Semester:	1			
Course Code:	EM1010			
Course Name:	Calculus I			
Credit Value:	4 (Notional hours:200)			
Prerequisites:	None			
Core/Optional	Core			
Hourly Breakdown	Lecture hrs.	Tutorial hrs.	Assignment hrs.	Independent Learning & Assessment hrs.
	48	06	12	134

Course Aim: To introduce mathematical concepts arising in the areas of calculus and functions of complex variables so that build confidence in students in solving related problems.

Intended Learning Outcomes:
On successful completion of the course, the students should be able to;

- **analyze** concepts in limits, continuity, differentiability of real-valued functions of single and multiple variables and integration of single variable function.
- **determine** the convergence of sequences and infinite series, the power series expansion of real analytic functions.
- **analyze** lines, planes, curves and surfaces in 2D and 3D spaces
- **derive** the mathematical models of physical problems as differential equations
- **solve** first order separable, linear and exact differential equations and reducible forms.
- **analyze** limits, continuity, and differentiability of complex-valued functions, and determine holomorphic and harmonic functions.

Course Content:

- **Functions of a Single Variable**: Functions and Limits, Continuity and Differentiability of real valued functions, Intermediate value theorem, Rolle's theorem, Mean value theorem, Leibnitz theorem, and tangent line approximation, extreme values, integration of single variable function.
- **Sequences and Series**: Monotonic and bounded sequences, Convergence, divergence and oscillation of a sequence, Series and their convergence, Real power series and their convergence, Maclaurin and Taylor series approximation.

- **First order Ordinary Differential Equations:** Differential Equations as a mathematical model and Classification, Separable, Linear, Exact, Reducible forms.
- **Vector approach to geometry in space**: Vectors, Determinant, Vector equations of lines and planes and their geometry, Parametric representation of curves in planes, Curvature, radius and center of curvature, Derivatives of vector valued function in parametric form.
- **Functions of Several Variables**: Limit and continuity of functions of two and three variables, Partial derivatives and total differential, Chain rule and higher order partial derivatives.
- **Functions of Complex Variables:** Roots of unity and functions of complex variables, Mapping of complex variables, Derivatives of complex functions, Cauchy Riemann equation, Holomorphic functions, Harmonic functions.

Teaching /Learning Methods:

Classroom lectures, tutorial discussions and in-class assignments

Assessment Strategy:

Continuous Assessment 50%	Final Assessment 50%		
Details: Assignments/Quizzes - 10% Tutorials - 10% Mid Semester Examination - 30%	Theory (%) 50%	Practical (%) -	Other (%) -

Recommended Reading:

- Stewart, J. (2006). *Calculus* (5th edition), Thomson Brooks/Cole
- Fulks, W. (1978). *Advanced Calculus an Introduction to Analysis* (3rd edition), John Wiley & Sons, Inc.
- Dass, H.K. (2008). *Advanced Engineering Mathematics*. S. Chand Publishing
- Nagle, R.K., Saff, E,W. and Snider A.D. (2012). *Fundamentals of Differential Equations* (8th edition), Pearson Education
- E. Kreyszig, E.(2011). *Advanced Engineering Mathematics* (10th Edition), Wiley
- Franklin, P. (1960). *Differential Equations for Engineers*, Dover Publications
- Staff, E.B. and Snider A.D. (2013), *Fundamentals of Complex Analysis with applications to Engineering and Science* (3rd edition), Pearson Education