# Toxicity Pathway Mapping & Systems Toxicology — Hands-on

Learn how to connect molecular events and omics readouts to mechanistic toxicity pathways and adverse outcomes. This module introduces systems toxicology thinking, toxicity pathway mapping, omics driven safety signatures, and network based summaries that support mechanism of action hypotheses and risk assessment in pharma, chemical and environmental contexts.

## Toxicity Pathway Mapping & Systems Toxicology

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**Session Index**



**Session 1**

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### Systems Toxicology & AOP Foundations

Systems toxicology concepts and motivation

**mechanistic vs phenomenological toxicity** | **molecular initiating events (MIE)** | **toxicity pathways and key events**

Adverse outcome pathway (AOP) frameworks (concept level)

**MIE to key event to adverse outcome chain** | **levels of**

biological organisation | examples from liver and cardiac toxicity

Toolchain and resources for systems toxicology thinking

pathway and AOP style knowledge bases (concept only) | safety pharmacology data types overview | omics and in vitro assay readouts

Session 2

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## Toxicity Pathway Mapping & Omics Signatures

From omics signatures to toxicity pathways

differential expression and pathway enrichment | stress response and toxicity relevant pathways | tissue and cell context considerations

Mapping MIEs and key events onto pathway diagrams

connecting targets and pathways | marking key event nodes | highlighting activation and inhibition patterns

Implementation toolkit for toxicity pathway mapping workflows

R / Python based enrichment pipelines | pathway visualisation tools for toxicity context | linking omics tables to pathway diagrams

Session 3

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## Network & Pathway Analytics for Safety Assessment

Network views of toxicity pathways and key events

linking pathways into toxicity networks | node roles for MIEs and key events | bottlenecks and convergence points

Safety relevant analytics on toxicity networks (concept level)

**scoring pathways for activation strength** **comparing profiles across doses and compounds** **flagging potential risk signatures**

Implementation toolkit for toxicity network analytics

**R and Python network packages** **Cytoscape for toxicity pathway layouts** **tables and plots for safety readouts**

**Session 4**

**Fee: Rs 18800** Apply Now

## Mini Capstone: Mechanistic Toxicity Pathway Report

Build a toxicity pathway map for a compound or case study

**Theory + Practical**

Summarise MIEs, key events and plausible adverse outcomes

**network and pathway diagrams** **omics support for key events** **qualitative risk interpretation**

Deliverables: analysis notebook, toxicity pathway map & summary

**R or Python toxicity analysis notebook** **Cytoscape session / pathway exports** **PDF/HTML mechanistic toxicity report**