Enclosure - X

DSE Allied courses in Mathematics offered to B.Sc. – Chemistry by Mathematics Department

Semester – III			
16UCDA05	**DSE Allied - 3: Mathematics - I**	**3hrs/week**	**3 Credits**

Objectives:-

Upon completion of the course students will be able to

1. Understand geometrical concepts including Line, Circle, Area and Volume
2. Identify and interpret the relationship among co-ordinate systems including Polar, Spherical & Cylindrical Co-ordinates.
3. Analyse the functional relationship among variables including Trigonometric functions, Exponential function, Logarithmic function, and Complex variable.
4. Understand and utilize the fundamental concepts of calculus including limits and continuity and differentiation.
5. Calculate inverse of matrix, variance and standard deviation of given data.
6. Interpolate the required value from the given data table.

Unit 1: Basic geometry **(7 hrs)**

- Line
- Circle
- Area
- Volume

Unit 2: Polar, spherical & cylindrical co-ordinates **(8 hrs)**

- Co-ordinate.
- Polar Co-ordinates in $R^{2.}$
- Distance between two points in polar Co-ordinates.
- Polar equations of a straight line.
- Polar equations of circle.
- Relation between Cartesian and Polar coordinates.
- Relation between Cartesian and Spherical coordinates.
- Relation between Cartesian and Cylindrical coordinates.

Unit 3: Elementary functions **(7 hrs)**

- Trigonometric functions
- Inverse trigonometric functions
- Trigonometric relations
- The exponential function
- The logarithmic function
- Values of exponential and logarithmic functions
- Complex variable & Complex conjugate

Unit 4: Differentiation **(7 hrs)**

- Basic concepts of limits and continuity.
- The process of differentiation
- Differentiation from first principles

- Differentiation by rule
- Implicit functions

Unit 5: Numerical & Statistical Methods: (7 hrs)

- Basic Concepts of Numerical methods and statistical methods.
- Errors in numerical and statistical methods.
- Interpolation
- Methods in linear algebra (Gauss elimination for the solution of linear equations, Gauss–Jordan elimination for the inverse of a matrix)
- Descriptive statistics (Mean, median, mode)
- Variance and standard deviation

TEXT BOOKS: -

1. Prof. H. K. Dass, Applied Mathematics, CBS Publishers & Distributors, New Delhi.
2. Dr. V. N. Vedamurthy, Dr. N. Ch. S. N. Iyengar, Numerical Methods, Vikas Publishing House Pvt. Ltd.
3. Robert R. Stoll, Set Theory and Logic, Eurasia Publishing House Pvt. Ltd.

REFERENCE BOOKS:-

1. Erich Steiner, The Chemistry Maths Book, OXFORD University Press, Second Edition.

Semester – III			
16UCDA06	**DSE Allied Practical - 3: Mathematics – I Practical**	**2hrs/wk**	**1 Credits**

Objectives:-

Upon completion of the course students will be able to

1. Understand geometrical concepts including Line, Circle, area and Volume
2. Identify and interpret the relationship among co-ordinate systems including Polar, Spherical & Cylindrical co-ordinates.
3. Analyse the functional relationship among variables including Trigonometric functions, Exponential function, Logarithmic function.
4. Understand and utilize the fundamental concepts of Calculus including limits and continuity and differentiation.
5. Calculate inverse of matrix, variance and standard deviation of given data.

List of Practical

1. Plotting the graphs of Lines and other problems related to lines.
2. Problems based on coordinate system..
3. Problems based on Area & Volume.
4. Plotting the Graphs of Elementary functions including conics.
5. Problems based on Limit & Continuity.
6. Problems based on Differentiation.
7. Problems based on Mean, median, mode.
8. Problems based on Gauss elimination for the solution of linear equations.
9. Problems based on Gauss–Jordan elimination for the inverse of a matrix.
10. Problems based on Variance and standard deviation.

TEXT BOOKS: -

1. Prof. H. K. Dass, Applied Mathematics, CBS Publishers & Distributors, New Delhi.
2. Dr. V. N. Vedamurthy, Dr. N. Ch. S. N. Iyengar, Numerical Methods, Vikas Publishing House Pvt. Ltd.
3. Robert R. Stoll, Set Theory and Logic, Eurasia Publishing House Pvt. Ltd.

REFERENCE BOOKS:-

1. Erich Steiner, The Chemistry Maths Book, OXFORD University Press, Second Edition.

Semester – IV			
16UCDA07	**DSE Allied - 4: Mathematics - II**	**3hrs/week**	**3Credits**

Objectives:-

Upon completion of the course students will be able to

1. Understand and implement the concepts of set theory and function in Chemistry.
2. Understand and utilize the concept of Vectors in Chemistry.
3. Calculate integration occurring in chemical calculation.
4. Understand and utilize the concept of Matrices.

Unit 1: Set theory and Functions (hrs)

- Basic definition of sets and its examples.
- Various operations on set theory.
- Properties of set theory.
- Vann Diagram.
- Applications of set theory.
- Definition of function and relation.
- Types of functions.
- Graphs of functions.

Unit 2: Vectors (hrs)

- Vector algebra
- Components of vectors
- Scalar differentiation of a vector
- The scalar (dot) product
- The vector (cross) product

Unit 3: Integration (hrs)

- Concepts
- The indefinite integral
- The definite integral
- The integral calculus
- Uses of the integral calculus
- Introduction of Double integral

Unit 4: Concept of a matrix (hrs)

- Introduction to matrices
- Different types of matrices.
- Operations on matrices.
- Symmetric and skew – symmetric matrices.
- Hermitian and skew-Hermitian matrices.

Unit 5: Matrix [contd...] (hrs)

- Eigen values.
- Eigen vectors.
- The characteristic equation of a matrix.
- Inverse of matrices.

TEXT BOOKS: -

1. Prof. H. K. Dass, Applied Mathematics, CBS Publishers & Distributors, New Delhi.
2. Shanti Narayana and P. K. Mittal, Textbook of Matrices, S. Chand and Company Ltd, 11^{th} Edition.

REFERENCE BOOKS:-

1. N. P. Bali, Solid Geometry, Laxmi Publications Ltd.
2. Oxford University, The Chemistry Maths Book, PAGES-718, Second Edition Erich.
3. Shanti Narayana and P.K. Mittal, Analytical Solid Geometry, S. Chand and Company Ltd.
4. R. S. Agarwal, Quantitative Apptitude, S. Chand and Company, New Delhi.

Semester – IV			
16UCDA08	**DSE Allied Practical – 4 : Mathematics – II Practical**	**2hrs/wk**	**1 Credits**

Objectives:-

Upon completion of the course students will be able to

1. Draw graphs of mathematical function with chemical point of view.
2. Draw understand and derive necessary information from Vann Diagrams.
3. Use Microsoft – Excel to plot charts and graphs including chart, and Line chart with Microsoft Excel.

List of Practical

1. Plotting the graphs of exponential function.
2. Plotting the graphs of logarithmic function.
3. Plotting the graphs of Trigonometric function.
4. Draw the Vann Diagrams.
5. Example based on Integration.
6. Find Inverse of a Matrix.
7. Find eigen value and eigen vector of a matrix.
8. Introduction to Microsoft Excel.
9. Plotting Pie chart, Column chart, and Line chart with Microsoft Excel.
10. Plotting Bar chart, Area chart, Scatter Chart with Microsoft Excel.

TEXT BOOKS: -

1. Prof. H. K. Dass, Applied Mathematics, CBS Publishers & Distributors, New Delhi.
2. Shanti Narayana and P. K. Mittal, Textbook of Matrices, S. Chand and Company Ltd, 11th Edition.

REFERENCE BOOKS:-

1. N. P. Bali, Solid Geometry, Laxmi Publications Ltd.
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4. R. S. Agarwal, Quantitative Apptitude, S. Chand and Company, New Delhi.