Module Code:	Math – 101
Module title:	Mathematics A-I (Calculus (I))
Name of Scheme:	BS Chemistry (4 Years)
Semester :	1st
Module Type:	General
Module Rating:	3 Credits

1. Introduction of the Course:

The goal of this course is for students to gain proficiency in calculus computations. In calculus, we use three main tools for analyzing and describing the behavior of functions: limits, derivatives, and integrals. Students will use these tools to solve application problems in a variety of settings ranging from physics and biology to chemistry and economics.

2. Course Objectives

Upon successful completion of this course, students will be able to:

- Compute limits, derivatives, and integrals.
- Analyze functions using limits, derivatives, and integrals.

1. • Recognize the appropriate tools of calculus to solve applied problems.

3. Course Contents

1. Preliminaries

- Real numbers and the real line.
- Functions and their graphs.
- Shifting and scaling graphs.
- Solution of equations involving absolute values.
- Inequalities.
- Complex numbers system. Polar form of complex numbers, De Moivr's theorem.
- Circular function, hyperbolic functions, logarithmic.

2. Limit and Continuity

- Limit of a function, left hand and right hand limits, Theorems of limits.
- Continuity, Continuous functions.

3. Derivatives and its Applications.

- Differentiable functions.
- Differentiation of polynomial, rational and transcendental functions.
- Mean value theorems and applications.
- Higher derivatives, Leibniz's theorem.
- L'Hospitals Rule.
- Intermediate value theorem, Rolle's theorem.
- Taylor's and Maclaurin's theorem with their remainders.

4. Integration and Definite Integrals

- Techniques of evaluating indefinite integrals.
- Integration by substitutions, Integration by parts.
- Change of variable in indefinite integrals.
- Definite integrals, Fundamental theorem of calculus.
- Reduction formulas for algebraic and trigonometric integrands.
- Improper integrals, Gamma functions.

1.

4. Teaching-learning Strategies

1. Lectures
2. Group Discussion

3. Laboratory work
4. Seminar/ Workshop

5. Learning Outcome:

1. Solve tangent and area problems using the concepts of limits, derivatives, and integrals.
2. Draw graphs of algebraic and transcendental functions considering limits, continuity, and differentiability at a point.
3. Determine whether a function is continuous and/or differentiable at a point using limits.
4. Use differentiation rules to differentiate algebraic and transcendental functions.
5. Identify appropriate calculus concepts and techniques to provide mathematical models of real-world situations and determine solutions to applied problems.
6. Evaluate definite integrals using the Fundamental Theorem of Calculus.
7. Demonstrate an understanding of the relationship between derivatives and integrals using the Fundamental Theorem of Calculus.

6. **Assessment Strategies**:
   1. Lecture Based Examination (Objective and Subjective)
   2. Assignments
   3. Class discussion
   4. Quiz
   5. Tests

7. Recommended Readings:

1. Thomas, Calculus, 11 th Edition. Addison Wesley Publishing Company, 2005.
2. H. Anton, I. Bevens, S. Davis, Calculus, 8th Edition, John Wiley & Sons, Inc. 2005.
3. Hughes-Hallett, Gleason, McCallum, et al, Calculus Single and Multivariable, 3rd Edition. John Wiley & Sons, Inc. 2002.
4. Frank A. Jr, Elliott Mendelson, Calculus, Schaum's outlines series, 4th Edition,1999.
5. C.H. Edward and E.D Penney, Calculus and Analytics Geometry, Prentice Hall, Inc. 1988.
6. E. W. Swokowski, Calculus and Analytic Geometry, PWS Publishers, Boston, Massachosetts, 1983.
7. Calculus: Concepts and Contexts, 4th edition, James Stewart, Brooks/Cole. ISBN 9781111027308.