

**DR.C.V.RAMAN CIENCE COLLEGE,  
SIRONCHA**



**Faculty of Science & Technology**

**Proposed Syllabus For**

**B.Sc. Mathematics**

**Semester-III & Semester-IV**

**(Choice Based Credit System)**

**With effect from**

**Academic Year: 2018-19**

**(Considered and Approved in B.O.S. in Mathematics)**

**DR.C.V.RAMAN SCIENCE COLLEGE,  
SIRONCHA**

**B.Sc. Mathematics**

**Semester-III & IV**

**(Choice Based Credit System)**

**Semester-III**

**Paper –V: USMT-05 Real Analysis**

**Paper- VI: USMT-06 Set Theory and Laplace Transform**

**Semester-IV**

**Paper – VII: USMT-07 Algebra**

**Paper- VIII: USMT-08 Elementary Number Theory**

**B.Sc. Mathematics**  
**Semester-III**  
**(Choice Based Credit System)**

**Paper –V: USMT-05**  
**Real Analysis**

**Max. Mark- 60 + 15**

**Unit-I**

Real sequence, bounded sequence, Cauchy convergence criterion for sequences, Cauchy's theorem on limits, monotone sequences and their convergence, monotone convergence theorem.

**Unit – II**

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, test for convergence.

**Unit – III**

Metric, Neighbourhood, closed sets, open sets, bounded sets, DeMorgan's law, definition of metric space, subspace of metric space, open sphere, closed sphere, Cauchy sequence, complete metric space.

**Unit-IV**

Riemann integral, Darboux's upper and lower sums, lower and upper integrals, Riemann integral, criterion for Riemann integrability, properties of integrable functions, integrability of continuous and monotonic functions, The fundamental theorem of integral calculus, Mean value theorem of integral calculus.

**Reference Books**

1. I. 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. E. Fischer - Intermediate Real Analysis, Springer Verlag, 1983
4. T. M. Karade , J.N. Salunke, K. S. Adhav and M. S. Bendre - Analysis , Sonu –Nilu Publ. Nagpur, 2004
5. T. M. Karade - Mathematical Analysis , Sonu –Nilu Publ. Nagpur, 2014
6. Walter Rudin – Principle of Mathematical Analysis , 3<sup>rd</sup> Edition Mac Graw Hill, 1976

**B.Sc. Mathematics**  
**Semester-III**  
**(Choice Based Credit System)**

**Paper- VI: USMT-06**  
**Set Theory and Laplace Transform**

**Max. Mark- 60 + 15**

**Unit-I**

Sets, subsets, basic set operations, Venn diagrams, finite and infinite sets, classes of sets, power of a set, countable and uncountable sets, basic sets of numbers, set of real numbers  $\mathbb{R}$ , real line, supremum and infimum, completeness property of  $\mathbb{R}$ , Archimedean property of  $\mathbb{R}$ , Cartesian products of two sets, relations, types of relations, equivalence relation.

**Unit-II**

Basic concepts of Fuzzy sets, examples of fuzzy sets, operations on fuzzy sets: intersection, union and complements of fuzzy sets, alpha cuts and convex fuzzy sets, normal fuzzy sets.

**Unit-III**

Laplace transform, existence theorem for Laplace transform, linearity of Laplace transform, shifting theorem, Laplace transform of derivatives and integrals.

**Unit-IV**

Inverse Laplace transform, convolution theorem, solution of differential equations and partial differential equations

**Reference Books**

1. R. P. Grimaldi - Discrete Mathematics and Combinatorial Mathematics, Pearson Education, 1998
2. P. R. Halmos - Naïve Set Theory, Springer, 1974
3. E. Kamke - Theory of Sets, Dover Publication, 1950
4. Erwin Kreyszig – Advanced Engineering Mathematics, John Willey and Sons Inc, 1999
5. T.M.Karade – Partial Differential Equations and Laplace Transform, Sonu-Nilu Publication, Nagpur, 2013
6. Seymour Lipschutz- Schaum's out lines- Set Theory and Related Topics , Tata MacGraw Hill Education Pvt. Ltd. 5<sup>th</sup> Edition -2005
7. G. J. Klir and Bo Yuan – Fuzzy Sets and Fuzzy Logic , PHI Publication
8. T. M. Karade, J. N. Salunke, M. S. Bendre – Elements of Calculus, Group and Fuzzy Sets, - Sonu Nilu Publication -2010, Nagpur.
9. Ross Timothy J. –Fuzzy Logic with Engineering Applications –Wiley India 2<sup>nd</sup> Edition 2007

**B.Sc. Mathematics**  
**Semester-IV**  
**(Choice Based Credit System)**

**Paper –VII: USMT-07**  
**Algebra**

**Max. Mark- 60 + 15**

**Unit-I**

Group: definition of a group with examples, properties of a group, subgroups, cyclic groups, order of a generator of a cyclic group, permutation groups, even and odd permutations.

**Unit-II**

Cosets and Normal Subgroups: cosets, Lagrange's theorem, normal subgroups: their definition, examples, and characterizations, algebra of normal subgroups, quotient groups.

**Unit – III**

Homomorphism and Isomorphism: homomorphism, homomorphic image, kernel of homomorphism, isomorphism of a group, fundamental theorem on homomorphism of a group, Natural homomorphism, second isomorphism theorem, third isomorphism theorem .

**Unit-IV**

Ring, Integral domain and Field: definition, examples and properties of a ring (commutative ring, ring with unity, zero divisor, without zero divisor), subring, characterization of ring, integral domain, field.

**Reference Books**

1. I. N. Herstein - Topics in Algebra, Wiley Eastern Ltd., New Delhi, 1975
2. John B. Fraleigh - A First Course in Abstract Algebra, 7<sup>th</sup> Ed. Pearson , 2002
3. M. Artin-Abstract Algebra, 2<sup>nd</sup> Ed. Pearson , 2011
4. Joseph A. Gallian-Contemporary Abstract Algebra , Narosa, 1999
5. N. Jacobson- Basic Algebra , Vol I and II W.H. Freeman ,1980, (Hindustan Publ. Co.)
6. K. B. Datta – Matrix and Linear Algebra , Prentice Hall of India Pvt. Ltd. New Delhi , 2000
7. P. B. Bhattacharya , S.K.Jain, and S.R. Nagpal – Basic Abstract Algebra , II nd Edition , Cambridge Uni. Press Indian Edition , 1997
8. Shanti Narayan – A Text Book of Modern Abstract Algebra , S. Chand and Co. New Delhi
9. Vivek Sahai and Vikas Bisht – Algebra , Narosa Publishing House , 1997
10. T. M. Karade , J. N. Salunke , K. S. Adhav ,S. D. Katore, Rekha Rani – Modern Algebra (Groups- Rings) Sonu- Nilu Publ. (Ist Publication )Nagpur, 2014

**B.Sc. Mathematics**  
**Semester-IV**  
**(Choice Based Credit System)**

**Paper- VIII: USMT-08**  
**Elementary Number Theory**

**Max. Mark- 60 + 15**

**Unit-I**

Divisibility, division algorithm, the greatest common divisor, 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, Chinese remainder theorem, Goldbach conjecture

**Unit-IV**

Arithmetic function, Euler's theorem, Mobius function, the and functions, Pythagorean triplets.

**Reference Books**

1. David M. Burton - Elementary Number Theory, 6th Ed. Tata McGraw-Hill Edition, Indian Reprint, 2007
2. Richard E. Klima, Neil Sigmon , Ernest Stitzinger - Applications of Abstract Algebra with Maple, CRC Press, Boca Raton, 2000
3. Neville Robinns - Beginning Number Theory, 2nd Ed. Narosa Publishing House Pvt. Ltd., Delhi,2007
4. I. Niven , S.H. Zuckerman and I.H. Montgomery - An Introduction to the Theory of Numbers , John Wiley, 1991
5. T. M. Karade, J. N. Salunke, K. D. Thengane , M. S. Bendre – Lectures on Elementary Number Theory, Sonu- Nilu Publ. , Nagpur , 2005
6. C.Y. Hsiung - Elementary Theory of Numbers, Allied Publishers Ltd. 1992
7. G.A.Jones and I. M. Jones - Elementary Number Theory, Springer, 1998
8. W. Sierpinski - Elementary Theory of Number, North- Holland, 1988, Ireland
9. K.H.Rosen - Elementary Number Theory and its Applications, Addison – Wesley, 1986