VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT.
SYLLABUS FOR B.Sc. (MATHEMATICS)
Semester: III, IV
Effective from July 2015

Semester	Paper	Name of the Paper	Hours	Credit	Marks
III	**MTH-301**	Advanced Calculus–I	3	3	**100** (30 Internal + 70 External)
	MTH-302	Ordinary Differential Equations	3	3	
	MTH-303	Numerical Analysis–I	3	3	
	EG	Mathematical Methods	2	2	**70** (20 Internal + 50 External)
		Group of Symmetries-I			
IV	**MTH-401**	Advanced Calculus–II	3	3	**100** (30 Internal + 70 External)
	MTH-402	Partial Differential Equations	3	3	
	MTH-403	Numerical Analysis–II	3	3	
	EG	Mathematical Modelling	2	2	**70** (20 Internal + 50 External)
		Group of Symmetries-II			

VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT.

SYLLABUS FOR B.Sc. (MATHEMATICS)

SEMESTER - III

MTH-301

(Advanced Calculus–I)

Effective from July 2015

Marks:100 (30 internal + 70 external)

(3 Hours / Week - Credits : 3)

Unit I:

Limits and Continuity of a function of two variables, Partial Differentiation, Total Differential, Composite function, Homogeneous functions, Euler'stheorem for Homogeneous functions.

Unit II:

Taylor's theorem for functions of two variables, Maclaurian's expansions in power series, Jacobian.

Unit III:

Double and Triple Integrals, Change of order of Double integrals, Computation of area using double integrals.

Unit IV:

Vector point function, Differentiation of vector point function, Gradient, Divergence and Curl, their properties.

The course is covered by the following reference books :

1. Shantinarayan& P. K. Mittal : A course of Mathematical Analysis, S.Chand and Co., New Delhi.
2. HariKishan : Differential Calculus, Atlantic Pub. & Distributors(P) Ltd., New Delhi.
3. T. M. Apostol : Mathematical Analysis, Narosa Publishing House, N. Delhi.
4. S. C. Malik : Mathematical Analysis, Wiley-Eastern Ltd, New Delhi.
5. N. P. Bhamore& et el : Mathematics Paper–III–IV, Popular Prakashan, Surat.

VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT.
SYLLABUS FOR B.Sc. (MATHEMATICS)
SEMESTER - III
MTH-302
(Ordinary Differential Equations)

Effective from July 2015
Marks:100 (30 internal + 70 external)
(3 Hours / Week - Credits : 3)

Unit I:
Linear Differential Equations with constant coefficients, Complimentary functions, Particular Integral, General Solution,Methods for finding Particular Integral.

Unit II:
Linear Differential Equations with variable coefficients, Homogeneous Differential Equations, Legendre's Differential Equation.

Unit III:
Second order Differential Equations: Solution in terms of known Integral, Method of Variation of Parameters.

Unit IV:
Second order Differential Equations: Solution by method of removal of first order derivatives, Method of Changing Independent Variable.

The course is covered by the following reference books :

1. D. A. Murray : An Introductory Course in Differential Equations, Orient Longmans, Bombay.
2. N.P.Bhamore& et el. : Mathematics Paper III–IV, Popular Prakashan, Surat.
3. M. D. RaiSinghania : Differential Equations, S. Chand & Co., New Delhi.
4. Nita H. Shah : Ordinary and Partial Differential Equations : Theory and Applications, PHI Learning Pvt. Ltd, New Delhi.
5. Gorakhprasad : Differential Equations, PothishalaPvt. Ltd., Allahabad.
6. S. L. Ross : Differential equations, John Weily and Sons., 1984.
7. ZafarAhsan : Differential Equations and their Applications, Prentice-Hall of India, 2004.

VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT.
SYLLABUS FOR B.Sc. (MATHEMATICS)
SEMESTER - III
MTH-303
(Numerical Analysis–I)*
Effective from July 2015
Marks:100 (30 internal + 70 external)
(3 Hours / Week - Credits : 3)

Unit I:
Error estimation: Errors and their computations, A general error formula.

Unit II:
Numerical Solutions of Algebraic and Transcendental Equations: Bisection Method, Method of False position, Iteration Method, Newton-Raphson'sMethod.

Unit III:
Forward Differences, Backward Differences, Central Differences, Symbolic relation and separation of symbols, Differences of Polynomials.

Unit IV:
Newton's Forward and Backward Formulae, Gauss's Interpolation formulae.

The course is covered by the following reference books :

1. S.S. Sastry : Introductory methods of Numerical Analysis, Prentice-Hall of India Pvt. Ltd.; 4thEdition.
2. M. K. Jain, Iyenger&Jain : Numerical Methods for Scientific and Engineering Computations, New Age International Ltd.
3. Goel&Mittal : Numerical Analysis, PragatiPrakashan, Meerut.
4. Kaiser A. Kunz : Numerical Analysis, McGraw Hill Book Co., London.
5. James I. Buchanan & Peter R. Turner : Numerical Methods & Analysis, McGraw Hill Book Co., London.
6. P. C. Biswal : Numerical Analysis, Prentice-Hall of India, 2008.
7. H. C. Saxena : Finite Differences and Numerical Analysis, S. Chand and Co., 2005.

* Use of Scientific non – Programmable calculator is permitted.

VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT.
SYLLABUS FOR B.Sc. (MATHEMATICS)
SEMESTER - III
Elective Generic
(Mathematical Methods)*

Effective from July 2015
Marks:70 (20 internal + 50 external)
(2 Hours / Week - Credits : 2)

Unit I:
Notations of finite difference calculus, Operators E, Δ, ∇,δ, Relations between different operators and their prosperities, Relation between difference and differential operators, Method of constructing difference tables, Finding the missing terms.

Unit II:
Factorial notation, Expression of polynomials in factorial notation by using finite differences, Method of unknown coefficients.

Unit III:
Difference Equations, Order and degree of a difference equation, Solution of linear difference equations, homogeneous differenceequations, homogeneous difference equations with constant coefficients.

The course is covered by the following reference books :
1. S.S. Sastry : Introductory methods of Numerical Analysis, Prentice-Hall of India Pvt. Ltd.; 4th Edition.
2. M. K. Jain, Iyenger& Jain: Numerical Methods for Scientific and Engineering Computations, New Age International Ltd.
3. Goel&Mittal : Numerical Analysis, PragatiPrakashan, Meerut.
4. Kaiser A. Kunz : Numerical Analysis, McGraw Hill Book Co., London.
5. James I. Buchanan & Peter R. Turner : Numerical Methods & Analysis, McGraw Hill Book Co., London.

* Use of Scientific non – Programmable calculator is permitted.

VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT.

SYLLABUS FOR B.Sc. (MATHEMATICS)

SEMESTER - III

Elective Generic

(Group of Symmetries-I)

Effective from July 2015
Marks:70 (20 internal + 50 external)
(2 Hours / Week - Credits : 2)

Unit I:
Definition of a group, its elementary properties, Order of a group, Order of an element of a group, Group multiplication tables, Examples of groups including finite groups, Infinite groups, Abelian groups, Cyclic groups.

Unit II:
Subgroup, Condition that a subset is a subgroup, Examples of subgroups.Basic concept of symmetry, Symmetry elements and symmetry operations in a space, Identity symmetry operation.

Unit III:
Symmetry planes and reflection symmetry, Inversion centre and inversion symmetry, Rotation axes and rotation symmetry, Improper axes and improper rotation symmetry, product of symmetry operations.

The course is covered by the following reference books:

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.
3. I.N.Herstein: Topics in Algebra, Wiley Eastern Ltd., New Delhi.

VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT.
SYLLABUS FOR B.Sc. (MATHEMATICS)
SEMESTER - IV
MTH-401
(Advanced Calculus–II)

Effective from July 2015
Marks:100 (30 internal + 70 external)
(3 Hours / Week - Credits : 3)

Unit I:
Maxima-Minima for functions of two variables, Necessary and sufficient conditions for extreme points.

Unit II:
Beta-Gamma functions: Relation between Beta and Gamma functions, Properties, Applications of Beta and Gamma functions.

Unit III:
Laplace Transform of elementary functions, Properties of Laplace Transform, Differentiation and Integration of Laplace Transform.

Unit IV:
Laplace Transform of derivatives and integrals, Inverse of Laplace Transform, Method of Partial fractions, Properties of inverse Laplace Transform.

The course is covered by the following reference books :

1. David V. Widder : Advanced Calculus, PHI Learning Pvt. Ltd, New Delhi
2. Kreysig: Advanced Engineering Mathematics, John Wiley, New York, 1999.
3. N.P.Bhamore& et al : Mathematics Paper-III-IV, Popular Prakashan, Surat.
4. Shantinarayan& P. K. Mittal : A course of Mathematical Analysis, S.Chand and Co., New Delhi.

VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT.
SYLLABUS FOR B.Sc. (MATHEMATICS)
SEMESTER - IV
MTH-402
(Partial Differential Equations)

Effective from July 2015
Marks:100 (30 internal + 70 external)
(3 Hours / Week - Credits : 3)

Unit I:
Formation of Partial Differential Equation, Solution of Partial Differential Equations, Equations solvable by direct integral.

Unit II:
Partial Differential Equations of first order, Nonlinear Partial Differential Equations of first order, Some special methods.

Unit III:
Homogeneous linear Partial Differential Equations with constant coefficients, Rules of finding the Complimentary functions and Particular Integral for solving Partial Differential Equations, Working methods to solve the homogeneous linear equations of any order.

Unit IV:
Non-homogeneous linear Partial Differential Equations, Non-linear equations of the second order.

The course is covered by the following reference books :

1. I. N. Sneddon : Elements of Partial Differential Equations, McGraw Hill Book Company.
2. B. S. Grewal : Higher Engineering Mathematics, Khanna Publishers, New Delhi.
3. D. A. Murray : An Introductory Course in Differential Equations, Orient Longmans, Bombay.
4. Nita H. Shah : Ordinary and Partial Differential Equations : Theory and Applications, PHI Learning Pvt. Ltd, New Delhi.

VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT.
SYLLABUS FOR B.Sc. (MATHEMATICS)
SEMESTER - IV
MTH-403
(Numerical Analysis–II)
Effective from July 2015
Marks:100 (30 internal + 70 external)
(3 Hours / Week - Credits : 3)

Unit I:
Finite difference with unequal interval, Lagrange's Interpolation Formula, Divided Differences, Newton's General Interpolation Formula.

Unit II:
Numerical Differentiation: 1^{st} and 2^{nd}order derivatives based on Newton's forward difference interpolation formula, Newton's backward difference interpolation formula and Gauss's formulae.

Unit III:
Numerical Integration: General Integration formula, Trapezoidal Rule, Simpson's 1/3-Rule, Simpson's 3/8-Rule.

Unit IV:
Solution of Ordinary Differential Equations by Taylor's series method, Picard's approximation method, Euler's method.

The course is covered by the following reference books :

1. S.S. Sastry : Introductory methods of Numerical Analysis, Prentice-Hall of India Pvt. Ltd.; 4^{th}Edition.
2. M. K. Jain, Iyenger&Jain : Numerical Methods for Scientific and Engineering Computations, New Age International Ltd.
3. Goel&Mittal : Numerical Analysis, PragatiPrakashan, Meerut.
4. Kaiser A. Kunz : Numerical Analysis, McGraw Hill Book Co., London.
5. James I. Buchanan & Peter R. Turner : Numerical Methods & Analysis, McGraw Hill Book Co., London.

* Use of Scientific non – Programmable calculator is permitted.

VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT.
SYLLABUS FOR B.Sc. (MATHEMATICS)
SEMESTER - IV
Elective Generic
(Mathematical Modelling)*

Effective from July 2015
Marks:70 (20 internal + 50 external)
(2 Hours / Week - Credits : 2)

Unit I:
Mathematical modelling through ordinary differential equations of first order, Linear growth models, Linear decay models, Models for growth of Science & scientists.

Unit II:
Non-linear growth & decay models, Model of Logistic law of population, Spread of technological innovation, Spread of infectious diseases.

Unit III:
Mathematical models of geometrical problems through ordinary differential equation of first order, Simple geometrical problems, Orthogonal trajectories.

The course is covered by the following reference books :

1. J. N. Kapoor : Mathematical Modelling, New Age International Publishers, New Delhi.
2. Kreysig: Advanced Engineering Mathematics, John Wiley, NewYork, 1999.
3. J. K. Sharma : OR Theory & Applications, Mac Milian India Ltd., 1998.
4. G.Hadley : Linear Programming, Narosa Publishing House, N. Delhi,1995.
5. G. Paria : Linear Programming, Transportation, Assignment, Game, Books & Allied Pvt. Ltd. Calcutta.

* Use of Scientific non – Programmable calculator is permitted.

VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT.
SYLLABUS FOR B.Sc. (MATHEMATICS)
SEMESTER - IV
Elective Generic
(Group of Symmetries-II)

Effective from July 2015
Marks:70 (20 internal + 50 external)
(2 Hours / Week - Credits : 2)

Unit I:
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)
4. A square (the group D_4)

Unit II:
Formation of groups of symmetries of the following Chemical Molecules (Configuration of atoms).
1. H_2O (the group V_4)
2. H_2O_2
3. Trans- $N_2 – F_2$ (the group V_4)
4. NH_3, PCl_3, $CHCl_3$(the group S_3)

Unit III:
Concept of isomorphism of groups, Isomorphism of multiplicative group with the group $C_2$of the symmetries of an isosceles triangle, Isomorphism of multiplicative group with the group $V_4$of the symmetries of a rectangle, Isomorphism of group V_4 of the symmetries of a rectangle with the group of symmetries of H_2O, Isomorphism of group $S_3$of the symmetries of an equilateral triangle with the group of symmetries of NH_3, PCl_3, $CHCl_3$.

The course is covered by the following reference books:
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.
3. I. N. Herstein: Topics in Algebra, Wiley Eastern Ltd., New Delhi.