Indian Institute of Information Technology, Allahabad

Department of Information Technology

Elective

1. **Name of the Course:** Infectious Disease Modeling

2. **LTP structure of the course:** 2-1-1

3. **Objective of the course:** To expose the B. Tech./M. Tech/ PhD students to the mathematical techniques of nonlinear dynamics and to use those to analyze the dynamics of any population, particularly a population that has been infected by a contagious agent.

4. **Outcome of the course:** Students would be able to analyze and model the dynamics of an infectious disease, and would be able to forecast the infection rate etc. for a population. Further, students would be able to master the techniques of nonlinear dynamics that are widely used in engineering, physics, chemistry, biology etc.

5. Course Plan:

Components	Units	Topics for Coverage	Prerequisite
C1	Unit 1	Review of Linear ordinary differential equations (ODE) and introduction to nonlinear ODE. Vector fields and flows, One-Dimensional Flows, Flows on a line.	Exposure to ordinary differential equations.
	Unit 2	Bifurcations, two dimensional flows, linear systems, phase plane, limit cycles.	
C2	Unit 1	Logistic model, carrying capacity. Infectious diseases, SIR, SEIR, SIRD, SEIRD models.	
	Unit 2	Parameter calibration in infectious disease models. Simulating the models with real data.	

6. Text Book: Nonlinear Dynamics and Chaos: With Applications to Physics, Biology, Chemistry and Engineering by S. Strogatz, Taylor & Francis (1 January 2014).