Course Code	BIO532
Course Name	Network Biology
Credits	4
Course Offered to	UG/PG
Course Description	The objective of this course is to provide introduction to network biology, an emerging interdisciplinary area which aims at graph theoretical modeling of biological complex systems and its applications. The student will be provided with conceptual understanding of complex networks and their application for modeling various biological systems. Through a combination of lectures, exercises, and assignments, the student is expected to achieve understanding of network biology.

Pre-requisites	
Pre-requisite (Mandatory)	Pre-requisite (Desirable)
	Knowledge of data structures, algorithms and programming (Desirable) Basic understanding of biology (Desirable)

*Please insert more rows if required

Post Conditions			
CO1	**CO2**	**CO3**	**CO4**
Students are able to explain basic concepts of complex networks.	Students are able to explain network models of biological systems (PPIN, GRN, RIG, Metabolic, Ecological and Brain Networks).	Students are able to interpret results from network analysis of biological systems.	Students are able to code and implement simple network models of biological systems.

Weekly Lecture Plan			
Week Number	**Lecture Topic**	**COs Met**	**Assignment/Labs/Tutorial**
1	Introduction to complex networks: History, Computational representation of networks, Applications in biology	CO1	4-5 hours (Exercises)
2	Introduction to systems biology and network models of biological systems	CO1, CO2	5-6 hours (Exercises)
3	Network metrics: Definitions, interpretations and application to biological networks	CO1, CO2	6-7 hours (Exercises+Assignment-1+Coding-1)
4	Protein-protein Interaction networks: Examples	CO2, CO3, CO4	4-5 hours (Exercises)
5	Small-world and scale-free networks: Biological implications	CO1, CO2, CO3, CO4	6-7 hours (Exercises+Assignment-2+Coding-2)
6	Modeling complex diseases as molecular networks	CO2, CO3, CO4	5-6 hours (Exercises)
7	Network metrics: Definitions, interpretations and application to biological networks	CO1, CO2, CO3	6-7 hours (Exercises+Assignment-3+Coding-3)
8	Gene Regulatory Networks	CO2, CO3, CO4	4-5 hours (Exercises)
9	Modularity, Hierarchy, Motifs and biological implications	CO2, CO3, CO4	6-7 hours (Exercises)+Mini Project

10	Residue Interaction Graph models of protein structures	CO2, CO3, CO4	6-7 hours (Exercises+Assignment-4)
11	Metabolic networks	CO2, CO3	6-7 hours (Exercises)
12	Ecological networks	CO2, CO3	6-7 hours (Exercises+Assignment-5)
13	Brain Networks	CO2, CO3, CO4	6-7 hours (Mini-Project Presentations)
*Please insert more rows if required			
Weekly Lab Plan			
Week Number	**Laboratory Exercise**	**COs Met**	**Platform (Hardware/Software)**

*Please insert more rows if required

Assessment Plan	
Type of Evaluation	% Contribution in Grade
Mid-Sem	25
Assignments	20
Coding Assignments	15
Mini-Project Presentation	15
End-Sem	25
*Please insert more row for other type of Evaluation	

Resource Material	
Type	**Title**
Textbook	The Structure of Complex Networks: Theory and Applications by Ernesto Estrada (Oxford University Press)
Textbook	Networks: An Introduction by M. E. J. Newman (Oxford University Press).