Course Syllabi: UMA001Mathematics-I (L : T : P :: 3 : 1 : 0)

1. **Course number and name:** UMA001; Mathematics-I

2. **Credits and contact hours:** Credits: 3.5; Hours: 4

3. **Text book, title, author, and year**

   - *Thomas, G.B. and Finney, R.L., Calculus and Analytic Geometry, Pearson Education (2007) 9thed.*
   - *Stewart James, Essential Calculus; Thomson Publishers (2007) 6thed.*
   - *Wider David V, Advanced Calculus: Early Trancedentals, Cengage Learning (2007).*
   - *Apostol Tom M, Calculus, Vol I and II John Wiley (2003).*

   a. Other supplemental materials
      - Nil

4. **Specific course information**

   a. Brief description of the content of the course (catalog description)

   Successive Differentiation: Higher Order Derivatives, Nth Derivatives of Standard Functions, Nth Derivatives of Rational Functions, Leibnitz Theorem.
   Applications of Derivatives: Mean Value Theorems and Their Geometrical Interpretation, Cartesian Graphing Using First and Second Order Derivatives, Asymptotes and Dominant Terms, Graphing of Polar Curves, Polar Equations for Conic Sections.
   Sequences and Series: Introduction to Sequences and Infinite Series, Tests for Convergence/Divergence: Limit Comparison Test, Ratio Test, Root Test, Cauchy Integral Test, Cauchy Condensation Test. Alternating Series, Absolute Convergence and Conditional Convergence.
   Series Expansions: Power Series, Taylor Series, Convergence of Taylor Series, Error Estimates, Term by Term Differentiation and Integration, Multiplication and Division Process in Power Series.
   Partial Differentiation: Functions of Several Variables, Limits and Continuity, Chain Rule, Change of Variables, Partial Differentiation of Implicit Functions, Taylor Series of Two Variables, Directional Derivatives and Its Properties, Maxima and Minima by Using Second Order Derivatives.
   Multiple Integrals: Change of Order of Integration, Change of Variables, Applications of Multiple Integrals to Areas and Volumes.
   Vector Calculus: Differentiation and Integration of Vector Valued Functions, Velocity, Acceleration, Tangent, Principle Normal and Binormal Vectors, Curvature, Torsion and TNB Frame. Scalar and Vector Fields, Gradient, Divergence and Curl. Line Integrals, Work, Circulation and Flux. Green's Theorem in Plane, Gauss-Divergence and Stoke's Theorem (Without Proof).

5. **Specific goals for the course**

   After the completion of the course, the students will be able to:
   - Apply the knowledge of calculus to plot graphs of functions, approximate functions and solve the problem of maxima and minima.
   - Evaluate multiple integrals and their application to engineering problems.

- Use vector analysis to calculate derivatives and integrals of vector-valued functions, relative positions, projections and work.
- Evaluate integral theorems of Green, Gauss & Stokes to find lines, surfaces & volumes.

6. Brief list of topics to be covered

- Successive differentiation
- Sequence and series
- Series expansion
- Partial differentiation
- Multiple integral
- Vector calculus