VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT.
SYLLABUS FOR B.Sc. (MATHEMATICS)
Semester: III, IV
Effective from June 2017

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

VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT.
SYLLABUS FOR B.Sc. (MATHEMATICS)
SEMESTER - III
MTH-301
(Advanced Calculus–I)

Effective from June 2017

Marks : 70 (20 internal + 50 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's theorem for Homogeneous functions.

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

Unit III:
Vector point function, Differentiation of vector point function, Gradient, Divergence and Curl, their properties, Line Integral.

Unit IV:
Surface Integral, Green's, Gauss' and Stoke's theorems (Only for Cartesian coordinates).

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. Hari Kishan : Differential Calculus, Atlantic Pub. & Distributors (P) Ltd., New Delhi.
3. T. M. Apostol : Mathematical Analysis, Narosa Publishing House, New 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
(Numerical Analysis–I)*

Effective from June 2017

Marks : 70 (20 internal + 50 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's Method.

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' 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.; 4th Edition.
2. M. K. Jain, Iyenger, Jain : Numerical Methods for Scientific and Engineering Computations, New Age International Ltd.
3. Goel, Mittal : Numerical Analysis, Pragati Prakashan, Meerut.
4. Kaiser A. Kunz : Numerical Analysis, Mc Graw Hill Book Co., London.
5. James I. Buchanan, Peter R. Turner : Numerical Methods and Analysis, Mc Graw 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 allowed.

VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT.
SYLLABUS FOR B.Sc. (MATHEMATICS)
SEMESTER - III
MTH-303
(Differential Equations)

Effective from June 2017

Marks : 70 (20 internal + 50 external)
(3 Hours / Week - Credits : 3)

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

Unit II:
Second order Differential Equations: Solution in terms of known Integral, Solution by method of removal of first order derivatives, Method of Changing Independent Variable.

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

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

The course is covered by the following reference books :

1. D. A. Murray : An Introductory Course in Differential Equations, Orient Longmans, Bombay.
2. I. N. Sneddon : Elements of Partial Differential Equations, McGraw Hill Book Company.
3. B. S. Grewal : Higher Engineering Mathematics, Khanna Publishers, New Delhi.
4. Gorakhprasad : Differential Equations, Pothishala Pvt. Ltd., Allahabad.
5. M. D. Rai Singhania : Differential Equations, S. Chand & Co., New Delhi.
6. Nita H. Shah : Ordinary and Partial Differential Equations : Theory and Applications, PHI Learning Pvt. Ltd, New Delhi.
7. 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
Elective Generic
(Mathematical Methods)*

Effective from June 2017

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 difference equations, 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, Pragati Prakashan, Meerut.
4. Kaiser A. Kunz : Numerical Analysis, McGraw Hill Book Co., London.
5. James I. Buchanan, Peter R. Turner : Numerical Methods & Analysis, Mc Graw Hill Book Co., London.

* Use of Scientific non – programmable calculator is allowed.

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

Effective from June 2017

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 June 2017

Marks : 70 (20 internal + 50 external)
(3 Hours / Week - Credits : 3)

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

Unit II:
Double and Triple Integrals: Change of order of Double integrals, Area.

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

Unit IV:
Laplace Transforms: Laplace Transform of elementary functions, Properties of Laplace Transform, Differentiation and Integration of Laplace Transform, 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. Shantinarayan, P. K. Mittal : A course of Mathematical Analysis, S. Chand and Co., New Delhi.
4. N. P. Bhamore & et al : Mathematics Paper III-IV, Popular Prakashan, Surat.

VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT.
SYLLABUS FOR B.Sc. (MATHEMATICS)
SEMESTER - IV
MTH-402
(Numerical Analysis–II)*

Effective from June 2017

Marks : 70 (20 internal + 50 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 and backward difference interpolation 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, Pragati Prakashan, Meerut.
4. Kaiser A. Kunz : Numerical Analysis, McGraw Hill Book Co., London.
5. James I. Buchanan, Peter R. Turner : Numerical Methods and Analysis, Mc Graw 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
MTH-403
(Introduction to Abstract Algebra)

Effective from June 2017

Marks : 70 (20 internal + 50 external)
(3 Hours / Week - Credits : 3)

Unit I:
Divisors, Greatest common divisor, Least Common multiple, Prime numbers, Fundamental theorem of Arithmetic, Congruence relation, Equivalence classes.

Unit II:
Definition of a Group, Examples of Group, elementary properties of a Group, Finite Groups.

Unit III:
Subgroups, Cyclic Groups, Order of an element.

Unit IV:
Definition of a Ring, Examples of Ring, Integral Domain, Field, Boolean Ring.

The course is covered by the following reference books :

1. I. N. Herstein : Topics in Algebra, Wiley Eastern Ltd., New Delhi, 2006.
2 I. H. Sheth : Abstract Algebra, Nirav Prakashan, Ahmedabad.
3. N. S. Gopal Krishnan : University Algebra, Wiley Eastern Ltd.
4. P. R. Bhattacharya, S. K. Jain and S. R. Nagpaul : Basic Abstract Algebra, Cambridge University Press, Indian Edition, 1997.
5. Shantinarayan : Modern Algebra, S. Chand and Co., New Delhi.
6. Serge Lang : Algebra, Addition Wesley, 1993.
7. Surjeet, Kazi Zameeruddin : Modern Algebra, Vikas Publishing House.

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

Effective from June 2017

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

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

Unit II:
Non-linear growth and 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, New York, 1999.
3. J. K. Sharma : OR Theory & Applications, Mac Milian India Ltd., 1998.
4. G. Hadley : Linear Programming, Narosa Publishing House, New Delhi,1995.
5. G. Paria : Linear Programming, Transportation, Assignment, Game, Books & Allied Pvt. Ltd. Calcutta.

* Use of Scientific non – programmable calculator is allowed.

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

Effective from June 2017

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 V4 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, 2006.