Systems Biology Foundations & Modeling Paradigms — Hands-on

Kickstart your journey into computational systems biology. Learn the core modeling paradigms (deterministic ODEs, stochastic SSA, rule-based), biochemical kinetics (mass-action, Hill), parameterization and basic verification & reporting with community standards (SBML/SBGN/COMBINE). You will implement small yet realistic pathway/GRN models using COPASI, CellDesigner and Python (Tellurium).

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Session Index

Session 1

Fee: Rs 8800 Apply Now

Systems Thinking & Math Foundations

Systems biology principles & modeling workflow

problem framing **scope & assumptions** **model diagramming**

Math preliminaries

linear algebra (vectors/matrices) **calculus & ODE**

basics phase portraits

Toolchain & standards

COPASI CellDesigner SBML / SBGN Python (Tellurium)

Session 2

Fee: Rs 11800 Apply Now

Deterministic Modeling (ODE) & Kinetics

Writing ODE models from reaction networks

mass-action Hill/Michaelis–Menten inhibition/activation

Simulation & analysis

time-course / steady state stability & Jacobian nondimensionalization

Practice

COPASI tasks deSolve/Tellurium sensitivity scans

Session 3

Fee: Rs 14800 Apply Now

Stochastic & Rule-Based Modeling

When to use stochastic models

intrinsic noise low copy numbers heterogeneity

Algorithms & tools

Gillespie SSA tau-leaping BioNetGen / Kappa

Basic parameter estimation & goodness-of-fit

least squares likelihood ideas profile scans

Session 4

Fee: Rs 18800 Apply Now

Mini Capstone: Build & Share a Model

From diagram to simulation: a small signaling/GRN model

Theory + Practical

Packaging & verification

export SBML/SBGN basic tests & sanity checks COMBINE-like bundle

Deliverables: notebook/report & model files

PDF/HTML .xml (SBML) / .sedml .cdml (CellDesigner) / .bngl