

MA 133 Syllabus

Part I

1. Basic concepts: introductory examples, notation and classification of ODEs.
2. First order linear equations: first order linear equations, concepts of existence and uniqueness, integration techniques for specific cases.
3. Second order equations: general homogeneous equations and linear second order equations with constant coefficients, reduction to 2×2 systems, phase diagrams.
4. Nonlinear equations and 2×2 systems: linear stability such as predator and prey models.
5. Discretisation techniques: explicit and implicit Euler.

Part II

6. Differential calculus of scalar functions of several variables: partial derivative, chain rule, change of coordinates, gradient, directional derivative.
7. Differential calculus of vector functions of several variables: crossed product, vector fields, nabla, divergence, curl, algebraic identities, expression in other coordinates (polar, cylindrical, spherical),
8. Differential geometry: Parametrisation of curves and surfaces, tangent, tangent planes, normal.
9. Integration: line integral and surface integral.