

BHAVNAGAR UNIVERSITY

BHAVNAGAR

(NACC Accreditation Grade “B”)

CREDIT AND SEMESTER SYSTEM

SYLLABUS

BACHELOR OF SCIENCE (B.Sc.)

MATHEMATICS

(In Force From Academic Year: 2011-2012)

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B.Sc.
Credit and Semester System Syllabus

NAME OF THE SUBJECT: MATHEMATICS

SEMESTER: 3rd

SR. NO.	PAPER NO	NAME OF THE PAPER	TOTAL MARKS EXT+INT*=TOTAL	PASSING STANDARD EXT+INT=TOTAL	TOTAL TEACHING HOURS	EXAM. HOURS	CREDITS
1	M-301	Advanced Calculus	70 + 30 = 100	28 + 12 = 40	15 Weeks x 03 Hours = 45 Hours	03	03
2	M-302	Linear Algebra-1	70 + 30 = 100	28 + 12 = 40	15 Weeks x 03 Hours = 45 Hours	03	03
3	M-303	Numerical Analysis	70 + 30 = 100	28 + 12 = 40	15 Weeks x 03 Hours = 45 Hours	03	03
4	M-304	Practical	90 + 00 = 90 (External Only)	36 + 00 + 36	15 Weeks x 03 Hours = 45 Hours	03	03

* <u>INTERNAL</u>	<u>MARKS</u>
ASSIGNMENT	10
SEMINAR	10
TEST	10

Note: Practical Paper M – 304 is subject to approval of the Faculty of Science and Consequently the Academic Council of the Bhavnagar University, Bhavnagar.



B.Sc.
Credit and Semester System Syllabus

NAME OF THE SUBJECT: MATHEMATICS

SEMESTER: 4th

SR. NO.	PAPER NO	NAME OF THE PAPER	TOTAL MARKS EXT+INT*=TOTAL	PASSING STANDARD EXT+INT=TOTAL	TOTAL TEACHING HOURS	EXAM. HOURS	CREDITS
1	M-401	Differential and Integral Calculus	70 + 30 = 100	28 + 12 = 40	15 Weeks x 03 Hours = 45 Hours	03	03
2	M-402	Linear Algebra-2	70 + 30 = 100	28 + 12 = 40	15 Weeks x 03 Hours = 45 Hours	03	03
3	M-403	Numerical Methods	70 + 30 = 100	28 + 12 = 40	15 Weeks x 03 Hours = 45 Hours	03	03
4	M-404	Practical	90 + 00 = 90 (External Only)	36 + 00 + 36	15 Weeks x 03 Hours = 45 Hours	03	03

* <u>INTERNAL</u>	<u>MARKS</u>
ASSIGNMENT	10
SEMINAR	10
TEST	10

Note: Practical Paper M – 404 is subject to approval of the Faculty of Science and Consequently the Academic Council of the Bhavnagar University, Bhavnagar.

**B.Sc. (MATHEMATICS)
SEMESTER – III**PAPER NO. M-301: Advance Calculus:**Credit: 03**

Total Marks: 100
Marks: Semester End Examination: 70
Continues Internal Evaluation: 30

UNIT	DETAILED SYLLABUS	TEACHING HOURS	MARKS / WEIGHT
Unit – I	Increasing and decreasing functions, Concave upwards and concave downwards functions, Points of inflexion, Asymptotes.	9	14
Unit – II	Beta and Gamma functions, relation between Beta and Gamma functions, Duplication formula, Properties of Beta and Gamma functions.	9	14
Unit – III	Real functions of several variables, Their limit and continuity, (Repeated limits and limits in R^2 to be explained), Partial derivatives of functions of n variable (For special case $n = 2$ notation, D_{12} and D_{21} to be explained)	9	14
Unit – IV	Differentiability, Chain rule, Partial derivatives of higher order, Condition for commutative property of variables in higher order partial derivatives, Derivatives of implicit functions.	9	14
Unit – V	Euler's theorem on partial derives of homogenous functions. Extrema of functions of several variables, Lagrange's method of undetermined multipliers, Taylor's and Maclaurin's expansions for functions of several variables (Proof for cases of two variables only)	9	14

Break up of Continuous Internal Evaluation:

1. Assignments	10 Marks
2. Seminar	10 Marks
3. Test	10 Marks
Total Marks	30 Marks

Reference / Text- Books/ Additional Reading:

1. David Widder : Advanced Calculus (Prentice hall, New Delhi)
2. T.M.Apostol : Advanced Calculus Volume-II (Blaisdoll)
3. Shanti Narayan : Differential Calculus (S.Chand)
4. Shanti Narayan : Integral Calculus (S.Chand)
5. T.Amarnath : Partial Differential Equation (Narosa) (Articles 1 to 4)
6. James Stewart : Calculus Brooks/Cole publishing company
7. S.T.Tan : Applied Calculus Brooks/Cole publishing company

(The course is roughly covered by the book by David Widder)



PAPER NO. M-302: Linear Algebra – I:

Credit: 03

Total Marks: 100
Marks: Semester End Examination: 70
Continues Internal Evaluation: 30

UNIT	DETAILED SYLLABUS	TEACHING HOURS	MARKS / WEIGHT
Unit – I	Vector space, Definition and examples, Vector Subspaces, Linear dependence and independence.	9	14
Unit – II	Span of a set, Basis and dimension of a vector space.	9	14
Unit – III	Linear transformation, Representation of linear transformation by a matrix, Kernel and image of a linear transformation.	9	14
Unit – IV	Linear isomorphism, Geometric ideas and rank, Identity, Stretch along axes, Reflection with respect to axes, Rotation, Shear, Projection, Their Combinations.	9	14
Unit – V	Inner product spaces, the Euclidean plane and the dot product, general inner product spaces.	9	14

Break up of Continuous Internal Evaluation:

1. Assignments	10 Marks
2. Seminar	10 Marks
3. Test	<u>10 Marks</u>
Total Marks	30 Marks

Reference / Text- Books/ Additional Reading:

1. Linear Algebra – A Geometric Approach by S.Kumaresan (Prentice Hall, New Delhi).
2. Finite Dimensional Vector spaces P.Halmos
3. Matrix and Linear algebra K.B. Dutta (Prntice Hill, New Delhi)
4. Linear Algebra-A problem book P.R.Halmoose(Cambrige university Press)
5. Linear Algebra G.Paria (New central book agency-Calcutta)
6. Linear algebra and applications Gilbert Strang Thomson Brooks/cole

(The course is roughly covered by the book by S. Kumaresan)



PAPER NO. M-303: Numerical Analysis:

Credit: 03

Total Marks: 100
Marks: Semester End Examination: 70
Continues Internal Evaluation: 30

UNIT	DETAILED SYLLABUS	TEACHING HOURS	MARKS / WEIGHT
Unit – I	Error in calculation and calculus of finite differences, interpolation. Significant error, Relative error, Estimation of error, Application of error formula.	9	14
Unit – II	Forward differences, Backward differences, Shift operator, Polynomial in factorial notation.	9	14
Unit – III	<u>Interpolation</u> : error in interpolation, Central difference, Gauss's forward and backward formula.	9	14
Unit – IV	Stirling's interpolation formula, Bessel's and Everett's formulae, Lagrange's formula.	9	14
Unit – V	Divided difference, Newton's divided difference formula, inverse interpolation, its application.	9	14

Break up of Continuous Internal Evaluation:

1. Assignments	10 Marks
2. Seminar	10 Marks
3. Test	<u>10 Marks</u>
Total Marks	30 Marks

Reference / Text- Books/ Additional Reading:

1. Numerical Analysis and Computational Procedures by S.A. Moolah, New Central Book Agency (P) Ltd., Calcutta.
2. Elementary Numerical analysis S.S. Sastry (Prentice Hall, New Delhi)
3. Numerical mathematical analysis Scarborough 6th edition. (Oxford & IBH)
4. Numerical analysis S.Kunz Mcgraw Hill Book New York
5. Numerical Analysis Richard Burden and J. Douglas Thomson

(The course is roughly covered by the book by S.A. Moolah)



PAPER NO. M-304: Practical:

Credit: 03

Total Marks: 90 (External Only)

Practical Based On

- (1) [M – 301] Advanced calculus {50%} and
- (2) [M – 303] Numerical Analysis {50%}

[M – 301] Advanced calculus:

- (1) To identify curve & tracing them in Cartesian equation $y = f(x)$
- (2) To identify curve & tracing them in polar equation $r = f(\theta)$
- (3) To find extreme values of function in two variables & in three variable

[M – 303] Numerical Analysis:

- (1) To find value of function using Gauss's forward interpolation formula
- (2) To find value of function using Gauss's back ward interpolation formula
- (3) To find value of function using sterling's central interpolation formula.
- (4) To find value of function using Bessel's formulas
- (5) To find value of function using Laplace Everest's formula.
- (6) To find polynomial solving given values using Newton's divided difference formula.



B.Sc. (MATHEMATICS)
SEMESTER – IV

PAPER NO. M – 401: Differential and Integral Calculus:

Credit: 03

Total Marks: 100
Marks: Semester End Examination: 70
Continues Internal Evaluation: 30

UNIT	DETAILED SYLLABUS	TEACHING HOURS	MARKS / WEIGHT
Unit – I	Curves, Surfaces, First order partial differential equation, Classification of integrals, Linear equations of first order	9	14
Unit – II	<u>Differentiation along a curve. Applications to geometry:</u> 1. Curvature in Cartesian and polar co-ordinates 2. Singular points for plane curves especially points of inflexion and double points.	9	14
Unit – III	<u>Tangent line and normal plane to curves:</u> 1. Tangent plane and normal line to surfaces 2. Gradient, Divergence and Curl of vectors	9	14
Unit – IV	Double integral, Repeated integral, integral on a non-rectangular region, Jacobian, only introduction and use for transformation from Cartesian to polar, spherical and cylindrical coordinates and vice-versa.	9	14
Unit – V	Line integral, Surface integral, Green's theorem and Stoke's theorem (Only statements), Examples based on Green's theorem and Stoke's theorem.	9	14

Break up of Continuous Internal Evaluation:

1. Assignments	10 Marks
2. Seminar	10 Marks
3. Test	10 Marks
Total Marks	30 Marks

Reference / Text- Books/ Additional Reading:

1. David Widder : Advanced Calculus (Prentice hall, New Delhi)
2. T.M.Apostol : Advanced Calculus Volume-II (Blaisdoll)
3. Shanti Narayan : Differential Calculus (S.Chand)
4. Shanti Narayan : Integral Calculus (S.Chand)
5. T.Amarnath : Partial Differential Equation (Narosa) (Articles 1 to 4)
6. James Stewart : Calculus Brooks/Cole publishing company
7. S.T.Tan : Applied Calculus Brooks/Cole publishing company

(The course is roughly covered by the book by David Widder)



PAPER NO. M-402: Linear Algebra – II:

Credit: 03

Total Marks: 100
Marks: Semester End Examination: 70
Continues Internal Evaluation: 30

UNIT	DETAILED SYLLABUS	TEACHING HOURS	MARKS / WEIGHT
Unit – I	Orthogonality, Geometrical application, orthogonal projection onto a line, orthonormal basis, orthogonal complements and projections.	9	14
Unit – II	Linear functionals and hyper-planes, orthogonal transformations, associated co-ordinates, reflections, orthogonal map of the plane.	9	14
Unit – III	Determinants and its properties, Value of a determinant, Basic results-Laplace expansion, Cramer's rule, Application to geometry, orientation and vector product.	9	14
Unit – IV	Rotation of axes of conics, Eigenvalues and eigenvectors, Cayley – Hamilton theorem. Diagonalization of symmetric matrices.	9	14
Unit – V	Conics and quadrics, classification of Quadrics, computational examples.	9	14

Break up of Continuous Internal Evaluation:

1. Assignments	10 Marks
2. Seminar	10 Marks
3. Test	10 Marks
Total Marks	30 Marks

Reference / Text- Books/ Additional Reading:

1. Linear Algebra – A Geometric Approach by S.Kumaresan (Prentice Hall, New Delhi).
2. Finite Dimensional Vector spaces P.Halmos
3. Matrix and Linear algebra K.B. Dutta (Prntice Hill, New Delhi)
4. Linear Algebra-A problem book P.R.Halmoose(Cambrige university Press)
5. Linear Algebra G.Paria (New central book agency-Calcutta)
6. Linear algebra and applications Gilbert Strang Thomson Brooks/cole

(The course is roughly covered by the book by S.Kumaresan)



PAPER NO. M-403: Numerical Method:

Credit: 03

Total Marks: 100
Marks: Semester End Examination: 70
Continues Internal Evaluation: 30

UNIT	DETAILED SYLLABUS	TEACHING HOURS	MARKS / WEIGHT
Unit – I	Estimation of error in differentiation formula based on Newton's forward and backward formulae, and Stirling's formula.	9	14
Unit – II	Differentiation formulae of un-equispaced arguments, General quadrature formula, Trapezoidal rule, Simpson's rule, Weddel's rule.	9	14
Unit – III	Quadrature formula based on Lagrange's formula, Newton-Cotes formula, Numerical integration formula based on central difference formulae, Euler-Maclaurin sum formula.	9	14
Unit – IV	Algebraic and transcendental equations, Numerical solution of differential equations of first order; Graphical method, method of bisection, method of iteration, Newton-Raphson formula, Newton's iterative formula, method of false position.	9	14
Unit – V	Euler's method, Euler's modified method, Picard's method. Taylor's series method, Runge-Kutta method, Milne's method.	9	14

Break up of Continuous Internal Evaluation:

1. Assignments	10 Marks
2. Seminar	10 Marks
3. Test	<u>10 Marks</u>
Total Marks	30 Marks

Reference / Text- Books/ Additional Reading:

1. Numerical Analysis and Computational Procedures by S.A. Moolah, New Central Book Agency (P) Ltd., Calcutta.
2. Elementary Numerical analysis S.S. Sastry (Prentice Hall, New Delhi)
3. Numerical mathematical analysis Scarborough 6th edition. (Oxford & IBH)
4. Numerical analysis S.Kunz Mcgraw Hill Book, New York
5. Numerical Analysis Richard Burden and J. Douglas Thomson.

(The course is roughly covered by the book by S.A. Moolah)



PAPER NO. M-404: Practical:

Credit: 03

Total Marks: 90 (External Only)

Practical Based On

- (1) [M – 401] Differential & integral calculus {50%} and
- (2) [M – 403] Numerical methods {50%}

[M – 401] Differential and integral calculus:

- (1) To find curvature in Cartesian & polar form of curve.
- (2) To find divergence & curl of vector in R^3 with its properties.
- (3) To change of order of double integral
- (4) To find volume of surface by double integral
- (5) To find area of region by green's theorem
- (6) To verify stone's theorem of for function in R^3 over certain surface

[M – 403] Numerical methods:

- (1) To find $\int_a^b f(x)dx$ using trapezoidal rule.
- (2) To find $\int_a^b f(x)dx$ using Simpson's $\frac{1}{3}$ rule.
- (3) To find $\int_a^b f(x)dx$ using Simpson's $\frac{3}{8}$ rule.
- (4) To find $\int_a^b f(x)dx$ using Weddle's rule.
- (5) To find solution of $\frac{dy}{dx} = f(x, y)$ using Picard's method.
- (6) To find solution of $\frac{dy}{dx} = f(x, y)$ using Euler's method.
- (7) To find solution of $\frac{dy}{dx} = f(x, y)$ using Runge-Kutta method.
- (8) To find solution of $\frac{dy}{dx} = f(x, y)$ using Milne's method