

**SARDAR PATEL UNIVERSITY ,VALLABH VIDYANAGAR**  
**SYLLABUS FOR B.Sc. SEMESTER - 6**  
**US06CMTH21(T) (COMPLEX ANALYSIS)**  
**FOUR HOURS PER WEEK (4 CREDIT)**  
**Effective from June 2020**  
**Marks:-100 ( 30 Internal + 70 External )**

**UNIT-1**

Functions of Complex Variable , Mappings, Mappings by the Exponential Function, Limits , Theorems on Limits , Limits Involving the Point at Infinity , Continuity, Derivatives, Differentiation formulas.

**UNIT-2**

Cauchy-Riemann Equations , Sufficient Conditions for Differentiability , Polar Coordinates, Analytic and Harmonic Functions , Reflection Principle.

**UNIT-3**

The Logarithmic Function, Branches and Derivatives of Logarithms, Some Identities Involving Logarithm , Complex Exponents, Trigonometric functions , Hyperbolic Functions , Inverse Trigonometric and Hyperbolic Functions .

**UNIT-4**

Linear Transformations , The Transformation  $w = 1/z$  , Linear Fractional Transformations , An Implicit Form , Mappings of the Upper Half Plane , The Transformation  $w = \sin z$  , Mappings by  $z^2$  and Branches of  $z^{1/2}$  .

**Recommended Texts :**

J.W.Brown, R.V.Churchill, Complex Variables and Applications , Seventh Edition, McGraw-Hill Book Co., 2003.

Chapter : 2 (except Article 26) , 3 , 8 (except Articles 91, 92, 93 )

**Reference Books :**

- (1) J.B.Conway, Functions of one complex variables, Narosa publ. House, New Delhi, 1973.
- (2) Joseph Bak and Donald j. Newman , Complex Analysis , Second Edition , Undergraduate Texts in Mathematics, Springer-Verlag New York, Inc., New York, 1997.

**SARDAR PATEL UNIVERSITY ,VALLABH VIDYANAGAR**  
**SYLLABUS FOR B.Sc. SEMESTER - 6**  
**US06CMTH22(T) (RING THEORY)**  
**FOUR HOURS PER WEEK (4 CREDIT)**  
**Effective from June 2020**  
**Marks:-100 ( 30 Internal + 70 External )**

**UNIT-1**

Rings , Properties of Ring , Zero Divisor , Integral Domains , Field , Ring Isomorphism , Ring Homomorphism , Kernel of Ring Homomorphism , Quotient Fields

**UNIT-2**

Ideals for Ring , Proper Ideal , Quotient Rings , First Isomorphism Theorem for Ring , Prime and Maximal Ideals , Factorization , Associates Elements , Irreducible Element , Prime Element , g.c.d.

**UNIT-3**

Euclidean Domain , Principal Ideal Domain , Unique Factorization Domain, Polynomial Rings

**UNIT-4**

Roots of Polynomials , Factorization of Polynomials , Eisenstein's Criterion , Primitive Polynomial , Gauss Lemma , Gauss Theorem , Rational Function , Field Extensions , Normal Extensions , Separable Extensions .

**Recommended texts :**

N.S.Gopalakrishnan, University Algebra, Second Edition, Wiley Eastern Ltd., New Delhi 1994.

Chapter 2 , 4 ( Only 4.1 , 4.2 , 4.3 ) .

**Reference Books :**

- (1) John B. Fraleigh , A First Course in Abstract Algebra , Pearson,
- (2) M. Artin ,Abstract Algebra, Pearson,
- (3) Joseph A. Gallian , Contemporary Abstract Algebra , Narosa Pub.House , New Delhi .
- (4) I.N.Herstein, Topics in algebra ,Wiley Eastern Limited, India
- (5) Asha Rani Singal, Algebraic structures,
- (6) J.Whitesitt, Principles of modern algebra.

**SARDAR PATEL UNIVERSITY , VALLABH VIDYANAGAR**  
**SYLLABUS FOR B.Sc. SEMESTER - 6**  
**US06CMTH23(T) (LINEAR ALGEBRA)**  
**FOUR HOURS PER WEEK (4 CREDIT)**  
**Effective from June 2020**  
**Marks:-100 ( 30 Internal + 70 External )**

**UNIT-1**

Vector Spaces , Subspaces , Linear Dependence and Independence , Basis and Dimension for Vector Space

**UNIT-2**

Linear Transformations , Modules , Structure Theorem

**UNIT-3**

Matrices , Matrix associated with a Linear Map , Linear Map associated With a Matrix , Trace and Transpose , Rank

**UNIT-4**

Characteristic Roots , Canonical Form , Inner Product Spaces , Unitary , Hermitian and Orthogonal Matrices .

**Recommended text:**

N.S.Gopalakrishnan , University Algebra , Revised Second Edition , New Age International Publishers, New Delhi.  
Chapter : 3 , 5 (Except 5.6,5.7,5.8,5.13)

**Reference texts:**

- (1) I.N.Herstein, Topics in algebra ,Wiley Eastern Limited, India
- (2) Joseph A. Gallian , Contemporary Abstract Algebra , Narosa Pub.House , New Delhi .
- (3) John B. Fraleigh , A First Course in Abstract Algebra , Pearson,
- (4) M. Artin ,Abstract Algebra, Pearson,
- (5) S. Kumaresan , Linear Algebra- A Geometric Approach ,Prentice-Hall of India
- (6) S.Lang ,Introduction to Linear Algebra ,Springer
- (7) V.Krishnamurthy , An introduction to Linear Algebra ,
- (8) P.B.Bhattachary,S.K.Jain,N.R.Nagpaul,First Course in Linear Algebra , Wiley - Eastan Ltd.
- (9) Dr.Gundadhar Paria , Linear Algebra,New Central Book Agency .
- (10) A Ramchandra Rao ,P.Bhima shankaram , Linear Algebra , Tata MacGraw-Hill Pub.

**SARDAR PATEL UNIVERSITY , VALLABH VIDYANAGAR**  
**SYLLABUS FOR B.Sc. SEMESTER - 6**  
**US06CMTH24(T)**  
**(RIEMANN INTEGRATION AND SERIES OF FUNCTIONS)**  
**FOUR HOURS PER WEEK (4 CREDIT)**  
**Effective from June 2020**  
**Marks:-100 ( 30 Internal + 70 External )**

**UNIT-1**

Riemann Integrals Definitions and Existence , Inequalities for Integrals , Refinement of Partitions , Darboux's Theorem for Integrals , Conditions of Integrability , Integrability of the Sum , Difference , Product , Quotient and Modulus of Functions.

**UNIT-2**

Integral as the Limit of Sums (Riemann Sums) , Some Integrable Functions , Integration and Differentiation , The Primitive ,The Fundamental Theorem of Integral Calculus , Mean Value Theorems of Integral , Second Mean Value Theorem .

**UNIT-3**

Improper Integrals , Integration of Unbounded Functions with Finite Limits of Integration, Comparison Tests for Convergence at  $a$  of  $\int_a^b f dx$  , Infinite Range of Integration , Integrand as a Product of Functions

**UNIT-4**

Pointwise Convergence , Uniform Convergence on an Interval ,Tests for Uniform Convergence , Properties of Uniformly Convergent Sequences and Series , The Weierstrass Approximation Theorem .

**Recommended Text :**

S.C.Malik and Savita Arora, Mathematical Analysis, Third Revised Edition New Age International Pvt. Ltd., New Delhi .  
Chapter : 9 , 11 , 12 .

**Reference Books :**

- (1) K.A.Rose , Elementary Analysis : The Theory of Calculus , Springer (SIE) , Indian reprint , 2009 .
- (2) R.G.Bartle,D.R.Sherbert ,Introduction to Real Analysis ,Third Edition , Wiley India Pvt.Ltd., New Delhi .
- (3) Charles G.Denlinger ,Elements of Real Analysis,Jones and Bartlett (Student Edition),2011

**SARDAR PATEL UNIVERSITY , VALLABH VIDYANAGAR**  
**SYLLABUS FOR B.Sc. SEMESTER - 6**  
**US06CMTH25(P) (MATHEMATICS PRACTICAL)**  
**TWELVE HOURS PER WEEK (6 CREDIT)**  
**Effective from June 2020**  
**Marks:-150 ( 45 Internal + 105 External )**

**Practical/Lab work to be performed on a computer :**  
**For the Practicals the use of Free Open Source softwares like SAGE, MAXIMA , SCILAB, OCTAVE, Python (with Numpy, SciPy etc.) is recommended.**

**PART - 1 [ Marks:-50 (15 Internal + 35 External) ]**

Group tables and Permutation group, Finite Fields, Applications of Primality, Polynomials, Divisibility, Factorization and roots, Limit, Differentiation and integration.

**PART - 2 [ Marks:-50 (15 Internal + 35 External) ]**

Introduction to Programming and Basic Programming Constructs, User defined functions , Sequences series and power series expansions.

**PART - 3 [ Marks:-50 (15 Internal + 35 External) ]**

Programming for finding roots of equations using Numerical methods, Primality testing, G.C.D. and L.C.M., Perfect numbers.

**NOTE :**

- (1) Practical session will be of Twelve hours per week and they will be conducted in batches of students of size 15 to 20 per batch.
- (2) The candidate shall have to produce at the time practical Examination the record of their prescribed Laboratory work, certified by the Head of the Department.

**SARDAR PATEL UNIVERSITY , VALLABH VIDYANAGAR**  
**SYLLABUS FOR B.Sc. SEMESTER - 6**  
**US06DMTH26(T)(NUMBER THEORY - 2)**  
**TWO HOURS PER WEEK (2 CREDIT)**  
**Effective from June 2020**  
**Marks:-50 ( External )**

**PREREQUISITE :** Prerequisite to opt for this course is that the Student must have opted the course US05DMTH26(T) (NUMBER THEORY-1) in Sem - 5

**UNIT-1**

Linear indeterminate equations and its solution ,General solution of Linear indeterminate equation with three unknown , Pythagoras (Shang-gao indeterminate) equation and its solution.

**UNIT-2**

Congruences : Definition and examples , Properties of congruences ,Necessary and sufficient condition for a positive integer can be divided by 3,9,4,7,11 or 13 .

**UNIT-3**

Complete residue system(mod  $m$ ) and its properties , Reduced residue system(mod  $m$ ) and its properties , Euler's theorem,Fermat's theorem , Properties of Euler's function .

**UNIT-4**

Congruence in one unknown , Solution of Linear congruence in one unknown and two unknown, Chinese theorem ,Solution of system of congruences.

**Recommended texts :**

C.Y.Hsiung, Elementary Theory of numbers, Allied publishers Ltd.(1992)

**Reference Books:**

- (1) D.Burton , elementary Number Theory, 6th Ed , Tata McGraw-Hill Edition,Indian reprint.
- (2) I.Niven And H.Zuckermar , An Introduction to the theory of Numbers, Wiley-Eastern Publication.
- (3) S.Barnard and J.N.Child , Higher Algebra, Mc Millan and Co. Ltd.
- (4) Neville Robinns, Beginning Number Theory , 2nd Ed.,Narosa Publishing House Pvt.Ltd. Delhi,2007

**SARDAR PATEL UNIVERSITY , VALLABH VIDYANAGAR**  
**SYLLABUS FOR B.Sc. SEMESTER - 6**  
**US06DMTH27(T)(GRAPH THEORY - 2)**  
**TWO HOURS PER WEEK (2 CREDIT)**  
**Effective from June 2020**  
**Marks:-50 ( External )**

**PREREQUISITE :** Prerequisite to opt for this course is that the Student must have opted the course US05DMTH27(T) (GRAPH THEORY-1) in Sem - 5

**UNIT-1**

Planer graphs , Kuratowski's Two graphs , Different representations of a planar graphs , Detection of Planarity geometric and combinatorial dual.

**UNIT-2**

Matrix representation of graphs ,Incidence matrix , Sub matrices , Circuit matrix , Fundamental circuit matrix .

**UNIT-3**

Cut set matrix , Path matrix , Adjacency matrix , Relation amongs  $A_f, B_f,$  and  $C_f$

**UNIT-4**

Directed graph , Some types of digraphs , Digraphs and Binary relations .

**Recommended texts :**

Narsingh Deo, Graph theory with application to engineering and Computer science, Fourth printing, prentice Hall of India, 1987.  
chapter 5 (except 5.1,5.8,5.9) , chapter 7 (except 7.5,7.7), chapter 8 (only 8.1,8.4,8.6), chapter 9 (only 9.1 to 9.6) ,.

**Reference Books:**

- (1) J.Clark and A.D.Holton, A first look at Graph Theory, First Indian Reprint. Allied Publishers,1995.
- (2) D.B.West, Introduction to graph theory, Prentice Hall of India, New Delhi, 1999.

**SARDAR PATEL UNIVERSITY, VALLABH VIDYANAGAR**  
**SYLLABUS FOR B.Sc.(MATHEMATICS) SEMESTER - 6**  
**USO6DMTH28(T) ( MECHANICS - 2 )**  
**TWO HOURS PER WEEK (2 CREDIT)**  
**Effective from June 2020**  
**Marks:-50 ( External )**

**PREREQUISITE :** Prerequisite to opt for this course is that the Student must have opted the course USO5DMTH28(T)(MECHANICS - 1) in Sem - 5

**UNIT-1**

Methods of plane dynamics , Motion of a particle , Motion of a system of particles.

**UNIT-2**

Applications in plane dynamics projectile with and without resistance , Motion under central force , Planetary orbits.

**UNIT-3**

Kinetic energy of rigid body , Angular momentum of rigid body , Moment of inertia of a rigid body.

**UNIT-4**

Rotational motion about a fixed line , Impulsive motion , General theory of plane , Collision.

**Recommended texts :**

J.L.Synge and B.A.Griffith , Principles of Mechanics .  
Chapter 5 (5.1,5.2),Chapter 6(6.1,6.2,6.4, 6.5), Chapter 7(7.1,7.2),Chapter 8(8.1,8.2).

**Reference Books:**

P.N.Chaterjee, Statics and Dynamics.



**SARDAR PATEL UNIVERSITY , VALLABH VIDYANAGAR**  
**SYLLABUS FOR B.Sc. SEMESTER - 6**  
**US06DMTH29(T)(OPERATIONS RESEARCH-2)**  
**TWO HOURS PER WEEK (2 CREDIT)**  
**Effective from June 2020**  
**Marks:-50 ( External )**

**PREREQUISITE :** Prerequisite to opt for this course is that the Student must have opted the course US05DMTH29(T) ( OPERATIONS RESEARCH - 1 ) in Sem - 5

**UNIT-1**

Introduction to Assignment Problem, Mathematical formulation of Assignment problem, Hungarian method for finding optimum solution to AP, Unbalanced Assignment Problem, Maximal Assignment Problem

**UNIT-2**

Elements of Game Theory: Two person zero sum game: Concept, saddle points, Games without saddle points, mixed strategies (Results without proof). Graphical solution of  $2 \times n$  and  $n \times 2$  game. Dominance property.

**UNIT-3**

Job Sequencing: Introduction, Solution of Sequencing problem processing with n jobs Through 2 Machines and n jobs Through 3 Machines.

**UNIT-4**

Project Management by PERT and CPM: Introduction to PERT and CPM, Advantages and Assumptions, Rules for Network construction, Critical Path calculations, Total float, Free float.

**Recommended text:**

Text Book: Operations Research by S. D. Sharma  
Chapter 12 (12.1, 12.2, 12.3, 12.4, 12.5, 12.6, 12.7.1) Chapter 19 (19.1, 19.2, 19.3, 19.4, 19.5, 19.6, 19.7,19.8, 19.9, 19.14, 19.15) Chapter 24 (24.1, 24.2, 24.3, 24.4, 24.5, 24.6) Chapter 25 (25.1, 25.2, 25.3, 25.4, 25.5, 25.6, 25.7, 25.8)

**Reference texts:**

- (1) Operations Research by J.K.Sharma
- (2) Operations Research: An Introduction by Hamdy A.Taha
- (3) Operations Research by Kanti Swarup and Man Mohan Gupta