Calculus and Analytical Geometry

Course Code	Credit Hours
MATH-101	3-0

Course Description

The course reviews the concepts of basic calculus; including limits, continuity, differentiation and integration. A brief account of three dimensional geometry and complex numbers is also included as pre-calculus review. Stress is laid on applications of differentiation and integration to practical/engineering problems. Convergence/divergence of the sequence and series are included towards the end of the syllabus

Text Book:

1. Calculus and Analytic Geometry (9th Edition) by George B. Thomas, Jr. and Ross L. Finney.

Reference Book:

1. Calculus (6th Edition) by Swokowski, Olinick and Pence
2. Calculus (3rd Edition) by Robert T. Smith & Roland B. Minton

Prerequisites. Nil

ASSESSMENT SYSTEM FOR THEORY

	Without Project (%)	With Project/Complex Engineering Problems (%)
Quizzes	15	10-15
Assignments	10	5-10
Mid Terms	25	25
Project	-	5-10
End Semester Exam	50	45-50

ASSESSMENT SYSTEM FOR LAB

Lab Work/ Psychomotor Assessment/ Lab Reports	70%
Lab Project/ Open Ended Lab Report/ Assignment/ Quiz	10%
Final Assesment/ Viva	20%

Teaching Plan

Week No	Topics/Learning Outcomes
1	Intervals and inequalities, methods for solving inequalities. Absolute value function and solving inequalities involving absolute value.
2	Functions, symmetry of functions, increasing and decreasing functions, curve sketching using transformation techniques.
3	Concepts of limits. Rules and techniques of finding limits. Concept of one-sided limits/existence and non- existence of limits.
4	Continuity. Continuity at a point and continuity on an interval. Intermediate value theorem and its application. Infinite limits, vertical and horizontal asymptotes, Squeeze theorem.
5-6	Geometric interpretation of derivatives. Differentiation by definition. Techniques of differentiation: Basic rules, power rule, chain rule, general power rule, implicit differentiation, logarithmic differentiation etc. L' Hopital Rule, indeterminate forms.
7-8	**Application of Differentiation**: Definition of extrema, extreme value theorem, relative extrema, critical numbers, Rolles's Theorem, The mean value theorem. Test of increasing and decreasing, first derivative test, second derivative test, Concavity and point of inflection.
9	Mid Semester Exam
10	**Application of Differentiation:** Curve sketching using derivative techniques. Optimization problems using differentiation.
11-12	Geometric interpretation of integration. Definition of integration and techniques of integration. Reiman Sums and definite integral, fundamental theorem of calculus, mean value theorem.
13-14	**Application of Integration:** Area under and between the curves, Volume by solid of revolution, disc method, washer method, shell method. Arc length, surface of revolution.
15	**Sequence and Series.** Convergence/ divergence of series by limit comparison test, p-test, ratio test, root test.
16	Alternating series. Absolute and conditional convergence. Power series, Taylor's and Maclaurin series.
17-18	**End Semester Exam**

Practical: Nil