

# VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT

## Syllabus for M.Sc. (Mathematics)

### Scheme of Teaching and Examination

#### Semester – I

Effective from June 2017

Subject Code	Subject	Scheme Of Teaching			Scheme Of Examination					
		L	P	Total	Th.		Pr.		Total	
					Int	ext	Int	Ext	Int	Ext
101	Real Analysis – I	4	--	4	30	70	--	--	30	70
102	Complex Analysis – I	4	--	4	30	70	--	--	30	70
103	Topology – I	4	--	4	30	70	--	--	30	70
104	Abstract Algebra – I	4	--	4	30	70	--	--	30	70
105	ODE – I	4	--	4	30	70	--	--	30	70
106	Numerical Analysis – I	4	--	4	30	70	--	--	30	70
	Total	24	--	24	180	420	--	--	180	420

**VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT.**  
**SYLLABUS FOR M.Sc.(MATHEMATICS)**  
**SEMESTER -I**  
**PGMTH-101**  
**(Real Analysis – I)**

**Effective from June 2017**

**Sequences and Series of Functions:**

Sequence of functions, Series of functions, Uniform Convergence, Uniform Convergence and Continuity, Uniform Convergence and Integration, Uniform Convergence and Differentiation, Equicontinuous families of Functions, The Stone-Weierstrass theorem.

**Pre-requisite:**

The extended real numbers, Open and closed sets of real numbers, Borel sets.

**Lebesgue Measure:**

Outer measure, measurable sets and Lebesgue measure, A non measurable sets, measurable function, Littlewoods's three principles.

**Reference Books:**

1. H. L. Royden: "Real Analysis", Macmillan publication, 1993.
2. G. de Barra: "Measure theory and Integration", Wiley Eastern limited 1981.
3. Walter Rudin: "Principles of Mathematical Analysis", McGraw Hill, 1976.
4. T. M. Apostol: "Mathematical Analysis", Narosa Publishing House, 1985.
5. I. P. Natanson: "Theory of Functions of real variable", Fredrick Unger pub.1961.

**VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT.**  
**SYLLABUS FOR M.Sc.(MATHEMATICS)**  
**SEMESTER -I**  
**PGMTH-102**  
**(Complex Analysis – I)**  
**Effective from June 2017**

**Algebra of Complex Numbers:**

Complex Numbers, Triangle Inequality and its Applications, Polar and Exponential forms, Powers and Roots, Region in the Complex Plane, Extended Complex Plane.

**Analytic Functions:**

Functions of a Complex variables, Limits, Continuity, Differentiability, Cauchy-Riemann Equations, Analytic functions, Harmonic functions.

**Elementary Functions:**

Exponential function, Trigonometric functions, Hyperbolic functions, Multivalued function and its branches, Logarithmic function, Complex Exponents, Inverse Trigonometric and Hyperbolic functions.

**Complex Integration:**

Contour Integral, Primitives, Cauchy-Goursat Theorem, Extension of Cauchy-Goursat Theorem, Winding Number, Cauchy Integral formula, Consequences of Cauchy Integral formula, Concept of Maximum Moduli of functions.

**Reference Books:**

1. H. S. Kasana: "Complex Variables – Theory and Applications", 2<sup>nd</sup> Edition (2006), PHI, N. Delhi.
2. J. N. Sharma: "Functions of a Complex Variable", Krishna Prakashan, 2000.
3. S. Ponnuswamy: "Foundation of Complex Analysis", Narosa Publishing House, 1997.
4. S. Lang: "Complex Analysis", Addison Wesley, 1997.
5. H. A. Priestly: "Introduction to Complex Analysis", Clarendon Press, 1990.
6. J. B. Conway: "Functions of one Complex Variable", Springer-Verlag, 1980.

**VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT.**  
**SYLLABUS FOR M.Sc.(MATHEMATICS)**  
**SEMESTER -I**  
**PGMTH-103**  
**(Topology – I)**

**Effective from June 2017**

**Topological Spaces:**

Topological Space, Relative Topology, Continuity and Convergence, Open and Closed sets, Closure of a set, Neighborhood of a point, Interior point, limit point, Derived set, Open Base and Open sub-base, First and second countable spaces, Separable spaces.

**Compactness:**

Cover, Sub-cover, open cover, Basic and sub-basic open cover, countable open cover, Continuity and Compactness, Finite intersection property, Heine-Borel property.

**Compactness for Metric Spaces:**

Sequentially Compact Metric Space, Bolzano-Weierstrass Property (BWP), Totally bounded Space, Ascoli's theorem.

**Reference Books:**

1. George F. Simmons: "Introduction to Topology and Modern Analysis", McGraw-Hill Book Co., 1963.
2. James R. Munkres: "Topology : A First Course", Prentice Hall of India Pvt. Ltd., New Delhi, 2000.
3. J. Dugundji: "Topology", Allyn and Bacon, 1966 (Reprinted in India by Prentice Hall of India Pvt. Ltd.).
4. K. D. Joshi: "Introduction to General Topology", Wiley Eastern Ltd., 1983.
5. J. Hocking and G. Young: "Topology", Addison-Wesley, Reading, 1961.

**VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT.**  
**SYLLABUS FOR M.Sc.(MATHEMATICS)**  
**SEMESTER -I**  
**PGMTH-104**  
**(Abstract Algebra – I)**  
**Effective from June 2017**

**Group Theory:**

Conjugate of an element, class equation, and Cauchy theorem, Sylow's theorem, Direct Products, Fundamental theorem of Finite Abelian Groups.

**Ring Theory:**

Primitive polynomials, Gauss lemma, the Eisenstein criterion, polynomial rings over commutative rings, unique factorization domain.

**Modules:**

Modules, sub-modules, finitely generated module. Direct sum of sub-modules, Homomorphism and quotient modules, Fundamental theorem of R-homomorphism, completely reducible modules, Schur's lemma, Free modules.

**Reference Books:**

1. I.N. Herstein : Topics in Algebra 4thEd., John Wiley Sons.
2. P.B. Bhattacharya : Basic Abstract Algebra 2ndEd., Cambridge University Press.
3. Artin M. Algebra, Prentice Hall, Englewood, Cliffs NJ.
4. J. A. Gallian: Contemporary Abstract Algebra, Narosa Publishing House.

**VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT.**  
**SYLLABUS FOR M.Sc.(MATHEMATICS)**  
**SEMESTER -I**  
**PGMTH-105**  
**(Ordinary Differential Equations – I)**  
**Effective from June 2017**

**Basic Concepts and Linear Equations of the First Order**

Introduction, Formation of Differential Equations (DE), Classification of DE, Initial and Boundary Value Problems, Definition of Solutions of DE, First Order Linear Equation, Exact Equations, Separable Equations.

**Linear Differential Equations of Higher Order**

Introduction, Higher Order DE, Examples, Linear Independence, Equations with, Constant Coefficients, Equations with Variable Coefficients, Wronskian, Variation of Parameters, Some Standard Methods, Method of Laplace Transforms.

**Solutions in Power Series**

Introduction, Second Order Linear Equations with Ordinary Points, Legendre Equation and Legendre Polynomials, Second Order Equation with Regular Singular Point, Properties of Bessel Functions..

**References:**

1. S. G. Deo, V. Lakshmikantham and V. Raghvendra : Text Book of Ordinary Differential Equations  
Tata Mc Graw Hill Pub. Co. Ltd, New Delhi, 1997.
2. Coddington E.A. and Levinson N. : Theory of Ordinary Differential Equations,  
Mc Graw Hill, 1955.
3. Hartmann P. : Ordinary Differential Equations, John Wiley  
International, 1964.
4. Somasundaram D. : Ordinary Differential Equations, Narosa, 2001
5. Mandal C.R. : Ordinary Differential Equations, P.H.I., 2003.
6. Rai B., Freedman H.I., and Chaudhary D.P., : A Course in Ordinary Differential Equations,  
Narosa, 2002.
7. King A.C., Otto R. and Billingham J. : Differential Equations, Cambridge, 2005

**VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT.**  
**SYLLABUS FOR M.Sc.(MATHEMATICS)**  
**SEMESTER -I**  
**PGMTH-106**  
**(Numerical Analysis – I)**  
**Effective from June 2017**

**Transcendental Equations:**

Bisection method, Iteration method based on first and second degree equation, Rate of convergence, General iteration Methods, System of nonlinear equations, Methods for complex roots.

**Polynomial Equations:**

Polynomial equations, Choice of iterative method.

**System of Linear Algebraic Equations:**

Direct Methods, Error analysis for direct root methods, Iteration methods.

**Eigen values problems:**

Eigen values and Eigenvectors, Bound on Eigen values, Jacobi method for symmetric matrices, Givens method for arbitrary Matrices, Power method, Inverse power method.

**Interpolation:**

Lagrangian and Newton interpolations, Finite difference operators, Interpolating polynomials, Hermite interpolation, Piecewise and Spline interpolations.

**Reference Books:**

1. M.K. Jain, S.R.K. Iyenger, R.K. Jain: "Numerical Methods for scientific and engineering computations", VI – edition, New Age International Publishers
2. Philips and Taylor: "Theory and Applications of Numerical Analysis Academic Press", 1996
3. Gourdin and Boumhart: "Applied Numerical Analysis", P.H.I., 1996
4. A.S. Householder: "Theory of Matrices in Numerical Analysis", Blarsedell - New York.
5. Jacques and Colin: "Numerical Analysis", Chapman & Hall, New-York, 1987.