SHAHEED BENAZIR BHUTTO WOMEN UNIVERSITY PESHAWAR
DEAPRTMENT OF BIOINFORMATICS

FOUR-YEARS CURRICULA FOR BS BIOINFORMATICS

STRUCTURE

S.NO	Categories	No. of courses Min- Max	Credit Hours Min- Max
1	Compulsory Requirement (No Choice)	9– 10	28 – 31
2	General Courses to be chosen from other departments	7 – 8	21 – 25
3	Discipline Specific Foundation Courses	9 – 10	30 – 34
4	Major Courses including research project / Internship	10 – 13	36– 42
5	Electives within the major	4 – 4	12 – 16
	TOTAL	**39-45**	**127-148**

Total numbers of Credit Hours	127-148
Duration	4 years
Semester Duration	16-18 weeks
Semesters	08
Course Load Per Semester	16-18 credit hours
Number of Courses Per Semester	4-6 (not more than 3 lab /practical courses)

LAYOUT

S.No	Compulsory Requirements (the student has no choice)	
	10 Courses	
	31 Credit Hours	
	Subject	**Credit Hours**
1.	English Comprehension	3
2.	Communication Skills	3
3.	Technical Report Writing	3
4.	Pak Studies	2
5.	Islamic Studies	2
6.	Basic Mathematics	3
7.	Computer fundamentals	4
8.	Chemistry	4
9.	Basic Cell Biology	4
10.	Basic Calculus	3
	*Deficiency Courses	
	Total Credit Hours	**31**

*Deficiency courses to be completed if needed

S.No	General Courses to be chosen from other Departments	
	7-8 Courses	
	21-25 Credit Hours	
	Subject	**Credit Hours**
1.	Programming Fundamentals	4
2.	Data Structure and Algorithms	4
3.	Object oriented programming	4
4.	Discrete Structures	3
5.	Database Management System	4
6.	Ethical and legal issues in Bioinformatics	2
7.	Probability & Biostatistics	4
	Total Credit Hours	**25**

S.No	Discipline Specific Foundation Courses	
	9-10 Courses	
	30-34 Credit Hours	
	Subject	**Credit Hours**
1.	Linear Algebra and Differential Equations	3
2.	Essentials of Genetics	3
3.	Bioinformatics I	3
4.	Bioinformatics II	4
5.	Biochemistry I	4
6.	Biochemistry II	4
7.	Molecular Biology	4
8.	Research Methodology	2
9.	System Biology	3
	Total Credit Hours	**30**

S.No	Major Courses including Research Project/Internship	
	10-13 Courses	
	36-42 Credit Hours	
	Subject	**Credit Hours**
1.	Bioinformatics Computing I	4
2.	Genomics	3
3.	Proteomics	3
4.	Graphics and Visualization	4
5.	Bioinformatics Computing II	4
6.	Artificial Intelligence	3
7.	Bioinformatics software Engineering	3
8.	Special topics in Bioinformatics	3
9.	Modeling and Simulation	3
10.	Research Project	6
	Total Credit Hours	**36**

S.No	Elective Courses within the major	
	4 Courses	
	12-16 Credit Hours	
	(Any four of the courses may be opted from the following elective courses)	
	Subjects	**Credit Hours**
1.	Elective I (Microbiology & Immunology)	4
2.	Elective II (Operating System)	4
3.	Elective III) (Modern Programming Languages)	4
4.	Elective IV (Molecular Phylogeny and Evolution)	3
	Total Credit Hours	**15**

S.No	List of Elective Courses
	(Any four of the courses may be opted from the following elective courses)
	Subjects
1.	Enzyme Kinetics
2.	Microarray Data Analysis
3.	Human Computer Interaction
4.	Nanotechnology
5.	Environmental Biotechnology
6.	Special Topics in Biochemistry
7.	Immuno-Informatics
8.	Microbial genomics and proteomics
9.	Protein-protein interaction
10.	Digital Image Processing
11.	Gene Mining
12.	Pattern recognition and matching
13.	Biophysics
14.	Modern programming languages
15.	Medical Image Processing
16.	Operating System
17.	Microbiology and Immunology
18.	Molecular Evolutionary Sequence Analysis
19.	Molecular Phylogeny and Evolution
20.	Drug Discovery and Development
21.	Computational Systems Biology
22.	Cheminformatics
23.	Biological Data Integration
24.	Whole Genome Expression Analysis and Biomarker Discovery
25.	Molecular Biology, Genetics, and Disease
26.	Structural and functional Bioinformatics
27.	R for Biomedical Informatics
28.	Bioinformatics Analysis
29.	Statistical Genetics

30.	Pharmacogenomics
31.	Advanced Computer Programming
32.	Advanced Database Systems
33.	Data Mining
34.	Bioinformatics Algorithms
35.	Bioinformatics Database Development.
36.	Network Biology
37.	Functional Genomics
38.	Methods in Protein Modeling
39.	Pharmacoinformatics
40.	Statistical Methods in Bioinformatics
41.	Designing & Analysis of algorithms.
42.	Epigenetics & Gene Regulation
43.	Protein Chemistry
44.	Microbial Genetics
45.	Molecular Oncology
46.	Introduction to Big Data

Note: *In addition to the above, the university can offer any elective which they feel necessary subject to the availability of resources.*

SHAHEED BENAZIR BHUTTO WOMEN UNIVERSITY PESHAWAR
SCHEME OF STUDIES OF BIOINFORMATICS 4-YEAR PROGRAM (SESSION- 2018)

Semester I

Course Code	Course Title	Credit Hrs

		Lectures	Lab
ENG-321	English comprehension	3	0
ISL-320	Islamic studies	2	0
	Basic Mathematics	3	0
CSC-300	Computer Fundamentals	3	1
BI-301	Chemistry	3	1
Deficiency Courses*			
Total Credit Hours		14	2

Semester II

Course Code	Course Title	Credit Hrs.	
		Lectures	**Lab**
ENG-322	Communication skills	3	0
	Pak Studies	2	0
CSC-302	Programming Fundamentals	3	1
	Basic Calculus	3	0
	Basic Cell Biology	3	1
Total Credit Hours		14	2

Semester III

Course Code	Course Title	Credit Hrs	
		Lectures	**Lab**
ENG-421	Technical Report writing	3	0
MTH-408	Linear Algebra and Differential Equation	3	0
	Biochemistry I	3	1
	Essential of Genetics	3	1
CSC-422	Data Structure and Algorithms	3	1
Total Credit Hours		15	3

Semester IV

Course Code	Course Title	Credit Hrs	
		Lectures	**Lab**
BI-411	Bioinformatics I	3	1
	Biochemistry II	3	1
	Molecular Biology	3	1
BI-401	Probability & Biostatistics	3	1
CSC-412	Object Oriented programming	3	1

	Total Credit Hours	14	4

Semester V

Course Code	Course Title	Credit Hrs	
		Lectures	**Lab**
CSC-304	Discrete Structures	3	0
BI-501	Research Methodology	2	0
CSC-524	Database Management System	3	1
BI-521	Bioinformatics II	3	1
BI-502	Ethical and Legal issues in Bioinformatics	2	0
	Genomics	3	0
Total Credit Hours		16	2

Semester VI

Course Code	Course Title	Credit Hrs	
		Lectures	**Lab**
BI-522	Bioinformatics Computing I	3	1
CSC-637	Modeling and Simulation	2	1
	Proteomics	3	0
CSC-525	Graphics and Visualization	3	1
BI-523	Special Topic in Bioinformatics	3	0
Total Credit Hours		14	3

Semester VII

Course Code	Course Title	Credit Hrs	
		Lectures	**Lab**
BI-621	Bioinformatics Computing II	3	0
BI-622	Bioinformatics Software Engineering	2	1
	Elective-I (Microbiology and immunology)	3	1
	Elective-II (Operating System)	3	1
	System Biology	3	0
Total Credit Hours		14	3

Semester VIII

Course Code	Course Title	Credit Hrs

		Lectures	Lab
CSC-543	Artificial Intelligence	3	1
	Elective-III (Modern Programming Languages)	3	0
	Elective-IV (Modern Phylogeny and Evolution)	3	0
BI-689	*Research Project	0	6
Total Credit Hours		09	7

*Research Project, worth of 06 credit hours is mandatory for all students.

The department is following the rules of HEC pertaining to the semester system, in content of courses, credit hours and examination.

Scheme of Studies for MS Program in Bioinformatics

Semester I and II

Note:
Students coming from computer and physical sciences background must take 1-2 courses from group A and may take at most one course from group B. Similarly, students coming from biological sciences background must take 1-2 courses from group B and may take at most one course from group A.

Students coming from bioinformatics background may take at most 1 course each from groups A and B.

Remaining credit hours for all students must be completed from group C.

A: <u>Students Coming From Biological Sciences Background</u>

Course Code	Semester 1 (Credit Hours)	Course Code	Semester 2 (Credit Hours)

Course Code	Courses	Credit Hours	Course Code	Courses	Credit Hours
***	Elective I From the List of Group B	3	***	Elective II From the List of Group B	3
BI-621	Advance Bioinformatics	3	BI-624	Computational Drug Design	3
BI-622	Genome Informatics	3	BI-625	Molecular Modeling & Simulation	3
BI-623	Protein Informatics	3	BI-626	Bioinformatics Scripting and Programming	3
Total Credit Hours		**12**	**Total Credit Hours**		**12**
Semester 3 & 4 (Credit Hours)					
BI-650	Research/Thesis			**6**	
	Total Credit Hours			**30**	

B: Students Coming From Computer Sciences Background

Course Code	Semester 1 (Credit Hours)		Course Code	Semester 2 (Credit Hours)	
	Courses	**Credit Hours**		**Courses**	**Credit Hours**
	Elective I From the List of Group A	3		Elective II From the List of Group A	3
BI-621	Advance Bioinformatics	3	BI-624	Computational Drug Design	3
BI-622	Genome Informatics	3	BI-625	Molecular Modeling & Simulation	3
BI-623	Protein Informatics	3	BI-626	Bioinformatics Scripting and Programming	3
Total Credit Hours		**12**	**Total Credit Hours**		**12**
Semester 3 & 4 (Credit Hours)					
BI-650	Research/Thesis			**6**	
	Total Credit Hours			**30**	

C: Students Coming From Bioinformatics Background

Course Code	Semester 1 (Credit Hours)		Course Code	Semester 2 (Credit Hours)	
	Courses	**Credit Hours**		**Courses**	**Credit Hours**
	Elective I From the List of Group A	3		Elective II From the List of Group B	3
BI-621	Advance Bioinformatics	3	BI-624	Computational Drug Design	3
BI-622	Genome Informatics	3	BI-625	Molecular Modeling & Simulation	3
BI-623	Protein Informatics	3	BI-626	Bioinformatics Scripting and Programming	3
Total Credit Hours		**12**	**Total Credit Hours**		**12**
Semester 3 & 4 (Credit Hours)					
	Research/Thesis		**6**		
BI-650	**Total Credit Hours**		**30**		

Note
In addition to the above, the universities can offer any other course in the respective groups according to their specialization.

Semester III and IV
Research Thesis (6 Credit Hours)

Research Project
1. Duration of the research project will be at least two regular semesters. An independent research topic chosen by the student and supervised by a full-time faculty member of the department is required for all students in M.S Bioinformatics.
2. The research work of each student will be reviewed periodically by the supervisor/head of department to ensure the objectives laid down for study are being met.
3. All students must present and defend their research work before the panel of examiners as per the rules of the university.