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. IIISemester

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. IVSemester

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

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, Realtions, Equavalence relations and partition Functions.
II   Algebraic structures, Group, Example of groups, Subgroups, Permutationgroup.
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 agroup.

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,*4thEd.,Prentice-Hall of India Pvt. Ltd., New Delhi,2004.
2. DavidC.Lay,*LinearAlgebra and its Applications,*3rdEd.,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 (spacecurve).

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 R, Archimedean property of 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 withoutproof.
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(l+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 offunctions.
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 itsexamples.

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 DonaldJ.Newman,*Complex analysis,*2ndEd.,UndergraduateTexts 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 thedual.

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.HillierandG.J.Lieberman,*Introduction to Operations Research,*8thEd.,TataMcGrawHill, 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.IyengarandR.K.Jain,*NumericalMethodsforScientific and Engineering Computation*, 5th Ed., New age International Publisher, India, 2007.