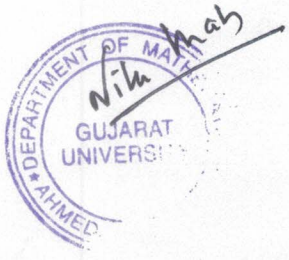
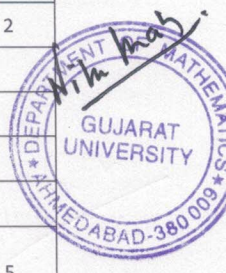
Gujarat University
Choice Based Credit System
Revised Syllabus for Under Graduate (B. Sc.) Mathematics
Effective from June-2018



Gujarat University

Design and Structure of B. Sc. Semester based Credit system to be implemented from June-2018

Department	Semester		Course	No. of Hours per Week				Course Credits
			Name	Lectures	Others	Practi-cals	Total	
Mathematics	1	EC 101	Mathematics Basics and Quantitative Skills	3	-	-	3	2
		MAT101	Calculus and Matrix Algebra	4	-	-	4	4
		MAT102	Practical (Based on MAT101)	-	-	4	4	3
			Total	**7**	**-**	**4**	**11**	**9**
	2	MAT103	Differential Equations and Co-ordinate Geometry	4	-	-	4	4
		MAT104	Practical (Based on MAT103)	-	-	4	4	3
			Total	**4**	**-**	**4**	**8**	**7**
	3	MAT201	Advanced Calculus - I	4	-	-	4	4
		MAT202	Linear Algebra - I	4	-	-	4	4
		MAT203	Practical (Based on MAT201, MAT202 and Numerical Methods - I)	-	-	6	6	2.5
			Total	**8**	**-**	**6**	**14**	**10.5**
	4	MAT204	Advanced Calculus - II	4	-	-	4	4
		MAT205	Abstract Algebra - I	4	-	-	4	4
		MAT206	Practical (Based on MAT204, MAT205 and Numerical Methods - II)	-	-	6	6	2.5
			Total	**8**	**-**	**6**	**14**	**10.5**
	5	MAT301	Linear Algebra - II	4	-	-	4	4
		MAT302	Analysis - I	4	-	-	4	4
		MAT303	Complex Variables and Fourier Series	4	-	-	4	4
		MAT304	Mathematical Programming	4	-	-	4	4
		MAT305E	Discrete Mathematics	3	-	-	3	2
			Combinatorics					
			C Programming for Mathematical Problems					
			Financial Mathematics					
			Mathematical Statistics					
			Number Theory					
		MAT306	Practical - I (Based on MAT301, MAT302)	-	-	12	12	5
			Practical - II (Based on MAT303, MAT304)					
			Total	**19**	**-**	**12**	**31**	**23**
	6	MAT307	Abstract Algebra - II	4	-	-	4	4
		MAT308	Analysis - II	4	-	-	4	4
		MAT309	Analysis - III	4	-	-	4	4
		MAT310	Graph Theory	4	-	-	4	4
		MAT311E	Convex Analysis and Probability Theory	3	-	-	3	2
			Mechanics					
			Cryptography					
			Operations Research					
			Bio-Mathematics					
		MAT312	Practical - I (Based on MAT307, MAT308)	-	-	12	12	5
			Practical - II (Based on MAT309, MAT310)					
			Total	**19**	**-**	**12**	**31**	**23**
			Grand Total (for Mathematics only)				**109**	**83**



Gujarat University
Choice Based Credit System (CBCS)

Syllabus for Semester I (Mathematics)
MAT 101: Calculus and Matrix Algebra(Theory)

Hours: 4 /week Credits: 4

Unit: I Calculus:

(a) Successive Derivatives, standard results for n^{th} derivative, Leibniz's Theorem.

(b) Definition of limit of a sequence, Convergence and divergence of an infinite series, Alternating Series (**without proof**). Comparison test, Ratio test and Root test, Power series.

Unit: II

(a) Rolle's Theorem (**without proof**), Lagrange's and Cauchy's Mean Value Theorems, Increasing and decreasing functions, Taylor's and Maclaurin's Theorems (**both without proof**). Using Taylor's and Maclaurin's Theorem find Maclaurin power series expansion of $\sin x$, $\cos x$, $\log(1 + x)$, e^x, $(1 + x)^n$ under proper restrictions (if any).

(b) Indeterminate forms: all forms of L'Hospital's Rules (**without proof)**.

Unit: III Matrix Algebra:

(a) Introduction to matrices, different types of matrices, operations on matrices, Theorems on matrices, Elementary operations on matrices and types of matrices, Symmetric and skew-symmetric matrices, Hermitian and Skew-Hermitian matrices.

(b) Linear dependence and independence of row and column matrices. Row rank, column rank and rank of a matrix. Row Reduced Echelon (RRE) form of a matrix and matrix inversion using it.

Unit: IV

(a) Eigen values, Eigen vectors and the characteristic equation of a matrix. Cayley-Hamilton (CH) theorem (**without proof)** and its use in finding inverse of a matrix.

(b) Application of matrices in solving a system of simultaneous linear equations. Cramer's rule. Theorems on consistency of a system of simultaneous linear equations.

Reference Books:

1. Calculus and Analytic Geometry – G. B. Thomas and R. L. Finney. Pearson Education. Indian Reprint.
2. Calculus – James Stewart, Sixth edition, (E-Book).
3. Calculus – T. M. Apostol. Volume I.
4. Differential Calculus – Shanti Narayan, P.K. Mittal, S. Chand and Co.
5. Differential Calculus – Harikishan, Atlantic Publishers.
6. Calculus – M. Spivak.
7. An Introduction to Linear Algebra – I. K. Rana, Ane Books Pvt. Ltd.
8. Linear Algebra Theory and Applications – Ward Cheney, David Kincaid. Jones and Bartlet India Pvt. Ltd.
9. Introduction to Linear Algebra – Serge Lang. Springer (India).
10. Matrix and Linear Algebra – K. B. Dutta, Prentice Hall.
11. A Textbook of Matrices – Shanti Narayan, P K Mittal, S. Chand Group.
12. Introduction to Linear Algebra – V. Krishnamurthy, Affiliated East-west Press Pvt Ltd.

Gujarat University
Choice Based Credit System (CBCS)
Syllabus for Semester I (Mathematics)
MAT 102: Calculus and Matrix Algebra (Practical)

Hours: 4/week Credits: 3

Duration: 2 hrs/practical Number of Practicals: 16

Unit I

Practicals based on tracing of curves and Integral. (Practical Number 1- 4).

Unit II

Practicals based on Integral, successive differentiation and convergence of infinite series. (Practical Number 5 - 8).

Unit III

Practicals based on Mean value theorems, Expansions of functions L'Hospital's Rules and RRE form of matrix. (Practical Number 9 - 12).

Unit IV

Practicals based on Matrices and its applications. (Practical Number 13 - 16)

List of Practicals:

1. Graphs of Trigonometric and Inverse trigonometric functions.
2. Find the limit of sums using the definite integral. (5+5=10 problems)
3. Find the definite integrals using substitution. (5+5=10 problems)
4. Find the definite integrals using integration by parts. (5+5=10 problems)
5. Find the definite integral by method of partial fractions. (5+5=10 problems)
6. Find the n^{th} derivative of the functions at the given points.
7. Applications of Leibnitz theorem.
8. Discuss Convergence of the infinite series.
9. Geometrical Interpretation of M.V.T. Problems on M.V.T.
10. Expansions of functions in infinite power series using Taylor and Macalurin's formulae
11. Evaluate limit using L'Hospital's rule.
12. Find RRE form and rank of a matrix.
13. Find inverse using Gauss Jordan method (using row operations).
14. Verify the Cayley-Hamilton (CH) theorem –inverse of matrix using it- problems on Cayley-Hamilton (CH) theorem.
15. Find Eigen values and Eigen vectors of square matrices of order 2 and 3.
16. Solution of system of linear equations using row operations and Cramer's rule.

Gujarat University
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Syllabus for Semester I (Mathematics)
EC 101: Mathematical basics and Quantitative skills

Hours: 3/week Credits: 2

Unit I Trigonometry

Unit circle, trigonometric functions, values of trigonometric function at distinct points, relation among trigonometric functions, trigonometric formulae, $\sin(x \pm y)$, $\cos(x \pm y)$, $\tan(x \pm y)$, $\sin c \pm \sin d$, $\cos c \pm \cos d$, $2 \sin x \cos y$ (and others), inverse of trigonometric functions.

Unit II Co-ordinate Geometry and Vectors

Distance Formula, Section Formula, Equation of a line and its slope, intersection of two lines, Equation of a circle and its tangent, elementary vector algebra.

Unit III Limit and Differentiation

Right hand limit, Left hand limit and limit of a function $\lim_{x \to 0} \frac{x^n - a^n}{x - a}$, $\lim_{x \to 0} \frac{\sin x}{x}$, $\lim_{h \to 0} \frac{a^h - 1}{h}$ and $\lim_{n \to \infty} \left(1 + \frac{1}{n}\right)^n$, continuity, derivative of x^n, e^x, trigonometry functions, inverse trigonometry functions, chain rule, geometric meaning of derivative.

Unit IV Integration

Integration of x^n, e^x, trigonometry functions, well known functions like $\frac{1}{x^2 \pm a^2}$, $\frac{1}{\sqrt{x^2 \pm a^2}}$, $\sqrt{x^2 \pm a^2}$, Method of substitution, integration by parts, definite integral (Up to Fundamental Theorem of Integral Calculus)

N.B. All the results / formulae are without proof.

Reference Books:

1. Gujarat Rajya Pathya Pustak Mandal for std 11 and std 12.
2. A Textbook for class XI & XII, National Council of Educational Research and Training.
3. A Class Book of Mathematics for class XII by Chakrabarty S. K., Biswajit Bhagwati, S. Chand Publishers.
4. Short Calculus by Serge Lang, Springer(India).