SARDAR PATEL UNIVERSITY ,VALLABH VIDYANAGAR
SYLLABUS FOR B.Sc. SEMESTER - 5
US05CMTH21(T) (REAL ANALYSIS)
FOUR HOURS PER WEEK (4 CREDIT)
Effective from June 2020
Marks:-100 (30 Internal + 70 External)

UNIT-1

Field Structure , Order Structure; Bounded and Unbounded Sets , Supremum and Infimum , Completeness and Order Completeness in R ,Archimedean Property of Real Numbers , Axioms of a Complete Ordered Field , Absolute Values .

UNIT-2

Neighbourhood of a Point , Interior Points , Interior of a Set , Limit Points of a Set, Bolzano-Weierstrass Theorem , Closed Sets , Closure of Set .

UNIT-3

Sequences , Bounds of a Sequence , Convergence of Sequences , Limit Point of a Sequence , Bolzano-Weierstrass Theorem , Limit Superior and Limit Inferior of a Sequence , Convergent and Divergent Sequences , Cauchy's General Principle of Convergence , Cauchy Sequences , Algebra of Sequences , Monotonic Sequences

UNIT-4

Infinite Series , A Necessary Condition for Convergence , Cauchy' General Principle of Convergence ; Some Preliminary Theorems , Positive Term Series , Comparison Tests for Positive Term Series , Cauchy' Root Test , D'Alembert Test , Integral Test, Alternating Series, Absolute Convergence .

Recommended texts:

S.C.Malik , Principles of Real Analysis , Third Edition , New Age International, New Delhi .
Chapter : 1(Except article 1.4.3,1.4.4,1.4.6,) , 2 ,3, 4 (Except article 4.6 , 4.7 , 4.9)

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) Gerald G.Bilodeau , Paul R.Thie,G.E.Keough, An Introduction to Analysis, 2nd Ed. Jones and Barlett,2010.
(4) S.C.Malik and Savita Arora, Mathematical Analysis, Third revised Edition,New Age International Pvt. Ltd., New Delhi .
(5) Maurice D.Weir, Joel Hass,Frank R.Giordano , Thomas'Calculus ,Pearson Education,India.
(6) R.R.Goldberg, Principles of Mathematical analysis.

SARDAR PATEL UNIVERSITY , VALLABH VIDYANAGAR
SYLLABUS FOR B.Sc. SEMESTER - 5
US05CMTH22(T)(THEORY OF REAL FUNCTIONS)
FOUR HOURS PER WEEK (4 CREDIT)
Effective from June 2020
Marks:-100 (30 Internal + 70 External)

UNIT-1

Limits , Continuous Function , Functions Continuous on Closed and Bounded Intervals , Uniform Continuity ,Derivability of a Function , Properties of Derivable Functions .

UNIT-2

Increasing and Decreasing Functions , Darboux Theorem , Rolle's Theorem , Lagrange's and Cauchy's Mean Value Theorems , Taylor's Theorem with Lagrange's Form of Remainder and Cauchy's Form of Remainder , Maclaurin's Theorem , Generalized Mean Value Theorem , Taylor's and Maclaurin's Series Expansions of Exponential and Trigonometric Functions , ln(1 + x) and $(1 + x)^n$.

UNIT-3

Functions of Several Variables: Explicit and Implicit Functions , Continuity , Partial Derivatives , Differentiability , Partial Derivatives of higher order , Differentials of Higher Order,Functions of Function

UNIT-4

Change of Variables, Taylor's Theorem and Maclaurin's Theorem for Function of Two Variables ; Extreme Values of Functions of Two Variables.

Recommended Texts :

S.C.Malik , Principles of Real Analysis , Third Edition , New Age International, New Delhi .
Chapter : 5 , 6 , 11 (Except 11.11)

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) S.R.Ghorpade and B.V.Limaye,A Course in Calculus and Real Analysis,Springer, 2006.
(4) A.Mattuck,Introduction to Analysis, Prentice Hall,1999
(5) S.C.Malik and Savita Arora, mathematical Analysis, second Edition New Age International Pvt. Ltd., New Delhi 2000.
(6) Dipak Chatterjee , Real Analysis ,Prentice -Hall India Pvt. Ltd.New Delhi .

SARDAR PATEL UNIVERSITY , VALLABH VIDYANAGAR
SYLLABUS FOR B.Sc. SEMESTER - 5
US05CMTH23(T)(GROUP THEORY)
FOUR HOURS PER WEEK (4 CREDIT)
Effective from June 2020
Marks:-100 (30 Internal + 70 External)

UNIT-1

Binary Operations , Group , Laws of Exponents , Subgroups , Centre of Group , Cyclic Group

UNIT-2

Cosets of Subgroup , Lagrange's Theorem ,Index of Subgroup , Euler's Theorem , Fermat's Theorem , Isomorphism , Isomorphic Groups, Automorphism , Inner Automorphism

UNIT-3

Homomorphism , Kernel of Homomorphism , Normal Subgroup , Simple Group , Commutator Subgroup , Quotient Groups , First , Second and Third Isomorphism Theorem , Direct Products , External Direct Products

UNIT-4

Permutation Groups , Transposition , Cycle , Signature of Permutation , Even and Odd Permutation , Cayley's Theorem for Group , Conjugate Classes , Cauchy's Theorem ,Partition , Sylow Theorem .

Recommended texts :

N.S.Gopalakrishnan, University Algebra, Second Edition, Wiley Eastern Ltd., New Delhi 1994.
Chapter : 1 (Except 1.13.10 to 1.13.30 and 1.14) .

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) AshaRani Singal, Algebraic structures,
(6) J.Whitesitt, Principles of modern algebra.

SARDAR PATEL UNIVERSITY , VALLABH VIDYANAGAR
SYLLABUS FOR B.Sc. SEMESTER - 5
US05CMTH24(T)
(METRIC SPACES AND TOPOLOGICAL SPACES)
FOUR HOURS PER WEEK (4 CREDIT)
Effective from June 2020
Marks:-100 (30 Internal + 70 External)

UNIT-1
Countability of Sets, Metric spaces , Limit in metric spaces , continuous functions on a Metric space, Open and Closed Sets.

UNIT-2
Topological Spaces : Definition and examples , Open and close sets in topological spaces , Usual topology on R , Comparison of topologies , Neighbourhood.

UNIT-3
Cluster points , Closure and interior points of a set , Definition and examples of a door space and dense set , Continuity in a topological space and homeomorphism.

UNIT-4
Definition and examples of connected and disconnected spaces , Connectedness in R , Relative topology , Connected subspaces , Open cover , Compact space.

Recommended texts:

(1) Richard R. Goldberg , Methods of Real Analysis ,
Oxford & IBH Publishing Co. Pvt. Ltd, New Delhi ,Revised Ed., 1970
Chapter : 4(only 4.2,4.3), Chapter : 5 (only 5.3,5.4,5.5)

(2) M.J. Mansfield , Introduction to Topology , CBS Publisher & Distributers, Delhi
Chapter : 2 (only 2.2,2.3 and 2.5), Ch.3 (only 3.3, 3.4), Ch.4, Ch.5

Reference Books :

(1) G.F.Simmons,Introduction to Topology and Modern Analysis,McGraw-Hill Book Company.
(2) Satish Shirali and Harikishan L.Vasudeva,Matric Spaces,Springer Verlag,London.
(3) S.Kumaresan,Topology of Matric Spaces,Narosa Pub. House
(4) S.C.Malik and Savita Arora, Mathematical Analysis, New Age International Pvt. Ltd., New Delhi .

SARDAR PATEL UNIVERSITY ,VALLABH VIDYANAGAR
SYLLABUS FOR B.Sc. SEMESTER - 5
US05CMTH25(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)]

Introduction to Mathematical computing environment, Basic Arithmetic operations and expressions, Basic inbuilt functions for general purpose and Mathematics, Linear Algebra : Matrix Operations, solution of system of linear equations , Eigen values and vectors, Data graphs.

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

Plotting graphs of functions, Symbolic Variables , Functions and their operations, Integer Linear Programming, Solution of Differential Equations, Laplace Transforms.

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

Numerical methods : Numerical integrations, Interpolation, Basic graph Theory and its application.

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 - 5
US05DMTH26(T)(NUMBER THEORY - 1)
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 NOT have opted the course US03SMTH21(T) (NUMBER THEORY - 1) in Sem - 3

UNIT-1
Divisibility , Fundamental theorem of divisibility ,Square number,Common divisors, Greatest common divisor (G.C.D.) : definition and examples , Properties of G.C.D.

UNIT-2
Least common multiple(L.C.M.) : definition and examples ,Properties of L.C.M , Relation between GCD and LCM, Prime numbers ,Fundamental property of prime number, Factorization in prime numbers , Unique factorization theorem.

UNIT-3
Total number of positive divisor of positive integer , Sum and product of positive divisors of positive integer,Definition of Congruences ,Definition of Euler's function, Perfect numbers : definition and examples , Mersenne numbers : definition and examples , Fermat numbers : definition and examples .

UNIT-4
Gauss function : definition and examples ,Properties of Gauss function, Mobius function : definition and examples , Properties of Mobius function ,Fibonacci numbers : definition and examples ,Properties of Fibonacci numbers .

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 - 5
US05DMTH27(T)(GRAPH THEORY - 1)
TWO HOURS PER WEEK (2 CREDIT)
Effective from June 2020
Marks:-50 (External)

UNIT-1
Graph , Applications of graph , Finite and infinite graph , Incidence and Degree , Isolated vertex , Pendant vertex and null graph , Isomorphism , Sub graphs , Walks , Paths and circuits .

UNIT-2
Connected and disconnected Graphs , Components , Euler graphs , Operation on graph , More on Euler graphs , Arbitrary Traceable graph Hamiltonian paths and circuits .

UNIT-3
Trees and their properties , Pendant vertices in a tree , Distance and centers in a tree , Counting trees , Spanning Trees , Fundamental circuits , Finding all spanning trees of a graph .

UNIT-4
Cut-sets in a graph and their properties , Fundamental circuits and cut sets , Connectivity and separability .

Recommended texts :

Narsingh Deo, Graph theory with application to engineering and Computer science, Fourth printing, prentice Hall of India, 1987.
Chapter 1 (except 1.6), chapter 2 (except 2.3,2.10), chapter 3 (except 3.5,3.10), chapter 4 (except4.6,4.7,4.8) .

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 - 5
USO5DMTH28(T) (MECHANICS - 1)
TWO HOURS PER WEEK (2 CREDIT)
Effective from June 2020
Marks:-50 (External)

UNIT-1

Ingredients of mechanics , Position vector , Velocity vector , Acceleration vector , Gradient vector , Fundamental laws of Newtonian mechanics , Theory of dimensions,

UNIT-2

Plane statics , Equilibrium of a particle , Equilibrium of systems of particles , Moment of force about a line , Necessary and sufficient condition for equilibrium.

UNIT-3

Couples , Work and potential energy , Principle of virtual work , Application in plane statics , Mass center and center of gravity , Gravitational potential .

UNIT-4

Flexible cables , Cable in contact with smooth and rough curve , Plane Kinematics , Kinematics of a particle , Motion of a rigid body parallel to a plane.

Recommended texts :

J.L.Synge and B.A.Griffith , Principles of Mechanics .
Chapter 1, Chapter 2(2.2,2.3,2.4), Chapter 3(3.1 , 3.4), Chapter 4(4.1,4.2)

Reference Books:

P.N.Chaterjee, Statics and Dynamics.

SARDAR PATEL UNIVERSITY , VALLABH VIDYANAGAR
SYLLABUS FOR B.Sc. SEMESTER - 5
US05DMTH29(T) (OPERATIONS RESEARCH - 1)
TWO HOURS PER WEEK (2 CREDIT)
Effective from June 2020
Marks:-50 (External)

UNIT-1
History, meaning and applications of OR. Introduction to LPP, General and Standard Formulation of LPP, Problems of formulation of LPP, Solution of LPP using Graphical method

UNIT-2
Solution of LPP using Simplex method and Big M method, Duality in LPP(Concept only)

UNIT-3
Transportation Problems: Introduction, Mathematical formulation of Transportation problem, Methods of finding initial basic feasible solution : North West Corner Method (N-W Corner Method),Row Minima Method,Column Minima method,Matrix Minima Method (Least Cost Entry Method),Vogels Approximation method (VAM),

UNIT-4
Modified distribution(MODI) method for finding optimum solution of Transportation Problem, Unbalanced TP, Degenerate TP .

Recommended text:

S. D. Sharma , Operations Research
Chapter 1 (1.1, 1.2, 1.3) Chapter 3 (3.1, 3.2, 3.3, 3.4, 3.5, 3.6, 3.7, 3.8, 3.10, 3.11) Chapter 5 (5.1, 5.2, 5.3, 5.4, 5.5.6, 5.8.1, 5.8.2, 5.8.3) Chapter 7 (7.1 to 7.5 (theorems without proof), 7.7(introduction only)) Chapter 11 (11.1, 11.2, 11.3, 11.4, 11.8, 11.9, 11.10, 11.11, 11.12)

Reference texts:

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