COURSE TITLE	**DATA ANALYSIS AND KNOWLEDGE GRAPH IN NETWORK BIOLOGY**
COURSE CODE	**01CB1507**
COURSE CREDITS	**2**

Objective:

1 The Cytoscape is a multi-platform open-source tool for visualising interaction networks and integrating them with annotations, multiomics profiles and other state data.

Course Outcomes: After completion of this course, student will be able to:

1 Apply network analysis tools/software for biological data visualization tasks.

2 Design protein-protein interaction networks and gene regulatory networks using network analysis tools.

3 Analyze biological network models using appropriate network analysis packages to interpret their functions.

4 Evaluate and select suitable algorithms for analyzing biological networks.

Pre-requisite of course: Basic knowledge of Computer

Teaching and Examination Scheme

Theory Hours	Tutorial Hours	Practical Hours	ESE	IA	CSE	Viva	Term Work
0	2	0	0	0	0	50	50

Contents : Unit	Topics	Contact Hours
Total Hours		

Suggested List of Experiments:

Contents : Unit	Topics	Contact Hours
1	**Module 1** To predict and visualize protein-protein interactions using a protein name with the help of the STRING database.	2
2	**Module 2** To predict and visualize protein-protein interactions using multiple protein names with the aid of the STRING database.	2
3	**Module 3** To retrieve gene expression data from the Gene Expression Omnibus (GEO) database and prepare it to visualize protein-protein interactions.	2

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Suggested List of Experiments:

Contents : Unit	Topics	Contact Hours
4	**Module 4** To import string results into Cystoscope and visualize the protein-protein interactions.	2
5	**Module 5** To identify hub genes using the CytoHubba plugin of Cytoscape.	2
6	**Module 6** To perform pathway analysis by visualizing the pathway using the KEGGScape plugin of Cytoscape.	2
7	**Module 7** To retrieve a protein-protein interaction data from the IntAct database.	2
8	**Module 8** To visualize the retrieved protein-protein interaction data of IntAct database using Cytoscape.	2
9	**Module 9** To explore BioGRID database and retrieve the genetic interaction data.	2
10	**Module 10** To filter the genetic interaction data retrieved from the BioGRID database and visualize it using Cytoscape.	2
11	**Module 11** To perform gene ontology (GO) annotation of genes using ClueGO tool of Cytoscape.	2
12	**Module 12** To create various types of plots using the CyPlot plugin of Cytoscape.	2
13	**Module 13** To create a protein-protein interaction file with the help of research paper.	4
14	**Module 14** To predict and visualize protein-protein interactions using single protein name with the aid of the STRING database.	2
Total Hours		**30**

Textbook :

1 Analyzing Network Data in Biology and Medicine, Natasa Przulj, Cambridge University Press,, 2019

2 Network Biology: Methods and Applications, G Cagney, Spinger Pubication, 2021

References:

1 Fundamentals of Network Biology, Fundamentals of Network Biology, Fundamentals of Network Biology, Fundamentals of Network Biology, WenJun Zhang, World Scientific Publication , 2018

Suggested Theory Distribution:

The suggested theory distribution as per Bloom's taxonomy is as follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process

Distribution of Theory for course delivery					
Remember / Knowledge	**Understand**	**Apply**	**Analyze**	**Evaluate**	**Higher order Thinking / Creative**
0.00	0.00	35.00	35.00	30.00	0.00

Instructional Method:

1. The course delivery method will depend upon the requirement of content and need of students. The teacher in addition to conventional teaching method by black board, may also use any of tools such as demonstration, role play, Quiz, brainstorming, MOOCs etc.
2. The internal evaluation will be done on the basis of continuous evaluation of students in the laboratory and class-room.
3. Practical examination will be conducted at the end of semester for evaluation of performance of students in laboratory.
4. Students will use supplementary resources such as online videos, NPTEL videos, ecourses, Virtual Laboratory.

Supplementary Resources:

1. https://cytoscape.org/

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