



Department of Biotechnology		LP: BT22032 Rev. No: 00
B.E/B.Tech/M.E/M.Tech : <u>B.Tech</u> (Biotechnology) Regulation: 2022		Date: 04.07.24
PG Specialisation : -		
Sub. Code / Sub. Name : BT22032 –Programming for Computational Biotechnology Applications		
Unit : I		

Unit Syllabus: ESSENTIALS IN R PROGRAMMING

9 hrs

Introduction to the R language, operators, datatypes and R objects, vectors, lists, matrices, arrays, data frames, factors.

Objective: This unit aims to explore the fundamentals of R programming language.

Session No *	Topics to be covered	Ref	Teaching Aids
1	Introduction to the R language	TB1 – Ch.2; Pg. 11-36 TB1 – Ch.3; Pg. 37-78	LCD/BB/ Blended Learning
2	R operators	TB1 – Ch.6; Pg. 184-190	LCD/BB/ Blended Learning
3	R datatypes	TB1 – Ch.6; Pg. 139-236	LCD/BB/ Blended Learning
4	R objects	TB1 – Ch.5; Pg. 111-138	LCD/BB
5	R vectors, lists	TB1 – Ch.6; Pg.143-165	LCD/BB
6	R matrices	TB1 – Ch.6; Pg. 200-217	LCD/BB
7	R arrays	TB1 – Ch.6; Pg. 141-165 RB4 - Ch.5; Pg.18-25	LCD/BB
8	R dataframes	TB1 – Ch.6; Pg. 166-183 RB4 – Ch.6; Pg.27-29	LCD/BB
9	R factors	TB1 – Ch.6; Pg.166-183	LCD/BB
Content beyond syllabus covered (if any): -NIL-			

* Session duration: 50 minutes



Sub. Code / Sub. Name: BT22032 –Programming for Computational Biotechnology Applications

Unit : II

Unit Syllabus : R CONTROL STRUCTURES, GRAPHICS AND STATISTICS

9 hrs

Control structures, R graphics: plot, line, scatterplot, pie charts, bars, dataset, max and min, mean median mode, percentiles, DNA, RNA and Protein analysis.

Objective: This unit aims to gain knowledge in R control structures, graphics and statistics.

Session No *	Topics to be covered	Ref	Teaching Aids
10	R Control Structures: conditional	TB1 – Ch.8; Pg. 298-303 RB4-Ch.9; Pg. 39-40	LCD/BB
11	R Control Structures: Looping	TB1 – Ch.8; Pg. 298-303 RB4-Ch.9; Pg. 39-40	LCD/BB
12	R Graphics: plot, line, scatterplot	TB1-Ch.7; Pg. 237-252 RB4-Ch.12; Pg. 62-74	LCD/BB/Flipped Classroom
13	R pie charts, bars	TB1-Ch.7; Pg. 253-288 RB4-Ch.12; Pg. 62-74	LCD/BB/Flipped Classroom
14	R datasets	TB1-Ch.8; Pg. 289-297 RB4-Ch.7; Pg.292-295	LCD/BB
15	R max and min	TB1-Ch.6; Pg. 191-199	LCD/BB
16	R mean median mode	TB1-Ch.6; Pg. 191-199	LCD/BB
17	R percentiles, R DNA analysis	TB1-Ch.6; Pg. 191-199	LCD/BB
18	R RNA and Protein Analysis	TB1-Ch.4; Pg. 95-100	LCD/BB

Content beyond syllabus covered (if any): - NIL-

* Session duration: 50 mins



Sub. Code / Sub. Name: BT22032 –Programming for Computational Biotechnology Applications

Unit : III

Unit Syllabus : JAVA

9 hrs

Data types, Keywords, Modifiers, Variables, Constants, Operators and Separators, Control structures, String handling, Interfaces, Applets.

Objective: This unit provides information on Java programming

Session No *	Topics to be covered	Ref	Teaching Aids
19	Introduction to Java, Java Data types	TB3 – Ch.3; Pg. 33 -40 RB2- Ch.9; Pg.261-292	LCD/BB/Flipped classroom
20	Java Keywords	TB3- Ch.3; Pg.120	LCD/BB/Flipped classroom
21	Java Modifiers	TB3-Ch.13; Pg. 299	LCD/BB/Flipped classroom
22	Java constants	TB3- Ch.2; Pg. 15-32	LCD/BB/Flipped classroom
23	Java Operators and Separators	TB3- Ch.4; Pg. 57-76	LCD/BB/Flipped classroom
24	Java control structures - Conditional	TB3- Ch.5; Pg. 77-104 RB1 – Ch.5; Pg. 91-120	LCD/BB
25	Java control structures - Looping	TB3- Ch.5; Pg. 77-104 RB1 – Ch.5; Pg. 121-136	LCD/BB
26	Java String Handling	TB3- Ch.15; Pg. 359-384	LCD/BB
27	Java Interfaces, Applets	TB3-Ch.9; Pg.183- 204 TB3-Ch.21; Pg. 617-636 RB1-Ch.16; Pg.367-376	LCD/BB

Content beyond syllabus covered (if any): -NIL-

* Session duration: 50 mins



Sub. Code / Sub. Name: BT22032 –Programming for Computational Biotechnology Applications
Unit : IV

Unit Syllabus : BIOJAVA

9 hrs

DNATools, MotifTools, RNATools, DNA to RNA conversion, Translation of DNA sequence to protein sequence, calculate mass and isoelectric point, sequence I/O basics, parsing, remote PDB file access.

Objective: This unit helps to gain knowledge of applications of Java in Biojava programming.

Session No *	Topics to be covered	Ref	Teaching Aids
28	DNATools	RB-3; pg. 1-8 Lecture notes	LCD/BB
29	MotifTools	Lecture notes	LCD/BB
30	RNATools	Lecture notes	LCD/BB
31	DNA to RNA conversion	Lecture notes	LCD/BB
32	Translation of DNA sequence to protein sequence	Lecture notes	LCD/BB
33	Calculate mass and isoelectric point	Lecture notes	LCD/BB
34	Sequence I/O basics	Lecture notes	LCD/BB
35	Parsing	Lecture notes	LCD/BB
36	Remote PDB file access	Lecture notes	LCD/BB

Content beyond syllabus covered (if any): -NIL-

* Session duration: 50 mins



Sub. Code / Sub. Name: BT22032 –Programming for Computational Biotechnology Applications

Unit : V

Unit Syllabus : PERL

9 hrs

Features, Packages and Modules, Datatypes, Operators, Control structures, Subroutines, File handling, Counting the aminoacids in protein, Finding the motif in protein.

Objective: This unit provides knowledge in development of programming skills in PERL.

Session No *	Topics to be covered	Ref	Teaching Aids
37	Basics of PERL programming for Bioinformatics	TB-2; pg. 20-41, 74-85	BB/LCD/Blended Learning
38	Datatypes: Scalars and Collections-I	TB-2; pg. 49-54	BB/LCD/Blended Learning
39	Datatypes: Scalars and Collections-II	RB-2; pg. 86-90	BB/LCD/Blended Learning
40	Operators	TB-2; pg. 361-372	BB/LCD/Blended Learning
41	Program control flow constructs: Conditional	TB-2; pg. 72-98	LCD/BB
42	Program control flow constructs: Looping	TB-2; pg. 72-98	LCD/BB
43	Library functions: String specific functions	TB-2; pg. 42-71	LCD/BB
44	User defined functions	TB-2; pg. 104-123	LCD/BB
45	File handling	TB-2; pg. 86-90, 99-103	LCD/BB

Content beyond syllabus covered (if any):

* Session duration: 50 mins



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REFERENCES:

TEXT BOOK (TB):

- 1. John M. Chambers, Software for Data Analysis: Programming with R, Springer, 1st Ed, 2008.
- 2. James Tisdall, Beginning PERL for bioinformatics, O-Reilly, 1st Ed, 2001.
- 3. Herbert Schildt, Java- a beginner’s guide, Mcgraw Hill, 7th Ed, 2017.
- 4. Kaladhar, BioJava: a programming guide, Lap Lambert, 1st Ed, 2012.

REFERENCE BOOK (RB):

- 1. Barry burd, Java for Dummies, Wiley & Sons, 6th Ed, 2014.
- 2. Joshua Bloch, Effective Java, Addison-Wesley Professional, 3rd Ed, 2017.
- 3. Lafita A, Bliven S, Prlic A, Guzenko D, Rose PW, Bradley A, Pavan P, Myers-Turnbull D, Valasatava Y, Heuer M, Larson M. BioJava 5: A community driven open-source bioinformatics library. PLoS Computational Biology, 15(2): e1006791, 2019.
- 4. W.N.Venables, D.M.Smith, An Introduction to R, Notes on R: A Programming environment for Data Analysis and Graphics, 4th Ed, 2024.

BLENDED LEARNING & FLIPPED CLASSROOM VIDEOS

- 1. Basics of R programming - <https://youtu.be/gDhsvaC2R0U>
- 2. Practical demonstration using R - <https://youtu.be/VbExvYoxUFA>
- 3. Basics of PERL - <https://youtu.be/zgNQ0p2G74>
- 4. Practical demonstration using PERL - <https://youtu.be/7-88Ka3TIE>

	Prepared by	Approved by
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Date	04.07.2024	04.07.2024
Remarks *:		
Remarks *:		