3. *Theoretical Neuroscience: Computational and Mathematical Modeling of Neural Systems*, Peter Dayan and Larry Abbott, MIT Press, 2005.

Note: Examination scheme and mode shall be as prescribed by the Examination Branch, University of Delhi, from time to time.

DISCIPLINE SPECIFIC ELECTIVE COURSE (DSE):

CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE

Course title & Code	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the course (if any)
		Lecture	Tutorial	Practical/ Practice		
Systems Biology (DSE)	**4**	**1**	**0**	**3**	**12th Pass**	**Network Biology, Python**

Learning Objectives

This module is designed to:

- Develop an understanding of the biological equations and events as a whole and combines different streams of biosciences to get a bigger picture
- Explore cutting-edge technologies of biosciences to novel findings that travel to hitherto unexplored fields

Learning outcomes

After studying this course, the students will be able to:

- Comprehend biological networks and organization of biological systems
- Develop an understanding of designing simple organisms
- Perform biological data analysis, protein-protein interaction networks etc.

SYLLABUS

Unit I: Introduction to Systems Biology (9 hours)

Biological complexity, Biological circuits, Bio-physical properties of macromolecules, Biomolecular interaction analysis, Developmental biology, Data integration and hypothesis generation, Reversible reactions and feedback loops

Unit II: Network and Modelling (9 hours)

Transient networks, Behavioral networks, Cognitive and neural modelling, Memory and Learning, Neural models (vision, memory function, rhythm), Synapse and networks, Neural plasticity and computational learning, Artificial intelligence, Neural imaging

Practical components/Projects (90 hours)

Interaction studies

Biological complexity, biological circuits - Biophysical properties of macromolecules - Biomolecular interaction analysis

1. Building Gene Regulation/Interaction networks models.
2. Intercellular signalling network analysis using relevant software's and data bases.
3. Creating biological databases and software.
4. Small projects integrating different biological parameters.

Essential/recommended readings

1. *An Introduction to Systems Biology: Design Principles of Biological Circuits*, Uri Alon, Chapman & Hall
2. *Fundamentals of Computational Neuroscience*, Thomas Trappenberg, Oxford University edition, 2010.
3. *Handbook of Systems Biology: Concepts and Insights*, Marian Walhout, Marc Vidal, Job Dekker (Edited), Academic Press; 1 edition, 2012.