Calculus 1(Differential Equations)
Syllabus

1. First order ordinary differential equations.
   General form; idea of general solution and boundary/initial conditions; separable, integrating factor, homogeneous; existence and uniqueness (proofs non-examinable); applications; Euler's numerical method.

2. Second order linear ordinary differential equations.
   Homogeneous equations with constant coefficients; inhomogeneous equations and particular integrals; general solutions; linear independence of solutions; variation of parameters; applications including driven mechanical systems with resonance.

3. Discrete dynamical systems
   First order maps and more general difference equations; solution of simple systems; fixed points; stability and periodic orbits; bifurcations; logistic map; chaos

4. Continuous dynamical systems
   Coupled first order systems; phase-plane analysis; fixed points; stability, periodic orbits; bifurcations; examples of predator-prey systems and others; The Lorentz equations; chaos.