Open Elective

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

MATOET 2.1(A): Mathematics – II	
Teaching Hours : 3 Hours/Week	Credits: 3
Total Teaching Hours: 42 Hours	Max. Marks: 100 (S.A.- 60 + I.A. – 40)

Unit-I: Groups

14 Hours

Definition of a group with examples and properties, problems. Subgroups, center of groups, order of an element of a group and its related theorems, cyclic groups, Coset decomposition, Factor groups, Lagrange's theorem and its consequences. Fermat's theorem and Euler's function.

Unit-II: Partial Derivatives

14 Hours

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 and standard properties and illustrative examples. Maxima-Minima of functions of two variables.

Unit-III: Integral Calculus

14 Hours

Recapitulation of definite integrals and its properties. Reduction formula $\sin^n x$, $\cos^n x$, $\tan^n x$, $\sec^n x$, $\operatorname{cosec}^n x$, $\cot^n x$, and $\sin^m x \cos^n x$ and its applications, Area of plane curves, Length of plane curves, Volume of solids of revolutions, Surfaces area of revolutions.

Reference Books:

1. Topics in Algebra, I N Herstein, Wiley Eastern Ltd., New Delhi.
2. Higher algebra, Bernard & Child, Arihant, ISBN: 9350943199/ 9789350943199.
3. Modern Algebra, Sharma and Vasishta, Krishna Prakashan Mandir, Meerut, U.P.
4. Differential Calculus, Shanti Narayan, S. Chand & Company, New Delhi.
5. Integral Calculus, Shanti Narayan and P K Mittal, S. Chand and Co. Pvt. Ltd.,
6. Schaum's Outline Series, Frank Ayres and Elliott Mendelson, 5th ed. USA: Mc. Graw Hill., 2008.
7. Mathematical Analysis, S C Malik, Wiley Eastern.
8. A Course in Abstract Algebra, Vijay K Khanna and S K Bhambri, Vikas Publications.
9. Text Book of B.Sc. Mathematics, G K Ranganath, S Chand & Company.

Elective
(For Students of other than science stream)

MATOET 2.1(B): Business Mathematics-II	
Teaching Hours : 3 Hours/Week	Credits: 3
Total Teaching Hours: 42 Hours	Max. Marks: 100 (S.A.- 60 + I.A. – 40)

Unit - I: Commercial Arithmetic

14 Hours

Interest: Concept of Present value and Future value, Simple interest, Compound interest, Nominal and Effective rate of interest, Examples and Problems Annuity: Ordinary Annuity, Sinking Fund, Annuity due, Present Value and Future Value of Annuity, Equated Monthly Installments (EMI) by Interest of Reducing Balance and Flat Interest methods, Examples and Problems.

Unit - II: Measures of central Tendency and Dispersion

14 Hours

Frequency distribution: Raw data, attributes and variables, Classification of data, frequency distribution, cumulative frequency distribution, Histogram and give curves. 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.

Unit - III: Correlation and regression

14 Hours

Concept and types of correlation, Scatter diagram, Interpretation with respect to magnitude and direction of relationship. Karl Pearson's coefficient of correlation for ungrouped data. Spearman's rank correlation coefficient. (with tie and without tie) Concept of regression, Lines of regression for ungrouped data, predictions using lines of regression. Regression coefficients and their properties (without proof). Examples and problems.

Reference Books:

1. Practical Business Mathematics, S. A. Bari New Literature Publishing Company New Delhi
2. Mathematics for Commerce, K. Selvakumar Notion Press Chennai
3. Business Mathematics with Applications, Dinesh Khattar & S. R. Arora S. Chand Publishing New Delhi
4. Business Mathematics and Statistics, N.G. Das & Dr. J.K. Das McGraw Hill New Delhi
5. Fundamentals of Business Mathematics, M. K. Bhowal, Asian Books Pvt. Ltd New Delhi
6. Mathematics for Economics and Finance: Methods and Modelling, Martin Anthony and Norman, Biggs Cambridge University Press Cambridge
7. Financial Mathematics and its Applications, Ahmad Nazri Wahidudin Ventus Publishing APS Denmark
8. Fundamentals of Mathematical Statistics, Gupta S. C. and Kapoor V. K., Sultan Chand and Sons, New Delhi.
9. Statistical Methods, Gupta S. P.: Sultan Chand and Sons, New Delhi.
10. Applied Statistics, Mukhopadhyaya Parimal New Central Book Agency Pvt. Ltd. Calcutta.
11. Fundamentals of Statistics, Goon A. M., Gupta, M. K. and Dasgupta, B. World Press Calcutta.