Systems Biology Foundations and Formalisms — Hands-on

Gain a solid foundations level understanding of systems biology as a discipline that connects genes, pathways and phenotypes through explicit models. Learn how to move from verbal mechanisms to mathematical formalisms and simulatable models that support decision making in research and development.

Systems Biology Foundations and Formalisms

Help Desk · WhatsApp

Session Index

Session 1

Fee: Rs 8800 Apply Now

Systems Thinking and Modeling Paradigms

What is systems biology and why modeling is needed

genes to pathways to phenotypes **top down vs bottom up** **mechanistic vs data driven**

Modeling paradigms in systems biology

logical and rule based **constraint based** **dynamic kinetic models**

Conceptual model building

storyboards and causal diagrams | states and flows | boundary and scope

Session 2

Fee: Rs 11800 Apply Now

Mathematical Formulations and Dynamics

From reactions to equations

mass action kinetics | Hill and Michaelis Menten forms | state variables and parameters

Deterministic and stochastic formalisms

ordinary differential equations ODE | stochastic differential equations SDE | when noise matters

Simulation ready formulations

initial conditions | time scales and units | numerical solvers overview

Session 3

Fee: Rs 14800 Apply Now

Network Structure, Feedback and Behavior

From pathways to interaction networks

nodes and edges | motifs and modules | feedback and feedforward loops

Qualitative system behavior

steady states and transients | switches and oscillations | robustness concepts

Introduction to model standards

SBML basics | SBGN and visual maps | model

repositories BioModels

Session 4

Fee: Rs 18800 Apply Now

Mini Capstone: Build a Simple Systems Model

Case study selection and problem framing

Theory plus guided practical

Implement a small SBML model and run simulations

use of open source tools parameter exploration basic sensitivity checks

Deliverables: model file, notebook and brief report

SBML model Python or R notebook PDF or HTML summary