Systems Biology - Web course

COURSE OUTLINE

Systems Biology- Fundamentals- gene expression paradigms - genetic switch in Lambda Phage -Noise-based Switches and Amplifiers for Gene Expression - Ecoli chemotaxis - genetic oscillators - Noise in Biochemical Systems-Quorum Sensing - Programmed Population Control by Cell-Cell Communication and Regulated Killing- Drosophila Development - Establishment of Developmental Precision and Proportions in the Early Drosophila embryo -Gene expression networks -Gene regulation at a single cell level-Transcription Networks basic concepts

COURSE DETAIL

Sl. No	Topics	Hours
1.	**Systems Biology – Fundamentals** • Overview of Gene Control –Working of Genetic Switches – Introductory Systems Biology The biochemical paradigm, genetic paradigm and the systems paradigm.	5
2.	**Kinetics** • Equilibrium Binding and Co-operativity -Michaelis-Menten Kinetics –identical and independent binding sites – Identical and interacting binding sites, non-interacting binding sites. • Genetic switch in Lambda Phage -Noise-based Switches and Amplifiers for Gene Expression. • Synthetic genetic switches –Ecoli chemotaxis – biological oscillators- genetic oscillators -The Origin and Consequences of Noise in Biochemical Systems.	15 6 4 5
3.	**Developmental Systems Biology** • Building an Organism Starting From a Single Cell -Quorum Sensing – Programmed Population Control by Cell-Cell Communication and Regulated Killing- Drosophila Development. • Establishment of Developmental Precision and Proportions in the Early Drosophila embryo.	8 5 3
4.	**Gene expression networks** • Gene regulation at a single cell level- Transcription Networks -basic concepts -coherent Feed Forward Loop (FFL) and delay gate -The incoherent FFL - Temporal order, Signaling networks and neuron circuits -Aspects of multi-stability in gene networks.	14

NP-TEL

NPTEL

http://nptel.iitm.ac.in

Biotechnology

Pre-requisites:

- Molecular Biology
- Mathematics

Additional Reading:

- MIT Courseware on Systems Biology
- Literature references

Coordinators:

Dr. M. Vijayalakshmi
School of Chemical & BiotechnologySASTRA University

	Total	42

References:

- Uri Alon, An Introduction to Systems Biology: Design Principles of Biological Circuits, Chapman & Hall/CRC Press, Mathematical and Computational Biology, 2nd edition, 2006.