B.Sc. Mathematics

PROPOSED COURSE STRUCTURE

To be in force from June 2009.

F.Y.B.Sc. :

Paper 1 Algebra, Trigonometry and Vector Calculus.

Paper 2 Calculus and Differential Equations.

S.Y.B.Sc. :

Paper 3 Advanced Calculus.

Paper 4 Differential Equations.

Paper 5 Linear Algebra (Theory and Practical).

S.Y.B.Sc. : (For students of **Computer Science** as a special subject)

Paper 3 Calculus and Differential Equations.

Paper 4 Discrete Mathematics.

S.Y.B.Sc. : (For students of **Industrial Chemistry** as a special subject)

Paper 3 Calculus and Differential Equations.

Paper 4 FORTRAN 77 and Statistical Methods.

S.Y.B.Sc. : (IDS)

Mathematical Methods.

Group of Symmetries.

T.Y.B.Sc. :

Paper 6 Real Analysis.

Paper 7 Abstract Algebra.

Paper 8 Numerical Analysis (Theory and Practical).

Paper 9 Discrete Mathematics.

T.Y.B.Sc. : (CAN Courses) [Any one from the following]

Number Theory.

Mechanics.

Mathematics in Finance.

Computer Oriented Numerical Methods.

Operation Research.

Mathematical Modelling.

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S.Y.B.Sc.

Mathematics Paper - III

(ADVANCED CALCULUS)

To be in force from June 2009

[L : 4; P : 0]

Unit 1 : Limits, continuity and Partial derivatives :
Limits and continuity of functions of two variables.
Partial derivatives, Total differential, Composite function, Homogeneous function, Euler's theorem for homogenous functions, Implicit function.

Unit 2 : Taylor's theorem and Maxima-Minima :
Taylor's theorem for functions of two variables, Maclaurin's expansion in power series, Jacobian, evaluation of Jacobian.
Maxima-Minima for functions of two variables, Necessary and sufficient condition for extreme points.

Unit 3 : Double Integrals, Beta and Gamma functions :
Double Integrals, Change of order of double integration, Area and Volume.
Beta and Gamma functions and relation between them.

Unit 4 : Functions and Sequences :
Real-valued functions, Equivalence, Countable & Uncountable sets, Real numbers, Greatest lower bounds and Least Upper bounds.
Sequences of real numbers, Sub-sequences, Limit of a sequence, Convergent sequences, Divergent sequences.

Unit 5 : Operations on Sequences :
Bounded sequences, Monotone sequences, Operations on convergent sequences, Operations on divergent sequences, Limit Superior and Inferior (Theorems without proof), Cauchy sequence.

The course is covered by the following reference books :

1. Shantinarayan : Differential Calculus, S. Chand & Co., New Delhi.
2. Shantinarayan : Integral Calculus, S. Chand & Co., New Delhi.
3. R.R. Goldberg : Methods of Real Analysis, Oxford & TBH Publishing Co.
4. J.N. Sharma : Advanced Differential Calculus, Krishna Prakashan Mandir, Meerut.
5. T.M.Apostol : Mathematical Analysis, Narosa Publishing House, New Delhi.
6. N.P.Bhamore et el : Mathematics Paper III, Popular Prakashan, Surat.

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S.Y.B.Sc.

Mathematics Paper - IV

(DEFERENTIAL EQUATIONS)

To be in force from June 2009

[L : 4; P : 0]

Unit 1 : Linear differential equations with constant coefficients :
Linear differential equations with constant coefficients, Complimentary functions, Particular integrals, General solution, Short Methods for finding particular integral.

Unit 2 : Linear differential equations with variable coefficients :
Linear differential equations with variable coefficients, Homogenous linear differential equations.
Method of variation of parameters, Ordinary Simultaneous equations.

Unit 3 : Second order Linear Differential Equations :
Linear differential equations of second order, Transformation of equation by changing dependant variables & independent variable with known integral of CF.

Unit 4 : Laplace Transformation :
Laplace Transformation, Linearity of Laplace transform, Laplace transforms of standard functions, Existence theorem of Laplace transform, Shifting theorems for Laplace transform, Laplace transform of derivatives and integrals, Differentiation and integration of Laplace transform, Inverse of Laplace transforms, Shifting theorems for Inverse Laplace transform, Convolution Theorem (Only statement), Solution of differential equation.

Unit 5 : Partial Differential equations :

Formation of Partial differential equations by the elimination of arbitrary constants and arbitrary functions, Partial Differential equations of the first order, the complete and particular integrals, Lagrange's solution of the linear equation, some special types of equations which can be solved easily by the methods other than Charpit's method.

The course is covered by the following reference books :

1. D.A.Murray: Introductory Course of Diff. equations, Orient Longman (2^{nd} ed.).
2. Kreysig: Advanced Engineering Mathematics, John Wiley, New York, 1999.
3. N.P.Bhamore & et el : Mathematics Paper IV, Popular Prakashan, Surat.
4. Vasistha and Gupta : Integral Transforms, Krishna Prakashan, Meerut.
5. Rai Singhania M.D.: Differential Equations, S. Chand and Co., N. Delhi.
6. Gorakhprasad : Differential Equations, Pothishala Pvt. Ltd., Allahabad.
7. I.N.Sneddon : Elements of' Partial Diff. Equations, McGraw Hill Book Co.

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S.Y.B.Sc.

Mathematics Paper –V (Theory)

(LINEAR ALGEBRA)

To be in force from June 2009

[L : 3; P : 3]

Unit 1 : Algebraic Structures and Vector Spaces :
Binary operations, Algebraic structures, Definitions of Group, Ring and Field with illustrations, Operations on functions, Study of the algebraic structure $\Im(A)$, Vector space - Definition and examples.

Unit 2 : Subspaces and Direct sum :
Subspace, Necessary and sufficient condition for a subspace, Illustrations, Span of a set, More about subspaces, Direct sum of two subspaces.

Unit 3 : Linear dependence, independence :
Linear dependence, Linear independence, Checking of Linear dependence or independence, Dimension and Basis, Dimension of sum.

Unit 4 : Linear Transformations :
Definition and examples of Linear transformation, Range and kernel of a linear transformation, Rank-Nullity Theorem, Inverse of a linear transformation, Consequences of Rank-Nullity Theorem, The space L(U,V), Composition of linear transformations.

Unit 5 : Association between Matrix and Linear transformation, Inner product spaces :
Matrix associated with a linear transformations, linear transformation associated with a matrix, Rank-Nullity Theorem for matrix (verification).
Inner product spaces, Norm of a vector, Schwarz's inequality, Triangular inequality, Orthogonal vectors, Gram-Schmidt orthogonalization process, Orthonormal sets and basis, Orthogonal and Unitary matrices.

The course is covered by the following reference books :

1. Krishnamurthy, Mainra & Arora : An Introduction to Linear Algebra, Affiliated East-West Press Pvt. Ltd., N.Delhi.
2. I. H. Sheth : Linear Algebra, Nirav Prakashan.
3. S. Kumaresan : Linear Algebra, Prentice Hall of India, 2000.
4. Serge Lang : Linear Algebra, Addition-Wesley Pub. Co. (Student Ed.).
5. Balakrishnan : Linear Algebra, Tata-McGraw Hill Ed.

VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT

S.Y.B.Sc.

Mathematics Paper – V

(PRACTICAL)

[One Practical of 3 periods per batch per week]

1. Group.
2. Ring.
3. Field.
4. Vector space.
5. Subspace.
6. Linear dependence and independence.
7. Extension of LI set into a Basis.
8. Dimension of sum.
9. Linear Transformation.
10. A matrix associated with a linear transformation.
11. A linear transformation associated with a matrix.
12. Verification of Rank - Nullity theorem for linear transformations.
13. Inverse of a linear transformation.
14. Verification of Rank - Nullity theorem for a matrix.
15. Solution of system of homogeneous linear equations.
16. Solution of system of non-homogeneous linear equations.
17. Gram-Schmidth Orthogonalization process.

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S.Y.B.Sc.

Mathematics Paper - III

(Calculus and Differential Equations)
(For students of Computer Science as a principal subject)
To be in force from June 2009

[L : 4; P : 0]

Unit 1 :
Functions of two variables, their Limits and continuity, Partial Derivatives, Euler's theorem for homogenous functions, Taylor's theorem, Jacobian and its properties, evaluation of Jacobian.

Unit 2 :
Maxima-Minima of functions of two variables, Necessary and sufficient conditions for extreme values of functions of two variables, Double and Triple Integration of bounded functions on bounded domain, Change of order of double integration, Area and Volume, Change of variables.
Beta and Gamma functions and relation between them, Evaluation of integrals using Beta and Gamma functions.

Unit 3 :
Linear differential equations with constant coefficients, Complimentary functions, Particular integrals, General solution, Homogeneous Linear equations, Auxiliary equations having different types of roots, Methods of finding particular integral and general solution of linear equations with constant and variable coefficients.

Unit 4 :
System of linear algebraic equations, Gauss – Elimination method, Gauss – Jordan method, Iterative methods, Gauss – Seidel iterative method.

The course is covered from the following Reference books:

5. Shantinarayan : Differential Calculus, S. Chand & Co., New Delhi.
6. Shantinarayan : Integral Calculus, S. Chand & Co., New Delhi.
7. D.A.Murray: Introductory Course of Diff. equations, Orient Longman (2^{nd} ed.).
8. M.K.Jain : Numerical methods for scientists and Engineers, Wiley-Eastern Ltd. Bombay.
9. N.P.Bhamore & et el : Mathematics Paper III-IV, Popular Prakashan, Surat.

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S.Y.B.Sc.

Mathematics Paper - IV

(Discrete Mathematics)

(For students of Computer Science as a principal subject)

To be in force from June 2009

[L : 4; P : 0]

Unit 1 :

Relations, Binary Relations, its properties, Relation matrix, graph of a relation, Equivalence relation, Composition of binary relations, Converse of a relation, Partial ordering, Hasse diagram, Well ordered sets, Partially ordered sets, Lattices Properties of lattices, Lattice homomorphism, Some special types of lattices.

Unit 2 :

Boolean Algebra: Definition, Boolean homomorphism, Joint irreducible elements, Boolean functions, Boolean expressions, Equivalence of Boolean expressions, Value of Boolean expressions and Boolean functions, Sum-of-product canonical forms, Product –of –sums canonical forms, Symmetric expressions, Characteristics of symmetric expressions, Minimization of Boolean functions by Karnaugh method and Quine-McCluskey method.

Unit 3 :

Self-loops, Parallel edges, Simple graphs, Applications of graphs, viz: Konigsberg bridge problem, Utilities problems, Seating problems, Degree of vertices and its properties, Subgraphs, Walks, Paths, Circuits, Connected graphs, Disconnected graphs, Components of a graph, Euler graphs, Conditions of a graph to be Euler graph, Hamiltonian graphs.

Unit 4 :

Trees and its properties, Rooted trees, Planar graphs, Euler's formula for regions.

The course is covered by the following reference books :

1. J.P. Tremblay & R. Manohar : Discrete mathematical Structures with Applications to Computer Science., McGraw Hill Book Co., 1999.
2. Narsingh Deo : Graph Theory with applications to Engineering & Computer Science, Prentice Hall of India Pvt. Ltd., 2000.
3. Olympia Nicodemi : Discrete Mathematics, CBS-Publisher and Distributor, Delhi.
4. E Harray : Graph Theory, Addison Wesley Pub. Co. 1969.
5. B. S. Vatssa : Discrete Mathematics, Vishva prakashan, Delhi.

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S.Y.B.Sc.

Mathematics Paper - III

(Calculus and Differential Equations)
(For students of Industrial Chemistry as a principal subject)
To be in force from June 2009

[L : 4; P : 0]

Unit 1 :
Functions of two variables, their Limits and continuity, Partial Derivatives, Euler's theorem for homogenous functions, Total differentials, Implicit functions, Taylor's theorem and Maclaurin's series expansions, Jacobian and its properties, evaluation of Jacobian.

Unit 2 :
Maxima-Minima of functions of two variables, Necessary and sufficient conditions for maxima and minima of functions of two variables, Integration of bounded functions of two and three variables on bounded domain, Change of order of double integration, Area and Volume, Change of variables.

Unit 3 :
Linear differential equations with constant coefficients, Complimentary functions, Particular integrals, General solution, Homogeneous Linear equations, Auxiliary equations having different types of roots, Methods of finding particular integral and general solution of linear equations with constant and variable coefficients.

Unit 4 :

Formation of Partial differential equations by the elimination of arbitrary constants and arbitrary functions, Partial Differential equations of the first order, the complete and particular integrals, Lagrange's solution of the linear equation, some special types of equations which can be solved easily by the methods other than Charpit's method.
Geometrical, Physical, Biological and Economical applications of first order and first degree differential equations.

The course is covered by the following reference books :

1. Shantinarayan : Differential Calculus, S. Chand & Co., New Delhi.
2. Sharma & et el : Advanced Differential Calculus, Krishna Prakashan Media, Meerut.
3. Gupta, Malik & Mittal : Ordinary Differential Equations, Pragati Prakashan, Meerut.
10. D.A.Murray: Introductory Course of Diff. equations, Orient Longman (2nd ed.).
11. N.P.Bhamore & et el : Mathematics Paper III-IV, Popular Prakashan, Surat.

VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT.

S.Y.B.Sc.

Mathematics Paper - IV

(FORTRAN 77 and Statistical Methods)
(For students of Industrial Chemistry as a principal subject)
To be in force from June 2009

[L : 4; P : 0]

Unit-1 :
Introduction to computer and its applications, Flow charts and its applications to problems of computer languages (Higher level and Lower level), Character set, Fortran constant and variables, Arithmetic expressions (Integer, Real and Mixed mode), Hierarchy of operators, Arithmetic statements, Modes of arithmetic expressions, Special functions, Input and out put statements, Simple programs.

Unit-2 :
Control statements, Relational operators, Logical IF, Arithmetic IF, Nested logical IF Statements, Statement labels, GO TO Statements.

Unit-3 :
The DO statements, Rules to write DO statements, Nested DO loops, Subscripted variables, Two dimensional array only, Dimension statements, Format statements I, F, E and X only, Different simple programs using control statements.

Unit-4 :
Statistical Methods : Concept of Correlation and its properties, method of finding correlation coefficient, Rank Correlation Coefficient.
Concept of Regression and its properties, Principle of least squares and fitting of linear equation.

The course is covered by the following reference books :

1. V. Rajaraman : Fortran - 77, Eastern Economy (Prentice Hall of India) Edn. 1995.
2. Ramkumar : Fortran - 77,
3. S.C.Gupta and V.K.Kapoor : Fundamentals of Mathematical Statistics, Sultan Chand & Sons, N.Delhi.
4. Gupta & Gupta : Business Statistics, S. Chand & Company.

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S.Y.B.Sc.

Mathematics [IDS]

(MATHEMETICAL METHODS)*

To be in force from June 2009

[L : 2; P : 0]

Unit 1: Solution of algebraic equations and Interpolation :
Bisection method, Method of False Position, Newton-Raphson method, Iteration method.
Interpolation, Finite differences, Forward & Backward differences, Divided differences, Netwton's formulae for forward, backward and divided differences, Lagrange's formula.

Unit 2: Solutions of linear systems and Mathematical Modelling :
Gauss – Elimination method, Gauss – Jordan method, Gauss – Seidel method.
Malthusian and Logistic laws of population model, Model for the spread of technological innovations, Models for diffusion of Glucose in the blood stream.

The course is covered from the following Reference Books:

1. S.S. Sastry : Introductory methods of Numerical Analysis, Prentice- Hall of India Pvt. Ltd.
2. Goel & Mittal : Numerical Analysis, Pragati Prakashan, Meerut.
3. J.N. Kapur : Mathematical Modeling.
4. A.P. Verma : Differential Equations Models.
5. R.N. Desai : Ganitik Models (in Gujarati).

* Use of Scientific non – Programmable calculator is allowed.

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S.Y.B.Sc.

Mathematics [IDS]

(GROUP OF SYMMETRIES)

To be in force from June 2009

[L : 2; P : 0]

Unit 1: Group of symmetries and its applications in Geometry :

Definition of group, its elementary properties subgroup, conditions that a subset is a subgroup, Examples of groups including finite groups, Infinite groups – cycle group, Abelian group.

Symmetry elements and symmetry operations in space, Identity operation , rotation symmetries, Reflection symmetry, inversion symmetry, improper rotation symmetry, product of two symmetries.

Formation of groups of symmetries (in space) of the following Plane figures (regarded as rigid objects) :

1. An isosceles triangle (cyclic group C_2 of order 2)
2. An equilateral triangle (the group S_3 of order 6)
3. A rectangle (the group V_4 of order 4)
4. A square (the group D_4 of order 4)
5. A regular hexagon (the group D_6 of order 12)

Unit 2: Isomorphism of groups and its applications in Chemistry :

Concept of isomorphism of groups, Isomorphism of the multiplicative group with the group C_2 of the symmetries of an isosceles triangle and of the group (1,3,5,7) under multiplication mod 8 with the group V_4 if the symmetries of a rectangle.

Formation of group of symmetries of the following chemical molecule (configuration of atoms) and identification of these groups with previously constructed groups.

1. H_2O (The group V_4)
2. $H_2\ O_2$
3. Trans – $N_2 – F_2$ (the group V_4)
4. NH_3, PCl_3, $CHCl_3$ (the group S_3)
5. $C_3\ H_4$ (the group D_4)
6. PF_5 (Trigonal Bipyramidal) (the group D_6)

The course is covered by the following reference book.

1. F.A. Cotton : Chemical application of group theory, Wiley Inter Science, Wiley Eastern Ltd., New Delhi.
2. G.Davidson : Intro. Group Theory for Chemists, Applied Science Publisher.