Module 1: Systems Biology of Disease and Therapeutics
+
This module explores the application of systems biology in the study of diseases and the development of therapeutic approaches, focusing on how systemic analysis can lead to better diagnostic and treatment strategies.

- Disease Modeling - constructing models of disease states to understand pathology and progression (systems pathology models, disease simulation software)
- Systems Pharmacology - studying drug actions and effects through the lens of systems biology (network pharmacology tools, simulation of drug interactions)
- Personalized Medicine - leveraging systems biology to tailor medical treatments to individual patients (genomic data analysis, patient-specific model adaptation)
- Case Studies in Therapeutic Development - examples of how systems biology has influenced the development of new therapies and drug regimens

Duration: 6 Weeks

Fee Structure: Rs 1,30,000

Module 2: Advanced Computational Techniques
+
This module covers advanced computational techniques that are essential for the analysis and interpretation of complex systems biology data, focusing on high-performance computing and algorithm development.

- High-Performance Computing (HPC) - using computational clusters to perform large-scale simulations and analyses (use of HPC environments, parallel computing)
- Advanced Algorithm Development - designing algorithms to handle complex, large-scale biological data sets (algorithm optimization, custom script development)
- Machine Learning Applications - applying machine learning techniques to predict and model biological behaviors and responses (neural networks, support vector machines)
- Dynamic Systems and Non-linear Analysis - techniques for analyzing dynamic and non-linear systems in biology (chaotic models, time-series analysis)

Duration: 8 Weeks

Fee Structure: Rs 1,30,000

Module 3: Synthetic Biology and Systems Design
+
This module examines the intersection of systems biology and synthetic biology, emphasizing the design, modeling, and construction of synthetic biological systems for practical applications.

- Foundations of Synthetic Biology - principles and methodologies for designing and building biological parts and systems
- Modeling Synthetic Networks - tools and techniques for modeling synthetic biological networks to predict their behavior (biocircuit simulation tools, genetic circuit design software)
- BioBrick Parts and Assembly - introduction to standard biological parts and methods for their assembly into functioning systems (Registry of Standard Biological Parts, DNA synthesis)
- Applications in Biotechnology and Medicine - exploring real-world applications of synthetic biology in developing new therapies and biotechnological innovations

Duration: 12 Weeks

Fee Structure: Rs 2,50,000

Module 4: Environmental Systems Biology
+
This module delves into the application of systems biology to environmental sciences, using systems approaches to study ecosystems, biodiversity, and the impacts of human activities on the environment.

- Systems Ecology - understanding the complex interactions within ecosystems through systems approaches (ecosystem modeling tools, landscape ecology software)
- Biodiversity and Conservation - using systems biology methods to study biodiversity and develop conservation strategies (genetic diversity analysis, habitat modeling)
- Environmental Impact Analysis - applying systems biology to assess and mitigate the impacts of environmental changes and human activities (environmental risk assessment tools, impact simulation software)
- Sustainable Practices - leveraging systems biology to promote sustainable environmental practices (life cycle analysis, resource management modeling)

Duration: 12 Weeks

Fee Structure: Rs 2,50,000

Module 5: Quantitative and Computational Pharmacology
+
This module addresses the application of systems biology techniques to pharmacology, enhancing

drug discovery and development through computational and quantitative methods.

- Drug Discovery and Development - introduction to the drug development pipeline and the role of computational models (in silico screening, ADMET prediction models)
- Pharmacokinetics/Pharmacodynamics (PK/PD) Modeling - using mathematical models to predict the absorption, distribution, metabolism, and excretion of drugs (software for PK/PD modeling)
- Drug Interaction Networks - analyzing the interaction between drugs and biological systems to predict efficacy and side effects (network analysis tools, pathway databases)
- Personalized Medicine - applying systems biology approaches to tailor treatments to individual genetic profiles (genomic data integration, patient-specific modeling software)

Duration: 12 Weeks

Fee Structure: Rs 2,50,000

Module 6: Advanced Topics in Systems Biology Research
+
This final module delves into specialized and emerging topics in systems biology, providing insights into the frontier of research and application in this dynamic field.

- Multi-scale Modeling - exploring models that integrate processes at various biological scales, from molecules to organisms (multi-scale simulation tools)
- Systems Neurobiology - applying systems biology methods to understand neural systems and brain function (neural network modeling software, connectomics tools)
- Integrative Cancer Systems Biology - using systems approaches to understand cancer complexity and heterogeneity (cancer genome databases, tumor modeling software)
- Emerging Technologies - overview of the latest technologies in genomics, proteomics, and data science impacting systems biology (next-generation sequencing platforms, AI in systems biology)

Duration: 12 Weeks

Fee Structure: Rs 3,00,000

Module 7: Systems Biology and Global Health Challenges
+
This module explores the role of systems biology in tackling global health challenges by integrating data across different scales and disciplines to develop more effective health interventions and policies.

- Epidemiological Modeling - using systems biology to model the spread and control of infectious diseases (epidemiological simulation tools)
- Nutritional Systems Biology - studying the interactions between nutrition, health, and disease at a systemic level (metabolic pathway analysis tools)
- Systems Vaccinology - applying systems approaches to optimize vaccine development and

response prediction (immune response modeling software)
- Public Health Informatics - integrating systems biology with public health data to improve disease prevention and health care responses (public health databases and analytical tools)

Duration: 12 Weeks

Fee Structure: Rs 3,00,000

Module 8: Ecological Systems Biology
+
This module integrates systems biology with ecological research, applying advanced modeling and computational techniques to study the interactions and dynamics within ecosystems.

- Modeling Ecosystem Dynamics - using computational models to simulate and analyze interactions within ecosystems (ecosystem modeling software, dynamic simulation tools)
- Conservation Systems Biology - applying systems biology approaches to conservation issues, including species preservation and habitat restoration (conservation genetics tools, landscape ecology models)
- Biodiversity and Ecosystem Health - using systems approaches to assess and monitor biodiversity and ecosystem health (biodiversity databases, remote sensing applications)
- Climate Change and Ecosystems - modeling the impact of climate change on ecosystems and exploring mitigation strategies (climate models, resilience analysis tools)

Duration: 14 Weeks

Fee Structure: Rs 3,00,000