Genome-Scale Metabolic Models: Reconstruction & Curation (GEMs) — Hands-on

Learn the practical workflow to reconstruct, curate and quality control genome-scale metabolic models (GEMs) for microbes, cell lines and other organisms. Starting from genome annotation and pathway databases, you will generate draft networks, perform gap-filling, check mass and charge balance, ensure thermodynamic and structural consistency, and benchmark with MEMOTE and experimental data. The final output is a reusable, publication-grade GEM in SBML/COBRA format with full provenance.

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Session Index

Session 1

Fee: Rs 8800 Apply Now

Inputs, Annotation & Draft GEM Generation

Data & reference resources

genome annotation (Prokka, RAST) **BiGG / KEGG / MetaCyc** **ModelSEED & KBase**

Draft model generation workflows

ModelSEED pipeline | CarveMe / AuReMe | template-based reconstructions

Model structure & bookkeeping

compartments & transporters | GPR associations | naming & identifiers

Session 2

Fee: Rs 11800 Apply Now

Gap-Filling, Balancing & Thermodynamic Checks

Gap analysis & gap-filling strategies

blocked reactions & dead-end metabolites | topology-based gap-filling | condition specific gap-filling

Mass, charge & stoichiometric consistency

formula and charge checks | leaks & energy generating cycles | thermodynamic directions

Toolchain for curation

RAVEN / COBRA Toolbox | COBRApy diagnostics | MEMOTE scores

Session 3

Fee: Rs 14800 Apply Now

Validation, Contextualization & Versioning

Model validation against experiments

growth phenotypes | substrate utilization panels | gene essentiality screens

Context specific GEMs (overview)

tissue and environment specific models | expression constrained networks | basic integration workflows

Documentation, provenance & version control

metadata & changelogs **Git/GitHub for models** **FAIR sharing practices**

Session 4

Fee: Rs 18800 Apply Now

Mini Capstone: End-to-End GEM Reconstruction

Case study: reconstruct, curate & benchmark a GEM for a chosen organism

Theory + Practical

Quality control & packaging

final MEMOTE report **SBML/JSON/Matlab exports** **Escher map and README**

Deliverables

PDF/HTML report **.sbml / .json / .mat** **requirements.txt/environment.yml**