C. U. SHAH UNIVERSITY

WADHWAN CITY

FACULTY OF SCIENCES

B.Sc.

SEM-I

Syllabi (CBCS) Mathematics

C. U. SHAH UNIVERSITY

FACULTY OF SCIENCES

DEPARTMENT OF MATHEMATICS

COURSE: B.Sc. **SEMESTER: I**

SUBJECT NAME: Mathematics-I **SUBJECT CODE: 4SC01MAT1**

Teaching & Evaluation Scheme:-

Teaching hours/week				Credit	Evaluation Scheme/semester							
					Theory				Practical			Total Marks
					Sessional Exam		University Exam		Internal		University	
Th	Tu	Pr	Total		Marks	Hrs	Marks	Hrs	Pr	TW		
4	0	0	4	4	30	1.5	70	3	--	--	--	100

Objectives:-

The main objective of this course is to learn

- The basics of the Calculus: Limits, Derivatives, Geometry.
- The definitions of matrix and types of matrices.
- Algebra of matrices.
- Methods to solve system of linear equations.
- Eigen value and Eigen vectors of matrices.
- Methods to solve differential equations

More generally, the students will improve their ability to think critically, to analyze a real problem and solve it using a wide array of mathematical tools. These skills will be highly valuable to them in whatever path they choose to follow, be it as a Mathematics major or in pursuit of a career in one of the other sciences.

Prerequisites:-

Before studying calculus, all students should have basic knowledge algebra, geometry, trigonometry, and elementary functions, determinants, matrices and differential equations of at least 10+2 level.

Course outline:-

Sr. No.	Course Contents	Hours
1	Review of Limit, Continuity, Differentiability, Sandwich Theorem. Indeterminate forms: $\frac{0}{0}, \frac{\infty}{\infty}, 0 \times \infty, \infty - \infty, 0^0, \infty^0, 1^\infty$.	05
2	Successive derivative, Higher order derivatives, n^{th} derivatives of standard form. Leibnitz's theorem and its applications.	05
3	Roll's Mean Value Theorem, Lagrange's Mean Value Theorem, Cauchy's Mean Value Theorem and problems related to it.	05
4	Taylor's Theorem (Without Proof), Maclaurin's Theorem (Without Proof), Taylor's and Maclaurin's infinite series expansions, expansions of $e^x, \sin x, \cos x, (1+x)^n, \log(1+x)$ under proper conditions.	05
5	Polar coordinates in two dimensions; Relation between two points in polar coordinates, Polar equations of line, circle, Relation between polar and Cartesian coordinates, Relation between Cartesian and Spherical coordinates, Relation between Cartesian and Cylindrical coordinates	06
6	Sphere: General Equation of sphere, Plane section of a sphere, intersection of two spheres, intersection of sphere and a line, Equations of a tangent plane and a normal line to a sphere.	06
7	Review of Determinants and matrix, Row operations, Row Echelon & Reduced row echelon form of Matrix, Solution of system of linear equations, solving system of linear equations simultaneously, Inverting coefficient matrix, Inverse of Matrix, Rank of matrix.	08
8	Characteristic equation of a matrix and Cayley-Hamilton theorem and its use in finding inverse of matrix, Eigen value and Eigen vector of square matrices, eigenvalue of special type of matrices, Diagonalization of matrix.	08
9	First order and first degree differential equations: basic concepts, Homogeneous Equations, Integrating factor, Linear differential equations, Bernoulli equations, Exact differential equations.	06
10	Differential equations of the first order but not of first degree: Solvable for p, for x and for y, Clairaut's form of differential equations and Lagrange's form of differential equations.	06

Learning Outcomes:-

After the successful completion of the course, students will be able to

- Graphing and optimization of the functions.
- Imagine three dimensional objects virtually.
- Analyze differential equations.

- Solve first ODES.
- Solve systems of linear equations.
- Manipulate matrix algebra and determinants.
- Evaluate Eigen values and Eigen vectors.

Books Recommended:-

1. 'Analytical solid Geometry', **Shanti Narayan and P. K. Mittal**, *S. Chand and Co.* New Delhi.
2. 'Differential Calculus', **Shanti Narayan and P. K. Mittal**, *S. Chand and Co.* New Delhi.
3. 'A Textbook of Matrices', **Shanti Narayan and P. K. Mittal**, *S. Chand and Co.* New Delhi.
4. 'Higher Engineering Mathematics, Thirty-fifth edition', **B. S. Grewal**, *Khanna Publication*.
5. 'The calculus with analytic geometry', **Louis Leithod**, *Harper-Collins Pub.*
6. 'The Elements of Co-ordinate Geometry', **S. L. Loney**, *Mac Milan & Co.*
7. 'A Textbook of Analytical Geometry of three dimensions', **P. K. Jain**, *New Age International.*
8. 'Elementary Treatise on Co-ordinate Geometry of three dimensions', **R. J. T. Bell**, *Mac Milan Co.*
9. 'Advanced Engineering Mathematics', **E. Kreyszig**, *New Age International Publishing Co.*
10. 'Elementary Linear Algebra', **Howard Anton and Chris Rorres**, *Wiley Pub.*

E-Resources:-

1. http://online.math.uh.edu/HoustonACT/
2. http://www.math.ucdavis.edu
3. https://en.wikipedia.org/wiki/Calculus
4. http://archive.org/details/calculuswithanal032985mbp
5. www.sosmath.com/calculus/calculus.html
6. en.wikibooks.org/wiki/Calculus
7. http://mathworld.wolfram.com/Calculus.html
8. en.wikipedia.org/wiki/Polar_coordinate_system
9. tutorial.math.lamar.edu/Classes/CalcII/PolarCoordinates.aspx
10. math.ucsd.edu/~wgarner/math4c/textbook/.../polar_coordinates.htm
11. http://mathworld.wolfram.com/PolarCoordinates.html
12. http://www.wolframalpha.com/examples/Matrices.html
13. http://www.online.math.uh.edu
14. http://www.math.ucdavis.edu
15. https://en.wikipedia.org/wiki/Matrix_(mathematics)
16. http://archive.org/details/calculuswithanal032985mbp
17. www.maths.manchester.ac.uk/kd/ma2m1/matrices.pdf
18. en.wikipedia.org/wiki/Eigenvalues_and_eigenvectors
19. http://mathworld.wolfram.com/First-OrderOrdinaryDifferentialEquation.html
20. www.sosmath.com/diffeq/first/first.html

C. U. SHAH UNIVERSITY

FACULTY OF SCIENCES

DEPARTMENT OF MATHEMATICS

COURSE: B.Sc. **SEMESTER: I**

SUBJECT NAME: Mathematics Practical-I **SUBJECT CODE: 4SC01MAP1**

Teaching & Evaluation Scheme:-

Teaching hours/week				Credit	Evaluation Scheme/semester							
					Theory				Practical			Total Marks
					Sessional Exam		University Exam		Internal		University	
Th	Tu	Pr	Total		Marks	Hrs	Marks	Hrs	Pr	TW		
0	0	6	6	3	--	--	--	--	20	10	70	100

Objectives: -

The main objective of this course is to learn

- The basics of the Calculus: Limits, Derivatives, Curve tracing, Geometry.
- The definitions of matrix and types of matrices.
- Algebra of matrices.
- Methods to solve system of linear equations.
- Eigen value and Eigen vectors of matrices.
- Methods to solve differential equations

More generally, the students will improve their ability to think critically, to analyze a real problem and solve it using a wide array of mathematical tools. These skills will be highly valuable to them in whatever path they choose to follow, be it as a Mathematics major or in pursuit of a career in one of the other sciences.

Prerequisites:-

Before studying calculus, all students should have basic knowledge algebra, geometry, trigonometry, and elementary functions, determinants, matrices and differential equations of at least 10+2 level.

Course outline:-

Sr. No.	Course Contents
1	L'Hospital's rule and exercises
2	Successive differentiation and Leibnitz's theorem
3	Taylor's and Maclaurin's Theorem, Mean value theorems
4	Sketching of Cartesian curve, Parametric curves, Polar curves and reciprocal curves
5	Differential equations of the first order and first degree.
6	Relation between Cartesian, polar, spherical and cylindrical coordinates.
7	Practical based on sphere.
8	Differential equations of the first order but not of first degree solvable for p, for x and for y
9	Systems of linear equation and Inverse of matrices.
10	Eigen values, Eigen vectors and Diagonalization, Cayley- Hamilton's Theorem

Learning Outcomes:-

After the successful completion of the course, students will be able to

- Calculate the derivatives of functions of several variables.
- Graphing and optimization of the functions.
- Imagine three dimensional objects virtually.
- Analyze differential equations.
- Solve first ODES.
- Solve systems of linear equations.
- Manipulate matrix algebra and determinants.
- Evaluate Eigen values and Eigen vectors.

Books Recommended:-

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9. 'Advanced Engineering Mathematics', **E. Kreyszig**, *New Age International Publishing Co.*
10. 'Elementary Linear Algebra', **Howard Anton and Chris Rorres**, *Wiley Pub.*

Notes:-

1. Problem solving skill in mathematics is an important aspect in the teaching of mathematics.
2. There would be problem solving session of six hours per week and they will be conducted in batches.