बिरसा मुंडा ट्रायबल युनिवर्सिटी
Birsa Munda Tribal University

राजपिपला, जि. नर्मदा   Rajpipla, Dist. Narmada
Established by Tribal Development Department, Govt. of Gujarat

School of Science
B.Sc. (Chemistry) Programme
Subject Code & Name: - BS01MICHE3 Mathematics-I

Teaching and Evaluation Scheme:

Teaching Scheme				Examination Scheme			
Credits				Component Weightage			
				CCE		SEE	
L	T	P	Total	TH	PWE	TH	PWE
3	0	1	4	37.5%	12.5%	37.5%	12.5%

Programme Name	B.Sc. (Chemistry)
Semester	I
Course Code	BS01MICHE3
Course Title	Mathematics-I
Course Content Type(Th./Pr.)	Theory & Practical
Course Credit	3+1
Sessions+ Lab. Per Week	3+2
Total Teaching/Lab. Hours	45 Theory Hours+ 30 Practical Hours

* 2 Laboratory = 1 Session

Learning Objectives

Students will able to study
1. Understanding the concept of differentiation and its applications.
2. Developing the ability to find derivatives of various functions using differentiation rules.
3. Exploring higher-order derivatives and their interpretations.
4. Utilizing differentiation techniques such as the chain rule, product rule, and quotient rule.
5. Understanding the concept of integration and its applications.
6. Developing the ability to find anti - derivatives and definite integrals.
7. Exploring techniques of integration such as substitution, integration by parts, and partial fractions.
8. Eigen values represent scalar values associated with a matrix, and eigenvectors are corresponding vectors.
9. By understanding and applying basic matrix algebra, we can solve a wide range of mathematical problems, analyze data, perform transformations, and model real-world phenomena.

Prerequisites (if any)

12th Science passed with Mathematics as a subject.

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Learning Outcomes
On the Completion of this course, students will able to:

1. Use Leibnitz's rule to evaluate derivatives of higher order, able to study the geometry of various types of functions, evaluate the area when studying Integration. The level of depth and complexity of these topics can vary depending on the educational level and the specific course being taken.

2. Perform Basic Matrix Operations, Multiply Matrices; Find the Inverse of a Matrix, Solve Systems of Linear Equations, Compute Determinants, Diagonalizable Matrices and Students will have a conceptual understanding of how matrices can represent transformations such as rotations, scaling, shearing, and reflections.

Detailed Contents

UNIT	TOPIC/SUB-TOPIC	TEACHING HOURS
I	Revision of algebra of derivatives and its standard forms, Successive Derivatives, standard results for derivative, Leibniz's Theorem and examples based on it. Definition of limit of a sequence, Convergence and divergence of an infinite series, Comparison test, Ratio test, Root test, Radius and interval of convergence of power series.	15
II	Revision of algebra of integration and its standard forms, Reduction Formulae for $\int Sin^n x\, dx$, $\int Cos^n x\, dx$, $\int Sin^m x\, Cos^n x\, dx$ and $\int_0^{\pi/2} Sin^n x\, dx$, $\int_0^{\pi/2} Cos^n x\, dx$, $\int_0^{\pi/2} Sin^m x\, Cos^n x\, dx$ where m, n $\in$ N, with m, n $\geq$ 2 Mean value theorems: Rolle's theorem, Lagrange's and Cauchy's theorem. and Taylor's theorem(without proof). Expansion in power series of $\sin x$, $\cos x$, $log(1+x)$, e^x and $(1+x)^m$ in appropriate domain, L'Hospital's rule and it's numerical.	15

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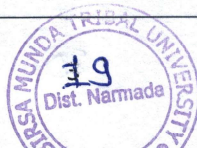Established by Tribal Development Department, Govt. of Gujarat

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III	Matrices: matrix operations (Addition, Scalar Multiplication, Multiplication, Transpose, Adjoin and their properties); Special types of matrices: Null, Identity, Diagonal, Triangular, Symmetric, Skew-Symmetric, Hermitian, Skew-Hermitian, Orthogonal, Unitary, Normal, Idempotent, Nilpotent, Involuntary, Algebra of determinants and its properties, Solution of the matrix Equation AX = B; Row reduced Echelon form of matrix and Matrix inversion using it, Linear dependence and independence of rows and columns of a matrix. Row rank, column rank and rank of a matrix. Equivalence of row rank and column rank of matrix. Eigen values, eigenvectors and the characteristics equation of a matrix. Cayley- Hamilton theorem and its use in finding inverse of a matrix. Application of matrices to a system of a linear equation. Theorems on system of consistency of linear equations, solution of system of linear equation in three variables by Cramer's rule.	15

Unit – IV Practical(s)	30 Hours

1. Problems solving based on Limit using definition.

2. Problems solving based on Derivative using first principle.

3. Problems solving based on L-hospital rule first and second kind.

4. Problems solving based on Extreme values of function using differentiation.

5. Problems solving based on Integration by parts of definite integral.

6. Problems solving based on $\int_0^{\pi/2} Sin^n\ x\ dx$, $\int_0^{\pi/2} Cos^n\ x\ dx$.

7. Problems solving based on $\int_0^{\pi/2} Sin^m\ x\ Cos^n\ x\ dx$.

8. Problems solving based on Properties of Inverse of matrix.

9. Problems solving based on rank of a matrix.

10. Problems solving based on Matrix represent as sum of Symmetric& Skew-Symmetric matrix

11. Problems solving based on Find solution of system of linear equation using Cramer's rule.

12. Problems solving based on Eigen values& Eigenvectors.

13. Problems solving based on verification of Cayley- Hamilton theorem.

14. Problems solving based on Inverse of matrix using Cayley- Hamilton theorem.

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Text Book(s)
1. Calculus - Dr. Elliot Mendel son, Mc GrawHill Book co.
2.Calculus - Thomas and Finney , Pearson Education , Asian edition
3.Calculus and Analytic Geometry - G. B. Thomas and R. L. Finney. Pearson Education. Indian Reprint.
4.Mathematical Physics,- H.K.Dass, S.Chand.

Reference Books
1. Differential Calculus by Shanti Narayan & Differential Calculus by Gorakh Prasad
2. Higher Algebra by Barnard S. and Child J. M.
3. Higher Algebra by H. S. Hall and S. R. Knight H. M.
4. Integral Calculus by Shanti Narayan & Integral Calculus by Gorakh Prasad
5. Mathematical sciences (UGC CSIR) by Pawan Sharma, Neha Sharma and Suraj singh. (Arihant publication India)

Web Resources
1. https://archive.nptel.ac.in/courses/111/105/111105121/
2. https://math.libretexts.org/
3. https://archive.nptel.ac.in/courses/111/108/111108157/

L:: Lecture, **T::** Tutorial , **P::**Practical

CCE:: Continuous and Comprehensive Evaluation

(CCE Theory includes Mid Semester Examination, Assignment, MCQ quizzes, Seminar, Reflective notes, class participation, case analysis and presentation, slip tests (announced/ surprised), attendance etc. or any combination of these)

PWE:: Practical Work Examination

(PWE includes Laboratory practical work, project work, viva simulation exercise work etc.)

SEE:: Semester End Evaluation