

SYLLABUS :-

Flows on the line and circle: introduction; fixed points and stability; linear stability analysis; classification of linear systems; potentials; physical examples including uniform and nonuniform oscillator; overdamped pendulum. Flows in two-dimension: phase plane; phase portraits; existence, uniqueness and topological consequences; index theory; fixed points and linearization; limit cycles; Poincare-Benedixon theorem; weakly nonlinear oscillators. Bifurcations: saddle-node bifurcation; transcritical bifurcation; pitchfork bifurcation; imperfect bifurcations; Hopf bifurcations; Poincare maps. Chaos and fractals: various routes; Lorenz equations: simple properties; strange attractor; Liapunov exponent; applications of chaos; Cantor set; dimension of self-similar fractals; box dimension; correlation dimensions. One-dimensional maps: fixed points; logistic map; numerics and analysis; universality and experiments; computer based problems.