# Kinetic Modeling ODE, SDE & Parameter Estimation — Hands-on

Learn how to formulate, simulate and calibrate kinetic models of biological systems using ordinary and stochastic differential equations. This module covers model setup, numerical solvers, parameter estimation, identifiability and uncertainty analysis with a focus on biologically interpretable, decision ready dynamic models.

## Kinetic Modeling ODE, SDE & Parameter Estimation

Help Desk · WhatsApp

**Session Index**



**Session 1**

**Fee: Rs 8800** Apply Now

### ODE Based Kinetic Modeling Fundamentals

Differential equations for biochemical reactions

**mass action kinetics** **Michaelis Menten style rates** **Hill functions and cooperativity**

Formulating ODE models from pathway diagrams

**state variables and parameters** **inputs and outputs** **conservation relationships**

Numerical integration and solver basics

time stepping and stiffness | common ODE solvers overview | basic stability intuition

Session 2

Fee: Rs 11800 Apply Now

## Stochastic Models, Noise and SDE Basics

Sources of noise in biological systems

intrinsic vs extrinsic noise | small copy number effects | stochastic switching intuition

Stochastic simulation and SDE overview

Gillespie style ideas | SDE formulation basics | Euler Maruyama concept

When to use deterministic vs stochastic models

scale and copy number | questions being answered | computational tradeoffs

Session 3

Fee: Rs 14800 Apply Now

## Parameter Estimation & Identifiability

Data for calibration and cost functions

time course and dose response data | least squares and likelihood views | data scaling and weighting

Optimization strategies for parameter fitting

gradient based and gradient free | local vs global search | practical tips for convergence

Identifiability, sensitivity and uncertainty basics

structural vs practical identifiability | local sensitivity

ideas confidence intervals overview

Session 4

Fee: Rs 18800 Apply Now

## Mini Capstone: Build & Calibrate a Kinetic Model

Select a small signaling or gene regulation motif and write equations

Theory plus guided practical

Fit parameters to synthetic or provided data and assess fit quality

optimization workflow diagnostic plots basic sensitivity and uncertainty checks

Deliverables: model code, plots and brief report

Python or R notebook time course and fit plots PDF or HTML summary