

Synthetic Biology Circuit Design & In-Silico Prototyping — Hands-on

Learn how to design and evaluate synthetic gene circuits using computational tools before going to the bench. This module walks through design abstractions (promoters, RBS, coding sequences, terminators), logic gates and genetic toggles, modeling and simulation (deterministic and stochastic), and in silico design workflows that use SBOL, Cello and circuit modeling platforms. By the end, you will implement a small design–build–test–learn style pipeline with publication ready circuit diagrams and simulation outputs.

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Session Index

[Session 1 — Synthetic Biology Foundations & Circuit Abstractions](#) [Session 2 — Circuit Modeling, Dynamics & Simulation](#) [Session 3 — SBOL, Design Automation & In-Silico Prototyping](#) [Session 4 — Mini Capstone: Design–Build–Test–Learn In-Silico Circuit](#)

Session 1

Fee: Rs 8800 [Apply Now](#)

Synthetic Biology Foundations & Circuit Abstractions

Synthetic biology design abstractions

[promoters, RBS, CDS, terminators](#) [logic gates & switches](#) [oscillators & feedback motifs](#)

Circuit design principles

[insulation & composability](#) [retroactivity & load effects \(overview\)](#) [host context & chassis choice](#)

Toolchain & design workflow overview

[SBOL descriptions](#) [Cello & related tools \(overview\)](#)
[bench to model information flow](#)

Session 2

Fee: Rs 11800 [Apply Now](#)

Circuit Modeling, Dynamics & Simulation

From circuit diagrams to models

[Hill function based ODE models](#) [transcription and translation delays \(overview\)](#) [simple stochastic formulations](#)

Simulating circuit behavior

[switches, oscillators, logic gates](#) [input-output curves & thresholds](#) [noise & robustness checks](#)

Circuit modeling tools

[BioCRNpyler / Tellurium](#) [COPASI / iBioSim \(overview\)](#)
[Python / R simulation notebooks](#)

Session 3

Fee: Rs 14800 [Apply Now](#)

SBOL, Design Automation & In-Silico Prototyping

SBOL & standardization of circuit designs

[SBOL entities & relationships](#) [linking sequence & function](#) [libraries & repositories](#)

Logic synthesis & design automation

[specification to circuit mapping \(Cello style overview\)](#) [constraints & objective functions](#)

screening candidate designs

In-silico prototyping workflows

from SBOL to executable models automated
simulation pipelines ranking designs by performance

Session 4

Fee: Rs 18800 Apply Now

Mini Capstone: Design–Build–Test–Learn In-Silico Circuit

Case study: design a small genetic circuit in silico

Theory + Practical

Build & test loops in simulation

design variants & parameter sweeps performance
metrics & specification checks iterative refinement
of designs

Deliverables

PDF/HTML circuit design report SBOL files & model
notebooks environment.yml / requirements.txt