

**SARDAR PATEL UNIVERSITY**  
**B.Sc.(MATHEMATICS) SEMESTER - III**  
**US03CMTH01 ( Advanced Calculus )**  
**Effective from June 2011**  
**THREE PERIODS PER WEEK (3 CREDIT)**  
**Marks:-100( 30 internal+70 external)**

**UNIT-1.** Line integral ; Evaluation of line integrals ; Double integral :Definition and Examples ; Mean value theorem ; Change of variables in double integral , Application of Double integral ( Area , Volume ) .

**UNIT-2.** Application of Double integral ( Total mass , Centroid , Moment of Inertia ) ; Change of order of integration in Cartesian and Polar form , Line integral independent of path.

**UNIT-3.** Green's theorem and its application with Examples ; Area of plane region ; Vector form of Green's theorem .

**UNIT-4.** Surfaces ; Tangent plane and Normal line to the surface ; First fundamental form ; Area of a surface ; Surface integrals ; Moment of inertia of surface.

**UNIT-5.** Triple integrals : Definition and Examples ; Divergence theorem of Gauss and its applications with Examples ; First and Second form of Green's theorem .

**UNIT-6.** Application of Triple Integral ( Total Mass ,Moment of Inertia , Volume ) Stoke's theorem and its applications with Examples.

**Reference texts:**

- (1) E.Kreyszing , Advanced Engineering Mathematics , Fifth edition , New Age International (P) Ltd., New Delhi , 1997.
- (2) Shanti Narayan , A course of Mathematical Analysis ,S.Chand & Company Ltd.
- (3) Dr.Dinesh Karia,M.L.Patel,N.Y.Patel,B.P.Patel,A Textbook of Calculus with an Introduction to Differential Equations.
- (4) B.S.Grewal,Higher Engineering Mathematics.

**SARDAR PATEL UNIVERSITY**  
**B.Sc.(MATHEMATICS) SEMESTER - III**  
**US03CMTH02 ( Numerical Analysis )**  
**Effective from June 2011**  
**THREE PERIODS PER WEEK (3 CREDIT)**  
**Marks:-100( 30 internal+70 external)**

**UNIT-1.** Solutions of algebraic and transcendental equations -Bisection Method, Iteration method, Aitken's process, method of false Position.

**UNIT-2.** Newton-Raphson method ; Interpolation : Forward , central and backward differences ; Symbolic relations of operators ; Detection of errors by use of difference Tables .

**UNIT-3.** Differences of a polynomial; Newton's forward and backward formulae ; Gauss forward and backward formulae ; Bessel's Stirling's and Everett's formulae.

**UNIT-4.** Interpolation with unevenly spaced points ; Lagrange's formula (Without proof) ; Divided difference and their properties ; Newton's General formula ; Inverse interpolation; Method of successive Approximations .

**UNIT-5.** Numerical differentiation- Newton's forward and Backward, Gauss's Method ; Maximum and minimum values of a tabulated function; Numerical integration trapezoidal rule ; Simpson's 1/3rd and 3/8th rules .

**UNIT-6.** Romberg differential equations ; Solution by Taylor's series ; picard's method, Euler's method ; Modified Euler's method ; Range-kutta method upto second order.

**Reference Texts:**

- (1) S.S.Sastry, Introductory methods of Numerical analysis, Prentice hall of India, 1990.
- (2) G. Sankar rao , Numerical analysis.
- (3) B.S.Grawal , Numerical analysis.

**SARDAR PATEL UNIVERSITY**  
**B.Sc.(MATHEMATICS) SEMESTER - III**  
**US03CMTH03 (Mathematics Practical )**  
**Effective from June 2011**  
**SIX PERIODS PER WEEK (3 CREDIT)**  
**Marks:-100( 30 internal+70 external)**

- (1) Inherent Errors and truncated errors ; Errors in a series approximation.
- (2) Interpolation- Newton's forward and backward, Gauss's forward and Backward, Sterling's, Bessel's, Everett's, Lagrange's ; Newton's General and Lagrange's general formulae ; Method of successive approximations ; Numerical differentiation and integration :- differentiation of Newton's forward and backward, Sterling's, Bessel's , Newton's General and Lagrange's formulae ; Trapezoidal, Simpson's 1/3rd and 3/8th rules, Romberg method.
- (3) Solution of algebraic and transcendental equations -Bisection method, Iteration method, Aitken's process, method of false position, Newton Raphson's method ; Numerical solution of ordinary differential equations :- Solution by Taylor's series, Picard's method, Euler's Method, Modified Euler's method ; Runge-kutta method (fourth order only).
- (4) Boolean algebra and Switching circuits.

**Recommended Texts :**

- (1) S.S.Sastry, Introductory methods of Numerical analysis, Prentice Hall Of India, 1990.
- (2) Scarborough, Numerical Mathematical Analysis
- (3) Bajpai, calus and farly, Numerical Analysis for scientists and Engineers, John Wiely.
- (4) J.E.Whitesitt , Boolean Algebra .

**Notes :**

- (1) Use of the standard texts books may be permitted at the time of Practical Examination.
- (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**  
**B.Sc.(MATHEMATICS) SEMESTER - III**  
**US03EMTH01 ( Calculus )**  
**Effective from June 2011**  
**TWO PERIODS PER WEEK (2 CREDIT)**  
**Marks:-100( 30 internal+70 external)**

**UNIT-1.**Definition of improper integrals of both types ; Convergence of improper integrals ; Comparison tests for convergence .

**UNIT-2.** Beta and Gamma functions and their properties; Relation between Beta and Gamma functions and Examples.

**UNIT-3.**Gradient of scalar field ; Directional derivatives ; The divergence of a vector field ; The curl of a vector field .

**UNIT-4.**Periodic functions ; Fourier series and its applications ; Euler formulae ; Even and odd functions ; Half range expansions.

**Reference texts:**

- (1) Shanti Narayan, Integral Calculus ,S.C.Chand and Co.
- (2) Dr.Dinesh Karia,M.L.Patel,N.Y.Patel,B.P.Patel,A Textbook of Calculus with an Introduction to Differential Equations.
- (3) E.Kreyszing ,Advanced Engineering Mathematics,Fifth edition,New Age International (p) Ltd.,New Delhi,1997.
- (4) B.S.Grewal,Higher Engineering Mathematics.
- (5) K.R.Kachot,Higher Engineering Mathematics.

**SARDAR PATEL UNIVERSITY**  
**B.Sc.(MATHEMATICS) SEMESTER - III**  
**US03EMTH02 ( Mathematical Methods - 1)**  
**Effective from June 2011**  
**TWO PERIODS PER WEEK (2 CREDIT)**  
**Marks:-100( 30 internal+70 external)**

**UNIT-1.**Differential Equations of First Order ; Methods of solution of Equations of the First Order and First Degree Differential Equations : Variable Separable,Homogeneous equations,Linear equations.

**UNIT-2.**Application of Differential Equations of First Order : Physical Applications , Simple Electric Circuit , Newton's Law Of Cooling .

**UNIT-3.** Application of Differential Equations of First Order : Heat Flow , Rate of Decay of Radio-Active Materials , Chemical Reactions and Solutions.

**UNIT-4.** Application of Linear Differential Equations of First Order : Simple harmonic motion , Oscillations , Simple Pendulum , Oscillatory electrical circuits , Deflection of Beams .

**Reference texts:**

- (1) B.S.Grewal,Higher Engineering Mathematics,Khanna Publishers,Delhi.
- (2) E.Kreyszing ,Advanced Engineering Mathematics,Fifth edition,New Age International (p) Ltd.,New Delhi,1997.
- (3) K.R.Kachot,Higher Engineering Mathematics.

**SARDAR PATEL UNIVERSITY**  
**B.Sc.(MATHEMATICS) SEMESTER - III**  
**US03EMTH03 (Financial Mathematics - 1 )**  
**TWO PERIODS PER WEEK (2 CREDIT)**  
**Effective from June 2011**  
**Marks:-100( 30 internal+70 external)**

**Unit - 1** . Simple interest ; Compound interest ; Doubling rule ; Continuously compound interest .

**Unit - 2** . Present Value Analysis : Present value of pay off ; Examples ; Rate of return for discrete as well as continuously varying interest rates.

**Unit - 3** . Options Pricing ; Examples ; Arbitrage and its meaning ; Law of one price .

**Unit - 4** . Examples of Pricing via Arbitrage ; Forward and future contracts ; Law of one price .

**Reference texts:**

- (1) Sheldon M. Ross, An Elementary Introduction to Mathematical Finance(Second Edition).
- (2) John C. Hull, Options , Futures and other derivatives(Seventh Edition).

**SARDAR PATEL UNIVERSITY**  
**B.Sc.(MATHEMATICS) SEMESTER - III**  
**US03EMTH04 ( Operations Research )**  
**TWO PERIODS PER WEEK (2 CREDIT)**  
**Effective from June 2011**  
**Marks:-100( 30 internal+70 external)**

**Unit - 1** . Introduction to Linear Programming ; LP model ; Graphical solution and sensitivity analysis .

**Unit - 2** . Simplex method ; Need of Simplex method ; Basic solutions .

**Unit - 3** . Transportation models ; Various methods and applications

**Unit - 4** . Assignment Problems ; Various cases and methods ; applications

**Recommended Texts :**

- (1) Hamdy and Tahia , Operations Research , An introduction, Prentice - Hall, 1997 .
- (2) V.K.Kapoor , Operations Research , S.Chand and sons , New Delhi ,2007 .

**SARDAR PATEL UNIVERSITY**  
**B.Sc.(MATHEMATICS) SEMESTER - III**  
**US03EMTH05 ( Calculus and Algebra - 1 )**  
**TWO PERIODS PER WEEK (2 CREDIT)**  
**(For the students who were in Biology group in semester I and II)**  
**Effective from June 2011**  
**Marks:-100( 30 internal+70 external)**

**Unit - 1** . Indeterminate forms ; L'Hospital's rule and examples.

**Unit - 2** . Partial derivatives ; Euler's theorem on homogeneous functions of two and three Variables its application and examples; .

**Unit - 3** . Different types of matrices associated with a given matrix - transpose Conjugate and Toe conjugate transpose of a matrix ; Some special Types of Matrices-square, row, column, diagonal , scalar , unit , Zero, Triangular , symmetric, skew-symmetric, Hermitian and skew- Hermitian matrices ; Sub matrices of a matrix .

**Unit - 4** . Determinant and Minors of a matrix ; Reversal law for the transpose of a product ; Associative law for matrix multiplication ; Distributive law; Characteristic matrix and characteristic equation of a matrix ; Cayley-Hamilton theorem.

**Recommended Texts :**

- (1) Shanti Narayan, Differential Calculus ,Ninth edition,S.C.Chand and Co.
- (2) Shanti Narayan and Mittal , A text book of Matrices ,S.C.Chand and Co.
- (3) D. J. Karia, N. Y. Patel, B. P. Patel, M. L. Patel, Introduction to calculus and differential equations.
- (4) B.S.Grewal, Higher Engineering Mathematics.

**SARDAR PATEL UNIVERSITY**  
**B.Sc.(MATHEMATICS) SEMESTER - IV**  
**US04CMTH01 ( Linear Algebra )**  
**Effective from June 2011**  
**THREE PERIODS PER WEEK (3 CREDIT)**  
**Marks:-100( 30 internal+70 external)**

**UNIT-1** . Vector spaces : Definition and examples ; Properties of vector spaces ; Subspaces Definition and Examples .

**UNIT-2** . Span of a set : Examples and Properties ; Union and intersection of subspaces of a vector space ; Linear dependence and independence vectors : Definition and Examples .

**UNIT-3** . Properties of LD and LI vectors ; Collinear and coplanar vectors : Definition and Examples .

**UNIT-4** . Dimension and basis of a vector space : Definition , Examples and Applications .

**UNIT-5** . Linear Transformations : Definition and examples ; Property of linear Transformation .

**UNIT-6** . Matrix associated with a linear map ; Linear map associated with a Matrix ; Examples .

**Recommended text:**

V.Krishnamurthy , An introduction to Linear Algebra :  
Chapter 3 (3.1,3.2,3.3,3.5,3.6), Chapter 4 (4.1), Chapter 5 (5.1,5.2).

**Reference texts:**

- (1) P.B.Bhattachary,S.K.Jain,N.R.Nagpaul,First Course in Linear Algebra , Wiley - Eastan Ltd.
- (2) Dr.Gundadhar Paria , Linear Algebra,New Central Book Agency .
- (3) A Ramchandra Rao ,P.Bhima shankaram , Linear Algebra , Tata MacGraw-Hill Pub.

**SARDAR PATEL UNIVERSITY**  
**B.Sc.(MATHEMATICS) SEMESTER - IV**  
**US04CMTH02 ( Differential Equations)**  
**Effective from June 2011**  
**THREE PERIODS PER WEEK (3 CREDIT)**  
**Marks:-100( 30 internal+70 external)**

**UNIT-1** . Surfaces and curves in three dimensions ; Methods of solving  
 $\frac{dx}{P} = \frac{dy}{Q} = \frac{dz}{R}$  .

**UNIT-2** . Orthogonal trajectories of a system of curves on surface. Pfaffian forms and equations ; Solution of Pfaffian differential equations in three variables .

**UNIT-3** . Partial differential equations ; Origin of first order partial differential equations ; Linear equations of the first order .

**UNIT-4** .Integral surfaces through a given curve ;Surfaces orthogonal to a given system of surfaces .

**UNIT-5** .Non-linear partial differential equations of first order; Compatible systems of first order equations .

**UNIT-6** . Charpit's method ,The origin of second order equations ; Linear partial differential equations with constant coefficients ; Equations with variable coefficients.

**Recommended texts:**

I.Sneddon,Elements of Partial Differential Equations,McGraw Hill Book Company,International Student Edition:

Chapter 1 (1.1,1.3,1.4,1.5(excluding Thm.6),1.6),Chapter 2 (2.1,2.2,2.4 (Statement only for Thm.3),2.5,2.6,2.7,2.9,2.10),Chapter 3 (3.1,3.4,3.5,3.9)

**Reference Books :**

- (1) M.D.Raisinghania, Ordinary and Partial differential equations.
- (2) T.Amarnath, An elementary course in partial differential equations.
- (3) B.S.Grawal,Higher Engineering Mathematics.
- (4) K.R.Kachot,Higher Engineering Mathematics.

**SARDAR PATEL UNIVERSITY**  
**B.Sc.(MATHEMATICS) SEMESTER - IV**  
**US04CMTH03 (Mathematics Practical )**  
**SIX PERIODS PER WEEK (3 CREDIT)**  
**Effective from June 2011**  
**Marks:-100( 30 internal+70 external)**

- (1) Recognition of the properties of functions from their graphs.
- (2) Constructions with a ruler and compass only.
- (3) Verifications of geometric results.
- (4) Conics , Polyhedra,Cylinder ,Cone and verification of properties.
- (5) Construction of some curves and finding areas by varies methods.
- (6) Solid surfaces and other models.

**Notes :**

- (1) Use of the standard texts books may be permitted at the time of Practical Examination.
- (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**  
**B.Sc.(MATHEMATICS) SEMESTER - IV**  
**US04EMTH01 (Boolean Algebra and Laplace Transforms )**  
**Effective from June 2011**  
**TWO PERIODS PER WEEK (2 CREDIT)**  
**Marks:-100( 30 internal+70 external)**

**UNIT-1.** Definition of Boolean algebra Properties of Boolean function ; Simplification of Boolean function ; Application of Boolean algebra to switching circuits.

**UNIT-2 .** Solution of algebraic and transcendental equations - Bisection method ; Iteration method ; Aitken's  $\Delta^2$ - process, Method of False position ; Newton - Raphson method.

**UNIT-3 .** Laplace transform ; Laplace transform of elementary functions ; Properties of Laplace transforms ; differentiation and integration of the transform ; Laplace transforms of derivatives and integrals .

**UNIT-4 .** Inverse transforms ; Method of Partial fractions ; Table of some Laplace transforms ; Shifting Property for inverse Laplace transforms ; convolution theorem (statement only) .

**Reference Texts :**

- (1) J.E.Whitesitt , Boolean Algebra .
- (2) S.S.Shasri, Introductory methods of Numerical analysis, Prentice Hall Of India .
- (3) B.S.Grewal, Elementary Engineering Mathematics , Khanna Publishers.
- (4) Kreyszig E., Advanced Engineering Mathematics .
- (5) B.S.Grewal, Higher Engineering Mathematics , Khanna Publishers.

**SARDAR PATEL UNIVERSITY**  
**B.Sc.(MATHEMATICS) SEMESTER - IV**  
**US04EMTH02 ( Mathematical Methods - 2)**  
**Effective from June 2011**  
**TWO PERIODS PER WEEK (2 CREDIT)**  
**Marks:-100( 30 internal+70 external)**

**UNIT-1.** Partial differential equations :Definition and Examples ; Solution of Partial differential equations by direct Integration ; Linear equations of First order and its solution .

**UNIT-2.** Non-linear equations of the first order and its solution ; Charpit's Method ; Homogeneous linear equations with constant coefficients .

**UNIT-3.** Rule of finding complimentary function and particular integral ; Working procedure to solve homogeneous linear equations of any order ; Non- homogeneous linear equations ; Non-linear equations of second order ; Monge's Method .

**UNIT-4.** Method of separation of variable ; Wave equation and its solution ; One dimensional heat flow equation and its solution ;Laplace equation and its solution .

**Reference texts:**

- (1) B.S.Grewal,Higher Engineering Mathematics,Khanna Publishers,Delhi.
- (2) E.Kreyszing ,Advanced Engineering Mathematics,Fifth edition,New Age International (p) Ltd.,New Delhi.
- (3) K.R.Kachot,Higher Engineering Mathematics.
- (4) M.E.Shimpi.V.R.Shah , R.B.Gandhi,S.R.Patel ,Advanced Engineering Mathematics,Nirav and Roople prakashan .

**SARDAR PATEL UNIVERSITY**  
**B.Sc.(MATHEMATICS) SEMESTER - IV**  
**US04EMTH03 ( Financial Mathematics - 2 )**  
**TWO PERIODS PER WEEK (2 CREDIT)**  
**Effective from June 2011**  
**Marks:-100( 30 internal+70 external)**

**Unit - 1** . The Arbitrage Theorem Risk neutral probability ; Multi period Binomial model ; Examples .

**Unit - 2** . Proof of the Arbitrage Theorem ; Weak Arbitrage strategy ; Examples.

**Unit - 3** . The Black-Scholes Formula ; its explanation ; Properties of Black-Scholes option cost ; Examples .

**Unit - 4** . The Delta Hedging Arbitrage Strategy ; Derivations related with , The Black-Scholes Formula ; Examples .

**Reference texts:**

- (1) Sheldon M. Ross, An Elementary Introduction to Mathematical Finance(Second Edition).
- (2) John C. Hull, Options , Futures and other derivatives(Seventh Edition).

**SARDAR PATEL UNIVERSITY**  
**B.Sc.(MATHEMATICS) SEMESTER - IV**  
**US04EMTH04 ( Mathematical Biology )**  
**TWO PERIODS PER WEEK (2 CREDIT)**  
**Effective from June 2011**  
**Marks:-100( 30 internal+70 external)**

**Unit - 1 .** Continuous-time dynamical system : Historical demographical models - Malthusian model ; Logistic model ; Population model with age distribution

**Unit - 2 .** Pest control : The spruce budworm ,Specialist and generalist predators, Interactions in Biological systems - Predator-Prey : Lotka-Volterra model ; Analytic solution of Lotka-Volterra model

**Unit - 3 .** Super predator ; Predator - Prey model ; General predator - prey model ; Competition .

**Unit - 4 .** Reaction-diffusion equations ; Solution control ; Steady solution and stability ; Applications .

**Reference texts:**

- (1) Jacques Istas , Mathematical Modeling for the Life Sciences, Springer.

**SARDAR PATEL UNIVERSITY**  
**B.Sc.(MATHEMATICS) SEMESTER - IV**  
**US04EMTH05 ( Calculus and Algebra - 2 )**  
**TWO PERIODS PER WEEK (2 CREDIT)**  
**(For the students who were in Biology group in semester I and II)**  
**Effective from June 2011**  
**Marks:-100( 30 internal+70 external)**

**UNIT-1** . Maxima and Minima for a function of two variables and its Examples and property.

**UNIT-2** . Definitions of vector and scalar functions ; Differentiation of scalar and vector fields ;Gradient of scalar field ; Directional derivative of scalar field; Tangent and normal plane to a surface ;

**UNIT-3** . Divergence and Curl of vectors fields ; Their Properties , relations and examples .

**UNIT-4** . Definition of Boolean algebra ; Simplification of Boolean function ; Application of Boolean algebra to switching circuits.

**Recommended Texts :**

- (1) D. J. Karia, N. Y. Patel, B. P. Patel, M. L. Patel, Introduction to calculus and differential equations.
- (2) M.S.Spiegel , Vector Analysis, Schaum's series .
- (3) Shanti narayan , Differential Calculus, Ninth edition, S. chand and Co. Ltd.1991
- (4) J.E.Whitesitt , Boolean Algebra .
- (5) B.S.Grewal, Higher Engineering Mathematics.