BE I-Semester syllabus for affiliated engineering colleges of Osmania University
(wef: academic year 2024-2025)
Common to all branches
MATRICES &DIFFERENTIAL CALCULUS

BS201MT	MATRICES &DIFFERENTIAL CALCULUS	3L:1T:0P	4 credits

Course objectives:
- To study matrix algebra and its use in solving system of linear equations and in solving eigen values problems
- To introduce the concepts of functions of one variable
- To introduce the concepts of functions of several variables
- To introduce and Interpret Multiple Integrals
- To Understand Vector Derivatives, Vector Integration techniques to solve real-world problems.

Outcomes : After completing this course, the students will be

- Solve system of linear equations and eigen value problems
- Understand and Apply Mean value theorems
- Understand partial derivatives, Maxima and minima of function of two and three variables
- Evaluate multiple integrals
- Analyze and Interpret Vector Derivatives& Vector Integration to Real-World Problems

UNIT-I
Matrices: Rank of a matrix, Echelon form, System of linear equations, Linearly dependence and independence of vectors, Linear transformation, Orthogonal transformation, Eigen values, Eigen vectors, Properties of eigen values, Cayley-Hamilton theorem(without proof), Reduction of quadratic form to canonical form by orthogonal transformation, Nature of quadratic forms.

UNIT-II
Calculus of one Variable: Rolle's theorem, Lagrange's Mean-value theorem, Cauchy's mean value theorem, Taylor's series(All theorems without proof), Curvature, Radius of Curvature, Circle of Curvature, Envelope of a family of curves.

UNIT-III
Multivariable Calculus (Differentiation): Functions of two variables, Limits and Continuity, Partial derivatives, Total derivative, Derivatives of composite and implicit functions (Chain rule), Change of variables, Jacobians, Higher order partial derivatives, Taylor's series of functions of two variables, Maximum and minimum of values of functions of two variables, Lagrange's method of undetermined multipliers.

UNIT-IV
Multivariable Calculus(Integration): Double integrals, Change of order of integration, Change of variables from Cartesian to plane polar coordinates, Triple integrals.

UNIT-V
Vector calculus: Scalar and vector fields, Gradient of a scalar field, Directional derivative, Divergence and Curl of a vector field, Line, Surface and Volume integrals, Green's theorem in a plane, Gauss's divergence theorem, Stoke's theorem(without proofs) and their verification.