B.Sc.-II Semester-III
3S-Mathematics Paper-V
(Advanced Calculus)

Unit. I : Sequence : Definition of sequence, uniqueness of limits of sequences, algebra of limit of a sequence, positivity theorem, sandwich theorem, bounded and monotonic sequences, Cauchy' s sequences.

Unit II: Series: Series of non-negative terms, convergence of geometric series and the series $\sum 1/n^p$ Comparison tests, Cauchy's integral test, Ratio test, Root test. Absolute convergent, conditional convergent, Leibnitz rule, Abel's test, Dirichlet's test.

Unit III: Limit and continuity of functions of two variables,Algebra of limits and continuity, indeterminate value property, Taylor's theorem forfunction of two variables.

Unit IV: Maxima and minima, Lagrange's multipliers method, Jacobians.

Unit V: Double integral: Definition and Evaluations of double integral.Change of order of integration in double integral, tripleintegral (evaluation technique only). Gauss and Stokes theorem.

Reference Books:

1) T. M. Karade, M. S. Bendre :Lectures on Vector Analysis andGeometry, Sonu-Nilu Publication, Nagpur.

2) T. M. Karade, J. N. Salunke, A. G. Deshmukh, M. S. Bendre:Lectures on Advanced Calculus, Sonu-Nilu Publication, Nagpur.

3) Gorakh Prasad : Differential Calculus, Pothishala Pvt. Ltd.,Allahabad.

4) Gorakh Prasad : Integral Calculus, Pothishala Pvt. Ltd., Allahabad.

5) Murray R. Spiegel :Theory and Problems of Advanced Calculus,Schaum Outline Series.

6) S. C. Malik and Arora : Mathematical Analysis, Wiley EsternLtd., New Delhi.

7) O. E. Stanaitis : An Introduction to Sequences, Series andimproper Integrals, Holden-Dey , Inc. San Francisco, California.

8) Earl D. Rainville : Infinite series, The Macmillan Co., New York.

9) N. Piskunov : Differential and Integral Calculus, Peace publishers, Noscow.

10) Shanti Narayan : A Course of Mathematical Analysis, S. Chand& Co., New Delhi.

11) D. Somasundaram and B. Choudhary: A First course in Mathematical Analysis, Narosa Publ. House.

B.Sc. –II Semester III

3S Mathematics paper- VI

(Elementary Number Theory)

Unit-I: divisibility, division algorithm, the greatest common divisor of more than two integers, Euclidean algorithm, least common multiple.

Unit-II: prime numbers, the fundamental theorem of arithmetic or unique factorization theorem, Fermat numbers, linear Diophantine equation.

Unit-III: congruence, properties of congruence, special divisibility test, linear congruence's, Chinese remainder theorem.

Unit-IV: Arithmetic functions, Euler's theorem, the τ and σ function's, mobius μ function.

Unit-V: primitive roots, primitive roots for prime, polynomial congruence's,the congruence

$x^2 \equiv a \pmod{p}$, the general quadratic congruence, quadratic residues.

Reference books:

1) D. M. Burton: Elementary number theory, universal book stall, New Delhi, second edition2003.
2) C. Y. Hsiung : Elementary theory of numbers ,Allied publishers Ltd. 1992.
3) I. Niven, H.S. Zuckerman and H.L. Montgomery: an introduction to theory of numbers, Wiley student edition, fifth edition2004.
4) K.H.Rosen: elementary number theory and its applications ,Addison-wesley,1986.
5) T.M. Karade, J.N. Salunke, k. D. Thengane, M.S. Bender: lectures on elementary number theory, sonu-nilu publication 2005.
6) G.A. Jones and I.M. Jones : elementary number theory, Springer, 1998.
7) W. Slerpinski: elementary number theory, north Holland, 1988, Ireland.
8) K. Rosen and M. Rosen: A classical introduction to modern number theory, GTM Volume94, Springer- verlag,1972.

B.Sc.-II Semester-IV
4S Mathematics Paper-VII
(Modern Algebra: Group and rings)

Unit I : Group: Definition of a Group with examples, properties of Groups, subgroups, cyclic groups, order of generator of cyclic group, permutation groups even and odd permutations.
Unit II: Coset's and normal subgroups: Coset's, Lagrange's theorem, Normal Subgroups, Different characterizations of normal subgroups, Algebra of normal subgroups, Quotient group.

Unit III : Homomorphism and Isomorphism: Homomorphism, Homomorphic image, Kernel of homomorphism, Isomorphism of groups, Fundamental theorem of homomorphism, Natural homomorphism, second isomorphism theorem, third isomorphism theorem.

Unit IV: Ring,Integral domain and field: Definition,Examples, Properties of ring, (Commutative ring, Ring with unity, Zero divisor, withoutzero divisor), Subring's, Characteristics of a ring,integral domain,field, Subfield, Prime field.

Unit V: Ideal: definition, left ideal, right ideal, examples, algebra of ideals, prime ideal, maximal ideal, principle ideal, quotient ring homomorphism.

Reference Books:

1. I.N.Herstein:Topics in Algebra, Wiley Eastern Ltd., New Delhi,1975.

2. N.Jocobson: Basic Algebr a ,Vol. I and IIW.H.Freeman,1980(Hindustan Publishing Co.

3. Shanti Narayan :A Text Book Of Modern Abstract Algebra, S.Chand and Co. ,New Delhi.

4. K.B.Datta: Matrix and Linear Algebra, Prentice Hall of IndiaPvt.Ltd.New Delhi,2000.

5. P.B.Bhattacharya, S.K.Jain and S.R.Nagpal : Basic Abstract Algebra (IIndEdition)Cambridge University Press Indian Edition,1997.

6. K.Hoffman and R.Kunze :Linear Algebra ,II nd Edition Prentice Hall,Englewood Cliffs, New Jersey,1971.

7. S.K.Jain, A Gunawardhana and P.B.Bhattacharya : Basic Linear algebra with MATLAB, Key College Publishing (SpringerVerlag)2001.

8. S. Kumaresan : Linear Algebra, A Geometric Approach, P Prentice Hall of India Pvt. Ltd. New Delhi,2000.

9. Vivek Sahai and Vikas Bisht :Algebra, Narosa Publishing House ,1997.

10. D.s.Malik,J.N.Mordeson and M.K.Sen :Fundamentals of Abstract Algebra ,McGraw Hill International Edition 1997.

11. T.M.Karade, J.N.Salunke, K.S.Adhav, M.S.Bendre :Lectures on Abstract Algebra.Sonu Nilu Publication.Nagpur(IInd Publication)

B.Sc.-II Semester IV
4s Mathematics paper-VIII
(Classical Mechanics)

Unit-I: Constraints, generalized coordinates, D' Alembert's principle and Lagrange's equation of motion.

Unit-II: central force motion: Areal velocity, equivalent one body problem, central orbit, virial theorem, Kepler's laws motions.

Unit-III: calculus of variations: functional, externals, Euler's differential equation, Brachistochone problem, invariance of Euler's equations , Euler's- Poisson equations for functional dependent on higher derivatives, Euler's- Ostrogradsky equations.

Unit-IV: Hamilton's principle, Lagrange's equations for non –holonomic system, Routh's procedure, least action principle .

Unit-V: Rigid body, generalized co-ordinates of a rigid body, Eulerian angles, Euler's theorem, finite rotations, infinitesimal rotations.

Reference Books:

1) T. M. Karade, M. S. Bendre :Lectures on Mechanics, Sonu-Nilu Publication, Nagpur.
2) H. Goldstein : Classical Mechanics (2nd edition), Narosa Publishing House, NewDelhi.
3) S. L. Loney : Statics, Mc-Millan and co., London.
4) R. S. Verma : A Text Book on Statics, Pothishala Pvt. Ltd. Allahabad.
5) S. L. Loney : An Elementary Treatise on the Dynamics of a particle and of rigid bodies, Cambridge University Press, 1956.
6) D. K. Daftari, V. N. Indurkar : Elements of Statics, Published by Dattsons, J. Neharu Marg, Nagpur.
7) M. A. Pathan : A modern Text Book of Statics, Pragati Prakashan,Nagpur.