SRM UNIVERSITY
FACULTY OF ENGINEERING & TECHNOLOGY
DEPARTMENT OF BIOINFORMATICS

BI0500- APPLICATION OF MATLAB IN BIOINFORMATICS

LECTURE PLAN

SEMESTER: II, M. Tech

CODE: BI0500

Course: Application of MATLAB in Bioinformatics
Staff Handling: Dr. N. Rathankar
Total Hours: 45

LECTURE	TOPIC	LEARNING OUTCOME
1	Introduction to MATLAB: Arithmetic, trigonometric operators, date and calendar, whos operator	o **Using MATLAB**
2	Matrices and arrays in matlab, decision making statements	o **Basic constructs in MATLAB**
3	Graphics in matlab, plotting, exporting, basics plotting functions	o **Analyzing numerical data in MATLAB**
4	Data analysis: loading data, locating outliers, smoothing and filtering, basic statistics, 2D, 3D-Scatter plots, regression	
5		o **Basic programming constructs**
6	Basic control statements: if, else, switch, for loop, while lop, continue, break statements. Functions, handles, vectorization	o **Generating different kinds of plots and solving differential equations using MATLAB**
7		
8	Solutions for AX=B, solving differential equations, different types of solvers. Using symbolic math toolbox	
9	Bioinformatics toolbox: data formats, sequence analysis- basics	
10	Basic commands: nwalign, swalign, molviewer	o **Sequence analysis**
11	Microarrays: Fundamentals and examples	o **Microarray analysis**
12	Microarray toolbox basic commands: gprread, maimage, colormap, maskeddata	o **Mass spec data analysis**
13	Mass spectroscopy: Fundamentals and examples	o **Graph theory applications**
14	Mass spectroscopy basic commands: msnorm, msbackadj	
15	Graph Theory fundamentals: node, edge, strongly and weakly connected graphs	
16	Graph theory functions: Directed graph, unidirected graph, DAG and spanning tree	
17	MATLAB commands to use the above functions	
18	Gene Ontology: fundamentals.	o **Gene Ontology usage**

19	Basic commands in GO: classperf, crossvalind, knnclassify	o **Sequence analysis using Bioinformatics toolbox**
20	Sequence analysis: Fundamentals	
21	Basic Commands: seqconsensus, seqlogo, seqprofile, pdbplot	o **Data importing**
22	Importing data and deploying applications: load, cftool,	
23	Viewing data, Smoothing data, and data exclusion	o **Image processing applications**
24	Deploying applications from MATLAB	
25	Image processing: reading and displaying an image, image size variation, improving image contrast, digitizing the image	o **Filtering noise from the signal**
26	Basic commands: imread, histeq, imwrite, iminfo	
27	Understanding noise in images, noise removal, linear, median filtering, adaptive filtering	
28	Commands to alter signal to noise ratio	
29	Spatial transformation, gray scale, RGB scales	
30	Image registration, point mapping in detail with commands	
31	Introduction to simbiology: basics of GUI used to add elements in the compartment	o **Applications of Systems Biology**
32	Chemical kinetics, types and uses, PTMs	
33	Simulations, odes, conditions	o **Modeling tools used in systems biology**
34	Simulations, odes, conditions	
35	Systems approach to biology, advantages	o **Usage of SIMBIOLOGY toolbox in Systems Biology.**
36	Model building strategies	
37	Model analysis using SIMBIOLOGY	
38	Model validation strategies	
39	Model of the Yeast Heterotrimeric protein- GPCR molecule	o **Case studies used in SIMBIOLOGY**
40	Model conditions, simulations and analysis	
41	Explanation of kinetic laws	

TEXT BOOK
1. Edda Klipp, Ralf Herwig, *Systems Biology in Practice-Concepts, Implementation and Application*, Wiley VCH, I Edition, 2005.
2. MATLAB Bioinformatics, Simbiology, Mass spectroscopy Toolbox

REFERENCE BOOK
1. G. Alterovitz, M. F. Ramoni, *Systems Bioinformatics: An Engineering Case-Based Approach*,
2. Artech House, 2007.

3. 2. Semmlow, *Biosignal and Biomedical Image Processing,* Marcel Dekker, Inc., 2004.
4. 3. Hoppensteadt, Peskin, *Modeling and Simulation in Medicine and Life Sciences*, Springer, 2002.

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