

**B.A./B.Sc. (Mathematics) Syllabus
(Semester System)**
Sri Dev Suman University, Badshahithaul (Tehri Garhwal)

(With effect from session 2018-2019)

B.A./B.Sc. I Semester

S.No.	Paper	Paper code	Maximum Marks	
			External	Internal
1	Trigonometry and Matrices	BM-101	80/100	20/25
2	Differential Calculus	BM-102	80/100	20/25

B.A./B.Sc. II Semester

S.No.	Paper	Paper code	Maximum Marks	
			External	Internal
1	Group Theory	BM-201	80/100	20/25
2	Integral Calculus	BM-202	80/100	20/25

B.A./B.Sc. III Semester

S.No.	Paper	Paper code	Maximum Marks	
			External	Internal
1	Advanced Algebra	BM-301	80/100	20/25
2	Differential Equations	BM-302	80/100	20/25

B.A./B.Sc. IV Semester

S.No.	Paper	Paper code	Maximum Marks	
			External	Internal
1	Linear Algebra	BM-401	80/100	20/25
2	Mechanics	BM-402	80/100	20/25

B.A./B.Sc. V Semester

S.No.	Paper	Paper code	Maximum Marks	
			External	Internal
1	Real Analysis	BM-501	80/100	20/25
2	Complex Analysis	BM-502	80/100	20/25

B.A./B.Sc. VI Semester

S.No.	Paper	Paper code	Maximum Marks	
			External	Internal
1	Linear Programming	BM-601	80/100	20/25
2	Numerical Analysis	BM-602	80/100	20/25

B.A./B. Sc. Semester-I

PAPER I

TRIGONOMETRY and MATRICES

- I. Separation into real and imaginary parts, Logarithmic of complex quantities, Hyperbolic functions with their inverses.
- II. Gregory's series, Summation of trigonometric series.
- III. Rank of a matrix, Invariance of rank under elementary transformations, Adjoint of matrices, Inverse of matrices, Reduction to normal form.
- IV. Solutions of linear homogeneous and non-homogeneous equations with number of equations and unknowns upto four, Solutions of a system of linear equations using matrices.

Books Recommended

1. S.L. Loney: *Plane Trigonometry (Part I, II)*, Arihant Publications.
2. M.D. Raisinghania, H.C. Sexena & H. K. Dass : *Trigonometry*, S. Chand & Company Pvt. Ltd. 2002.
3. A.I. Kostrikin, *Introduction to Algebra*, Springer Verlag, 1984.
4. Richard Bronson, *Theory and Problems of Matrix Operations*, Tata McGraw Hill, 1989.

PAPER II

DIFFERENTIAL CALCULUS

- I. Successive differentiation, Leibnitz's theorem, Partial differentiation, Euler's theorem on homogeneous functions.
- II. Tangents and normal, Curvature, Asymptotes.
- III. Singular points, Maxima and minima.
- IV. Tracing of curves, Parametric representation of curves and tracing of parametric curves, Polar coordinates and tracing of curves in polar coordinates.

Books Recommended:

1. M. Ray: *Differential Calculus*, Shiva Lal Agarwal and Co., Agra.
2. Gorakh Prasad: *Differential Calculus*, Pothishala publication, Allahabad.

B.A./B. Sc. Semester-II

PAPER I

GROUP THEORY

- I. Sets, Operations on sets, Relations, Equivalence relations and partition Functions.
- II. Algebraic structures, Group, Example of groups, Subgroups, Permutation group.
- III. Order of an element, Cyclic group, Coset decomposition, Lagrange's theorem and its consequences.
- IV. Quotient group, Homomorphism, Isomorphism, Cayley's theorem, Normalizer and center of a group.

Books Recommended

1. John B. Fraleigh, *A First Course in Abstract Algebra*, 7th Ed., Pearson, 2002.
2. Joseph A Gallian, *Contemporary Abstract Algebra*, 4th Ed., Narosa, 1999.

PAPER II

INTEGRAL CALCULUS

- I. Integration of rational and irrational functions, Properties of definite integrals.
- II. Gamma-Beta functions, Reduction formulae for integrals of rational, Trigonometric, Exponential and Logarithmic functions and of their combination.
- III. Areas and lengths of curves in the plane.
- IV. Volumes and surfaces of solids of revolution, Double and triple integrals.

Books Recommended

1. G.B. Thomas and R.L. Finney, *Calculus*, 9th Ed., Pearson Education, Delhi, 2005.
2. H. Anton, I. Bivens and S. Davis, *Calculus*, John Wiley and Sons (Asia) P. Ltd., 2002.

B.A./B. Sc. Semester-III

PAPER I

ADVANCED ALGEBRA

- I. Normal subgroups and their properties, Simple group.
- II. Rings, various types of rings, Subrings, Properties of rings.
- III. Ideals, Principal ideal ring, Quotient rings, Characteristics of a ring.
- IV. Integral domain, Field, Skew field; Examples and its characterizations,

Books Recommended

1. John B. Fraleigh, *A First Course in Abstract Algebra*, 7th Ed., Pearson, 2002.
2. Joseph A Gallian, *Contemporary Abstract Algebra*, 4th Ed., Narosa, 1999.
3. Khanna & Bhambhari, *A course in Abstract Algebra*, 4th ED, Vikash Publication 2006.

PAPER II

DIFFERENTIAL EQUATIONS

- I. First order exact differential equations, Integrating factors, Rules to find an integrating factor, First order higher degree equations solvable for x , y , p , methods for solving higher-order differential equations, Basic theory of linear differential equations, Wronskian, and its properties.
- II. Solving a differential equation by reducing its order, Linear homogenous equations with constant coefficients, Linear non-homogenous equations, The method of variation of parameters.
- III. The Cauchy-Euler equation, Simultaneous differential equations, Total differential equations.
- IV. Order and degree of partial differential equations, Concept of linear and non-linear partial differential equations, Formation of first order partial differential equations, Linear partial differential equation of first order, Lagrange's method, Charpit's method.

Books Recommended

1. Shepley L. Ross, *Differential Equations*, 3rd Ed., John Wiley and Sons, 1984.
2. I. Sneddon, *Elements of Partial Differential Equations*, McGraw-Hill, International Edition, 1967.

B.A./B.Sc. Semester IV

PAPER I

LINEAR ALGEBRA

- I. Vector spaces, Subspaces, Algebra of subspaces, Quotient spaces, Linear combination of vectors, Linear span, Linear independence, Basis and dimension, Dimension of subspaces.
- II. Linear transformations, Null space, Range, Rank and nullity of a linear transformation, Matrix representation of a linear transformation, Algebra of linear transformations.
- III. Dual Space, Dual basis, Double dual, Characteristic polynomial, Eigenvalues and eigen vectors.
- IV. Isomorphisms, Isomorphism theorems, Invertibility and isomorphisms, Change of coordinate matrix.

Books Recommended

1. Stephen H. Friedberg, Arnold J. Insel, Lawrence E. Spence, *Linear Algebra*, 4th Ed., Prentice-Hall of India Pvt. Ltd., New Delhi, 2004.
2. David C. Lay, *Linear Algebra and its Applications*, 3rd Ed., Pearson Education Asia, Indian Reprint, 2007.
3. S. Lang, *Introduction to Linear Algebra*, 2nd Ed., Springer, 2005

PAPER II

MECHANICS

- I. Conditions of equilibrium of a particle and of coplanar forces acting on a rigid body, Laws of friction, Problems of equilibrium under forces including friction.
- II. Centre of gravity, Work and potential energy.
- III. Newton's laws of motion, Motion under constant acceleration, Motion under inverse square law, Velocity and acceleration, Simple harmonic motion.
- IV. Angular velocity and angular acceleration, Velocity and acceleration of a particle along a curve: Radial and transverse components (plane curve), Tangential and normal components (space curve).

Books Recommended

1. A. S. Ramsay: *Statics*, CBS Publishers and Distributors (Indian Reprint), 1998.
2. A. P. Roberts: *Statics and Dynamics with Background in Mathematics*, Cambridge University Press, 2003.

B.A./B. Sc. Semester-V

PAPER I

REAL ANALYSIS

- I. Finite and infinite sets, Examples of countable and uncountable sets, Real line, Bounded sets, Suprema and infima, Completeness property of \mathbb{R} , Archimedean property of \mathbb{R} , Intervals, Concept of cluster points and statement of Bolzano-Weierstrass theorem.
- II. Real Sequence, Bounded sequence, Cauchy convergence criterion for sequences. Cauchy's theorem on limits, Order preservation and squeeze theorem, Monotone sequences and their convergence, Monotone convergence theorem without proof.
- III. Infinite series, Cauchy convergence criterion for series, Positive term series, Geometric series, Comparison test, Convergence of p-series, Root test, Ratio test, Alternating series, Leibnitz's test (Tests of convergence without proof), Definition and examples of absolute and conditional convergence.
- IV. Rolle's theorem, Mean Value theorems, Taylor's theorem with Lagrange's and Cauchy's forms of remainder, Taylor's series, Maclaurin's series of $\sin x$, $\cos x$, e^x , $\log(1+x)$, $(1+x)^m$.

Books Recommended

1. T. M. Apostol, *Calculus* (Vol. I), John Wiley and Sons (Asia) P. Ltd., 2002.

2. R.G. Bartle and D. R Sherbert, *Introduction to Real Analysis*, John Wiley and Sons (Asia), P. Ltd., 2000.
3. K.A. Ross, *Elementary Analysis- The Theory of Calculus Series-* Undergraduate Texts in Mathematics, Springer Verlag, 2003.

PAPER I

COMPLEX ANALYSIS

- I. Limits, Limits involving the point at infinity, Continuity, Properties of complex numbers, Regions in the complex plane, Functions of complex variable, Mappings, Derivatives, Differentiation formulas, Cauchy-Riemann equations, Sufficient conditions for differentiability.
- II. Analytic functions, Examples of analytic functions, Exponential function, Logarithmic function, Trigonometric function, Derivatives of functions.
- III. Definite integrals of functions, Contours, Contour integrals and its examples, Upper bounds for moduli of contour integrals, Cauchy- Goursat theorem, Cauchy integral formula.
- IV. Liouville's theorem and Taylor and Laurent series and its examples.

Books Recommended

1. James Ward Brown and Ruel V. Churchill, *Complex Variables and Applications*, 8th Ed., McGraw – Hill International Edition, 2009.
2. Joseph Bak and Donald J. Newman, *Complex analysis*, 2nd Ed., Undergraduate Texts in Mathematics, Springer-Verlag New York, Inc., New York, 1997.

B.A./B. Sc. Semester-VI

PAPER I

LINEAR PROGRAMMING

- I. Linear programming problems, Graphical approach for solving some LPP, Convex sets, Supporting and separating hyper planes.
- II. Theory of simplex method, Optimality and unboundedness, The simplex algorithm, Simplex method in tableau format, Introduction to artificial variables.
- III. Two-phase method, Big-M method and their comparison.
- IV. Duality, formulation of the dual problem, Primal-dual relationships, Economic interpretation of the dual.

Books Recommended

1. Mokhtar S. Bazaraa, John J. Jarvis and Hanif D. Sherali, *Linear Programming and Network Flows*, 2nd Ed., John Wiley and Sons, India, 2004.
2. F.S. Hillier and G.J. Lieberman, *Introduction to Operations Research*, 8th Ed., Tata McGraw Hill, Singapore, 2004.
3. Hamdy A. Taha, *Operations Research, An Introduction*, 8th Ed., Prentice-Hall India, 2006.

PAPER II

NUMERICAL ANALYSIS

- I. Algorithms, Convergence, Bisection method, False position method, Fixed point iteration method, Newton's method, Secant method, LU decomposition, Gauss-Jacobi, Gauss-Siedel methods.
- II. Lagrange and Newton interpolation: Linear and higher order, Finite difference operators.
- III. Numerical differentiation: Forward difference, Backward difference and central difference.
- IV. Numerical integration: Trapezoidal rule, Simpson's rule.

Recommended Books

1. B. Bradie, *A Friendly Introduction to Numerical Analysis*, Pearson Education, India, 2007.
2. M.K. Jain, S.R.K. Iyengar and R.K. Jain, *Numerical Methods for Scientific and Engineering Computation*, 5th Ed., New age International Publisher, India, 2007.