Semester Ist.

Title of the Course/ Course Number:- Differential Calculus/UMTTC101

Internal Assesment Test: 30 Marks

External End Semester University Examination: 120 Marks

UNIT-I

Concept of Limit and Continuity of functions on $\mathbb{R}$ ($\epsilon - \delta$ definition). Algebra of limits. Discontinuity and types of discontinuities. Rate of change and Tangent to the curve. Successive differentiability; Leibnitz Theorem. Indeterminate forms. Examples and exercises based on these topics. (18 Lectures)

UNIT-II

Functions of several variables. Continuity of functions in two real variables. Partial differentiation, Euler's theorem for homogeneous functions. Maxima and Minima of functions of two variables. Concavity of functions. Examples and exercises based on these topics. (18 Lectures)

UNIT-III

Asymptotes, Double points, Curvature, Envelope, Curve Tracing in Cartesian Coordinates. Examples and exercises based on these topics. (18 Lectures)

UNIT-IV

Polar Coordinates. Angle between radius vector and tangent to the curve. Graphic Techniques in Polar forms (Such as $r = a \pm b\cos\theta$, $r = a \pm b\sin\theta$, $r = a\sin n\theta$, $r = a\cos n\theta$, $n = 1, 2$ only.) Examples and exercises based on these topics. (18 Lectures)

UNIT-V

Rolle's Theorem, The Mean Value Theorems, Taylors Theorem with Lagrange's and Cauchy's form of remainder. Maclaurin's Series of $\sin x$, $\cos x$, e^x, $\log(1+x)$, $(1+x)^m$. Examples and exercises based on these theorems. (18-lectures)

Text Books:

- (1) H. Anton, I. Birens and S. Davis, Calculus, John Wiley and Sons, Inc., 2002.

- (2) G.B. Thomas and R.L. Finney, Calculus, Pearson Education, 2007.

- (3) Shanti Narayan, Dr. P.K. Mittal, Differential Calculus (Revised Edition), S. Chand and Co. Pvt. Ltd New Delhi

Semester IInd.

Title of the Course/Course Number:- Differential Equations/UMTTC201

Internal Assesment Test: 30 Marks

External End Semester University Examination: 120 Marks

UNIT-I

Review of differential equations. Linear differental equations and Bernoulli equation. First order, higher degree differential equations solvable for x , y , p. Clairaut's equation. Exact and Non-Exact differential equations, Integrating factors and rules to find the integrating factor of a non-exact differential equation. Examples, problems and exercises based on these topics.   (20-Lectures)

UNIT-II

Basic Theory of linear differential equations. Wronskian and its properties. Solving a differential equation by reducing its order. Linear homogeneous differential equations with constant coefficients. Examples and exercise based on these topics.   (20-Lectures)

UNIT-III

Linear non-homogeneous differential equations. The method of variation of parameters and the Cauchy-Euler equation. Examples and exercises based on these topics.   (14-Lectures)

UNIT-IV

Introduction to partial differential equations, order and degree of a partial differential equation. Formation of partial differential equations. Types of partial differential equations. Lagranges method of solving linear partial differential equations of order one. Non-linear partial differential equations of degree one: Complete integral, Singular integral, General integral. Charpits method and solutions of equations of

the type $f(p, q) = 0$, $z = px + qy + f(p, q)$, $f(z, p, q) = 0$, $f(x, p) = g(y, q)$. Examples and exercises based on these topics. (18-Lectures)

UNIT-V

Homogeneous and Non-homogeneous linear partial differential equations of second and third order with constant coefficients of the type $F(D, D') = g(x, y)$, where $g(x, y) = 0$, e^{ax+by}, $\sin(ax + by)$, $\cos(ax + by)$, $f(ax + by)$, $x^m y^n$, Ve^{ax+by}, when V is function of x and y and their sums. Homogeneous partial differential equations of the type $[(D + m_1 D')(D + m_2 D')(D + m_3 D')]Z = f(x, y)$. Examples and exercises based on these topics. (18-Lectures)

Text Books:

- (1) Shepley L. Ross, Differential Equations, 3rd Edition, John Willy and Sons, 1984.

- (2) I. Sneddon, Elements of Partial Differential Equations, McGraw-Hill International Edition, 1967.

Reference Books:

- (1) Dr. M. D. Raisinghania, Ordinary and Partial Differential Equations, S. Chand and Co., New Delhi, 2005