VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT.

SYLLABUS FOR B.Sc. (MATHEMATICS)

Semester: III, IV

Effective from December 2013

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	Group of Symmetries-I	2	2	70 (20 Internal + 50 External)
		Mathematical Modelling-I			
		Mathematical Methods-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	Group of Symmetries-II	2	2	70 (20 Internal + 50 External)
		Mathematical Modelling-II			
		Mathematical Methods-II			

VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT.
SYLLABUS FOR B.Sc.(MATHEMATICS)
SEMESTER -III
MTH-301
(Advanced Calculus–I)
Effective from December 2013
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.

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

Unit III:
Maxima-Minima for functions of two variables, Necessary and sufficientconditions for extreme points.

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. HariKishon : 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
(Ordinary Differential Equations)
Effective from December 2013
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.

VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT.
SYLLABUS FOR B.Sc.(MATHEMATICS)
SEMESTER -III
MTH-303
(Numerical Analysis–I)*
Effective from December 2013
Marks:100 (30 internal+70 external)
(3 Hours / Week - Credits : 3)

Unit I:
Error estimation: Errors and their computations, A general error formula, Error in a series approximations.

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.; 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.

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VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT.
SYLLABUS FOR B.Sc. (MATHEMATICS)
SEMESTER - III
Elective Generic
(Group of Symmetries-I)
Effective from December 2013
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 -III
Elective Generic
(Mathematical Modelling-I)*
Effective from December 2013
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 & 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, New Delhi,1995.
5. G. Paria : Linear Programming, Transportation, Assignment, Game, Books & Allied Pvt. Ltd. Calcutta - 9.

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VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT.
SYLLABUS FOR B.Sc.(MATHEMATICS)
SEMESTER -III
Elective Generic
(Mathematical Methods-I)*
Effective from December 2013
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:
Formation of difference equations, Order and degree of a difference equation, Solution of difference equations, linearly dependent and independent solutions, conditions for the linear independence.

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.
6. V. N.Vedamurthy, NCh SN Iyengar, Numerical Methods, Vikas Publishing House Pvt. Ltd.

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VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT.
SYLLABUS FOR B.Sc.(MATHEMATICS)
SEMESTER -IV
MTH-401
(Advanced Calculus–II)
Effective from December 2013
Marks:100 (30 internal+70 external)
(3 Hours / Week - Credits : 3)

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

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

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

Unit IV:
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 December 2013
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 equations with coefficient, Rule of finding Partial Differential Equation, Integral, Working methods to solve homogeneous linear equations of any order.

Unit IV:
Non-homogeneous Differential Equations, Non-linear equations of 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 December 2013
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: 1st and 2nd 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.; 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.

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VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT.
SYLLABUS FOR B.Sc. (MATHEMATICS)
SEMESTER - IV
Elective Generic
(Group of Symmetries-II)
Effective from December 2013
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.

VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT.
SYLLABUS FOR B.Sc.(MATHEMATICS)
SEMESTER -IV
Elective Generic
(Mathematical Modelling-II)*
Effective from December 2013
Marks:70 (20 internal+ 50 external)
(2 Hours / Week - Credits : 2)

Unit I:
Mathematical modelling of effect of immigration & emigration on population size, Mathematical models of rate of compound interest, Mathematical models of radioactive decay.

Unit II:
Mathematical modelling of Newton's cooling law; Mathematical modelling of Fick's law of diffusion, Mathematical modelling of change in price of commodity.

Unit III:
Mathematical models of epidemics to system of ordinary differential equations of first order, Simple epidemic model, SIS model.

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, New Delhi,1995.
5. G. Paria : Linear Programming, Transportation, Assignment, Game, Books & Allied Pvt. Ltd. Calcutta - 9.

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VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT.
SYLLABUS FOR B.Sc.(MATHEMATICS)
SEMESTER -IV
Elective Generic
(Mathematical Methods-II)*
Effective from December 2013
Marks:70 (20 internal+ 50 external)
(2 Hours / Week - Credits : 2)

Unit I:
Theory of equations: Definitions, Fundamental theorem(only statement), relation between roots and coefficients,symmetric functions of roots, roots with sign changed, reciprocal roots and reciprocal equations.

Unit II:
Formation of equations, evaluation of roots, De Carte's rule of sign for positive and negative roots, existence of imaginary roots.

Unit III:
Cardan's method for solving cubic equations, Ferrari's method for solving biquadratic equations.

The course is covered by the following reference books :

1.Text book of Higher Algebra: M. Ray and H. S. Sharma,S. Chand& Co.
2.Theory of equations - Vol2:Purnside& Panton, S. Chand&Co.
3. Higher Algebra: Bernard & Child.

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