Course Code	**GP 115**
Course Title	**Calculus I**
No. of Credits	**3**
Pre-requisites	**-**
Compulsory/Optional	**Compulsory**

Aim(s): To build confidence in mathematical concepts and solving problems arising in the areas of calculus, coordinate geometry, complex variables, infinite series, and power series.

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

- Analyze conceptual problems in limits, continuity, differentiability, and integration of functions of single variables and compute the partial derivatives of functions of several variables.
- Compute the roots of unity, the derivatives of complex functions, and identify Holomorphic functions
- Identify and sketch conic sections, use polar and other coordinates to represent points in 2-D.
- Compute the vector and Cartesian equations of lines and planes, the derivatives of vector valued functions, and solve related problems.
- Determine the convergence of sequences and infinite series, calculate the radius of convergence and interval of convergence of power series and find the power series expansion of analytic functions.

Time Allocation (Hours): Lectures 36 Tutorials Practical Assignments18

Course content/Course description:

- **Review**: Sets and their applications, real number system and its properties,method of mathematical induction, concept of a function, description and classification of functions.
- **Functions of a Single Variable**: Limits, indeterminate forms and L'Hospital's rule, continuity and differentiability of real valued functions,
- **Applications**: Intermediate value theorem, mean value theorem,leibnitz theorem, and tangent line approximation.
- **Sketching curves**: Local and global maximum and minimum, inflection points
- **Applications of Integration:** Identify Riemann definition and find arc lengths, areas, volumes and moments using integration.
- **Function of Several Variables**: Partial derivatives and total differential, chain rule and higher order partial derivatives.
- **Parametric representation of curves in planes**: Curvature, radius and centre of curvature.
- **Complex functions**: Roots of unity and functions of complex variables, mapping of complex variables, derivatives of complex functions, Cauchy Reimann equation, holomorphic functions.
- **3-D Coordinate Geometry**: Vector equations of lines and planes in space, coplanar lines, shortest distance between a point (line, plane) and a line (plane), skew lines in the space, angels between planes and the equation of the intersection line, derivatives of vector valued function.
- **Function of positive integers**:Define sequences and examples, monotonic sequence

and bounded sequence, convergence, divergence and oscillation of a sequence.

- **Infinite Series**: Standard examples of infinite series, conditions for convergence, alternating series, absolute and conditional convergence.
- **Real Power Series**: Power series of function f(x); binomial expansion, radius and interval of convergence of power series, Maclaurin and Taylor series approximation.

Recommended Texts :

- James Stewart,Calculus, 5thedition, (2006),Thomson Books/Cole.
- Watson Fulks,Advanced Calculus - An Introduction to Analysis,3rdedition,(1978), John Wiley &Sons, Inc.
- H.K. Dass,Advanced Engineering Mathematics, (2008), S.Chand & Company.

Assessment	Percentage Mark
In-course	
Tutorials/Assignments/Quizzes	20
Mid Semester Examination	30
End-semester	50