

DEPARTMENT OF BIOINFORMATICS AND BIOSCIENCES



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Department of Bioinformatics and Bioscience

BS Bioinformatics

Bioinformatics is one of the newest areas of biological sciences. Since the beginning of the 1990s, many laboratories are engaged to concentrate on full genome of several species such as bacteria, yeasts, mice, plant and humans. During these collaborative efforts enormous amounts of data are collected and stored in databases. Besides gathering all these data, it is necessary to compare these nucleotide or amino acid sequences to find similarities and differences. It is not convenient to compare the

sequences of several (thousand) nucleotides or amino acids sequences manually, several computational techniques were developed to approach this problem. In addition, these are less error-prone than a manual approach. Bioinformatics is all about using computing systems to store, manage, and analyze biological data and information.

Program Educational Objectives

- i. The graduates will contribute competently in the industry or research by applying requisite technical skills.
- ii. The graduates will demonstrate advancement in Bioinformatics profession by enhancing their knowledge and skills.
- iii. The graduates will demonstrate ethical values and contribute positively towards the society.

BI Graduate Attributes

- i. [Knowledge] An ability to apply knowledge of mathematics, science, computing fundamentals and bioinformatics specialization to the solution of complex bioinformatics problems.
- ii. [Problem Analysis] An ability to identify, formulate, research literature, analyze complex bioinformatics problems, reaching substantiated conclusions using first principles of mathematics, natural sciences and computer sciences.
- iii. [System Design] An ability to design solutions for complex bioinformatics problems and design systems, component or processes that meet specified needs while maintaining bioinformatics standards, cultural, societal, and environmental considerations.
- iv. [Investigation] An ability to investigate complex bioinformatics problems in a methodical

way including literature survey, design and development of systems, analysis and interpretation of computational and experimental data, and synthesis of information to derive valid conclusions.

- v. [Modern Tool Usage] An ability to create, select and apply appropriate techniques, resources, and modern IT tools, including prediction and modeling, to complex bioinformatics activities, with an understanding of the limitations.
- vi. [Impact Analysis] An ability to apply reasoning informed by contextual knowledge to assess societal, legal and cultural issues and the consequent responsibilities relevant to professional bioinformatics practice and solution to complex bioinformatics problems.
- vii. [Management Skills] An ability to demonstrate management skills and apply bioinformatics principles to one's own work, as a member and/or leader in a team, to manage projects in a multidisciplinary environment.
- viii. [Team Work] An ability to work effectively, as an individual or in a team, on multifaceted and /or multidisciplinary settings.
- ix. [Ethics] Apply ethical principles and commit to professional ethics and responsibilities and norms of bioinformatics practice.
- x. [Communication] An ability to communicate effectively, orally as well as in writing, on complex bioinformatics activities with the bioinformatics community and with society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

- xi. [Lifelong Learning] An ability to recognize importance of, and pursue lifelong learning in the broader context of innovation and technological developments.



BS Bioinformatics

1. Admission Requirements

- a Higher Secondary School Certificate or equivalent securing at least 45% marks in aggregate.
- b CUST Admission Test or NTS test.

2. Degree Requirements

Each candidate for the BS Bioinformatics degree is required to successfully earn 130 credit hours as per the following detail:

Area	Cr. Hrs.
(a) Core Courses	56
(b) Supporting Science Courses	34
(c) Elective Courses	09
(d) General Education	25
(e) Internship	0
(f) Community Service	0
(g) Project	6
Total	130

(a) Core Courses (56 Cr. Hrs.)

Course Title	Code	Cr. Hrs.
Cell Biology	BI 1113	3
Cell Biology Lab	BI 1111	1
Biochemistry	BI 2223	3
Biochemistry Lab	BI 2221	1
Microbiology and Immunology	BI 1133	3
Microbiology and Immunology lab	BI 1131	1
Protein Chemistry	BI 3513	3
Molecular Genetics	BI 2423	3
Molecular Genetics Lab	BI 2421	1
Biological Databases and Tools	BI 3723	3

Biological Databases and Tools Lab	BI 3721	1
Bio-ethics and Bio-safety	BI 3823	3
Comparative Anatomy	BI 3163	3
Introduction to Biotechnology	BI 3813	3
Biodiversity and Conservation	BI 2173	3
Biosystematics and Classification	BI 3193	3
Functional Genomics	BI 4523	3
Endocrinology	BI 3183	3
Animal and Plant Physiology	BI 2153	3
General Ecology	BI 1123	3
Evolutionary Biology	BI 3173	3
Developmental Biology	BI 2163	3

(b) Supporting Science Courses (34Cr. Hrs.)

Course Title	Code	Cr. Hrs.
Introduction to Programming	CSBI 1133	3
Introduction to Programming Lab	CSBI 1131	1
Chemistry	BI 2213	3
Basic Mathematics	MTBI 1003	3
Calculus-I	MTBI 1013	3
Statistical Methods in Biology	MTBI 2033	3
Biophysics	BI 2143	3
Object Oriented Programming	CSBI 1143	3
Object Oriented Programming Lab	CSBI 1141	1
Linear Algebra	MTBI 1033	3
Data Structures	CSBI 2143	3
Data Structures Lab	CSBI 2141	1

Introduction to Database systems	CSBI 2313	3
Introduction to Database systems Lab	CSBI 2311	1

(c) Elective Courses (9Cr. Hrs.)

Course Title	Code	Cr. Hrs.
Computational Biology	BI 4773	3
Software Engineering	CSBI 2223	3
Discrete Mathematics	MTBI 2053	3
Design and Analysis of Algorithm	CSBI 3163	3
Object oriented Analysis and Design	CSBI 3213	3
Introduction to Information Security and Forensics	CSBI 3713	3
Web Application Development	CSBI 3193	3
Web Application Development Lab	CSBI 3191	1
Advanced Computer Programming	CSBI 2153	3
Advanced Computer Programming Lab	CSBI 2151	1
Data Security and Cryptography	CSBI 3843	3
Malware Analysis	CSBI 4873	3
Web Security and Forensics	CSBI 4863	3
Artificial intelligence	CSBI 4813	3
Bioinformatics Algorithms	BI 4433	3
Recombinant DNA Technology	BI 3453	3
Public Health and Environment	BI 3343	3
Human Genetics	BI 3443	3
Microarray Data Analysis	BI 4743	3
Pharmacogenomics	BI 3463	3
Systems Biology	BI 4783	3
Differential Equation Modeling and Simulation	MTBI 4813	3

(d) General Education (25 Cr. Hrs.)

Course Title	Code	Cr. Hrs.
Pakistan Studies	HMBI1002	2
Islamic Studies / Ethics	HMBI1012	2
English-I	HMBI1013	3
English-II	HMBI1023	3
Technical Report Writing	HMBI2033	3
Humanities-I	HMBI2xx3	3
Humanities-II	HMBI2xx3	3
Management-I	HMBI4xx3	3
Management-II	HMBI4xx3	3

(e) Internship:

It is mandatory for every student to register in an 8 week summer internship program following their 6th semester or after the completion of 90 credit hours. A formal evaluation is carried out and Pass/Fail grade is awarded to the student.

(f) Community Service:

It is mandatory for every student to get involved

in 60 hours community service during summer (not allowed when student is registered for internship) following their 4th semester or after completion of 50 credit hours.

(g) Design Project:

A student may register final year project in the 7th semester of his/her degree program, or on the completion of 90 Cr. Hrs.

Course Title	Code	Cr. Hrs.
Design Project-I	BI 4912	2
Design Project-II	BI 4924	4

3. Program Duration

This is a four year degree program comprising of 8 semesters with minimum of 130 semester credit hours (Cr. Hrs.). There will be a Fall and

a Spring semester in each year. The summer session will be utilized for internships or deficiency courses. The maximum duration to complete BS is 7 years.

Scheme of Study

BS Bioinformatics Program

Semester-1 (16Cr. Hrs.)

Course Code	Course Title	Course Category	Lec Hrs.	Lab. Hrs.	Cr. Hrs.
BI 1113	Cell Biology	Core	3	0	3
BI 1111	Cell Biology Lab	Core	0	3	1
CSBI 1133	Introduction to Programming	Supporting Science	3	0	3
CSBI 1131	Introduction to Programming Lab	Supporting Science	0	3	1
MTBI 1003	Basic Mathematics	Supporting Science	3	0	3
HMBI 1013	English-I	General Education	3	0	3
HMBI 1002	Pakistan Studies	General Education	2	0	2

Semester-2 (18Cr. Hrs.)

Course Code	Course Title	Course Category	Lec Hrs.	Lab. Hrs.	Cr. Hrs.
BI 1123	General Ecology	Core	3	0	3
BI 1133	Microbiology and Immunology	Core	3	0	3
BI 1131	Microbiology and Immunology Lab	Core	0	3	1
MTBI 1013	Calculus-I	Supporting Science	3	0	3
BI 2213	Chemistry	Supporting Science	3	0	3
HMBI 1023	English-II	General Education	3	0	3
HMBI 1012	Islamic Studies / Ethics	General Education	2	0	2

Semester-3 (17Cr. Hrs.)

Course Code	Course Title	Course Category	Lec Hrs.	Lab. Hrs.	Cr. Hrs.
BI 2223	Biochemistry	Core	3	0	3
BI 2221	Biochemistry Lab	Core	0	3	1
BI 2153	Animal and Plant Physiology	Core	3	0	3
BI 2143	Biophysics	Core	3	0	3
HMBI 2033	Technical Report Writing	General Education	3	0	3
CSBI 1143	Object Oriented Programming	Supporting Science	3	0	3
CSBI 1141	Object Oriented Programming Lab	Supporting Science	0	3	1

Semester-4 (17Cr. Hrs.)

Course Code	Course Title	Course Category	Lec Hrs.	Lab. Hrs.	Cr. Hrs.
BI 2423	Molecular Genetics	Core	3	0	3
BI 2421	Molecular Genetics Lab	Core	0	3	1
BI 2173	Biodiversity and Conservation	Core	3	0	3
BI 2163	Developmental Biology	Core	3	0	3
MTBI 1033	Linear Algebra	Supporting Science	3	0	3
CSBI 2143	Data Structures	Supporting Science	3	0	3
CSBI 2141	Data Structures Lab	Supporting Science	0	3	1

Semester-5 (16Cr. Hrs.)

Course Code	Course Title	Course Category	Lec Hrs.	Lab. Hrs.	Cr. Hrs.
BI 3193	Biosystematics and Classification	Core	3	0	3
BI 3513	Protein Chemistry	Core	3	0	3

MTBI	2033	Statistical Methods in Biology	Supporting Science	3	0	3
CSBI	2313	Introduction to Database Systems	Supporting Science	3	0	3
CSBI	2311	Introduction Database Systems Lab	Supporting Science	0	3	1
HMBI	2xx3	Humanities -I	General Education	3	0	3

Semester-6 (19Cr. Hrs.)

Course Code	Course Title	Course Category	Lec Hrs.	Lab. Hrs.	Cr. Hrs.
BI	3163	Comparative Anatomy	3	0	3
BI	3173	Evolutionary Biology	3	0	3
BI	3723	Biological Databases and Tools	3	0	3
BI	3721	Biological Databases and Tools Lab	0	3	1
BI	3813	Introduction to Biotechnology	3	0	3
BI	3183	Endocrinology	3	0	3
CSBI	3xx3	Elective-I	3	0	3

Semester-7 (14Cr. Hrs.)

Course Code	Course Title	Course Category	Lec Hrs.	Lab. Hrs.	Cr. Hrs.
BI	3823	Bioethics and Biosafety	3	0	3
BI	4xx3	Elective- II	3	0	3
HMBI	2xx3	Humanities- II	3	0	3
HMBI	4xx3	Management- I	3	0	3
BI	4912	Project Part -I	0	6	2

Semester-8 (13Cr. Hrs.)

Course Code	Course Title	Course Category	Lec Hrs.	Lab. Hrs.	Cr. Hrs.
BI 4523	Functional Genomics	Core	3	0	3
CSBI 4xx3	Elective-III	Elective	3	0	3
HMBI 4xx3	Management-II	General Education	3	0	3
BI 4924	Project Part-II	Design Project	0	12	4
BI 4912	Project Part -I	Design Project	0	6	2



BS Biosciences

Program Educational Objectives

- i. The graduates will contribute competently in the industry by applying requisite technical skills.
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- iii. The graduates will demonstrate ethical values and contribute positively towards the society.

BS Graduate Attributes

- i. [Knowledge] An ability to apply fundamental and specialized knowledge of biosciences to the solution of complex biosciences problems.
- ii. [Hypothesis Formulation] An ability to identify, formulate, research literature, analyze complex biosciences problems, and reaching substantiated conclusions towards formulation of hypothesis using fundamental principles of biosciences.
- iii. [Experiment/Process Design] An ability to design experimental solutions to validate biosciences hypothesis, and design processes while maintaining biosciences standards, cultural, societal, and environmental considerations.
- iv. [Investigation] An ability to investigate complex issues related to biosciences in a methodical way including literature survey, analysis and interpretation of experimental data, and synthesis of information to draw conclusions.
- v. [Modern Tool Usage] An ability to create,

select and apply appropriate techniques, resources, and modern tools, including prediction and modeling, to complex biosciences activities, with an understanding of the limitations.

- vi. [Impact Analysis] An ability to apply reasoning informed by contextual knowledge to assess societal, legal and cultural issues and the consequent responsibilities relevant to professional biosciences practice and solution to complex biosciences problems.
- vii. [Management Skills] An ability to demonstrate management skills and apply biosciences principles to one's own work, as a member and/or leader in a team, to manage projects in a multidisciplinary environment.
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- xi. [Lifelong Learning] An ability to recognize importance of, and pursue lifelong learning in the broader context of innovation and technological developments.

BS Biosciences

1. Admission Requirements

- a. Higher Secondary School Certificate or equivalent securing at least 45% marks in aggregate.
- b. CUST Admission Test or NTS test.

2. Degree Requirements

Each candidate for the BS Biosciences degree is required to successfully earn 130 credit hours as per the following detail:

Area	Cr. Hrs.
(a) Core Courses	56
(b) Elective Courses	24
(c) Supporting Science Courses	19
(d) General Education	25
(e) Internship	0
(f) Community Service	0
(g) Project	6
Total	130

(a) Core Courses (56 Cr. Hrs.)

Course Title	Code	Cr. Hrs.
Cell Biology	BI 1113	3
Cell Biology Lab	BI 1111	1
Biochemistry	BI 2223	3
Biochemistry Lab	BI 2221	1
Microbiology and Immunology	BI 1133	3
Microbiology and Immunology Lab	BI 1131	1
Protein Chemistry	BI 3513	3
Molecular Genetics	BI 2423	3

Molecular Genetics Lab	BI 2421	1
Biological Databases and Tools	BI 3723	3
Biological Databases and Tools Lab	BI 3721	1
Bio-ethics and Bio-safety	BI 3823	3
Comparative Anatomy	BI 3163	3
Introduction to Biotechnology	BI 3813	3
Biodiversity and Conservation	BI 2173	3
Biosystematics and Classification	BI 3193	3
Functional Genomics	BI 4523	3
Endocrinology	BI 3183	3
Animal and Plant Physiology	BI 2153	3
General Ecology	BI 1123	3
Evolutionary Biology	BI 3173	3
Developmental Biology	BI 2163	3

(b) Elective Courses (24Cr. Hrs.)

Course Title	Code	Cr. Hrs.
Enzymology	BI 3533	3
Health Biotechnology	BI 3843	3
Recombinant DNA Technology	BI 3453	3
Agriculture Biotechnology	BI 3843	3
Public Health and Environment	BI 3343	3
Medical Microbiology	BI 3313	3
Principles of Breeding	BI 4723	3
Microbial Genetics	BI 3453	3
Human Genetics	BI 3443	3

Synthetic Biology	BI 4613	3
Mitochondrial Genetics	BI 4443	3
Microarray Data Analysis	BI 4743	3
Bioinformatics Algorithms	BI 4433	3
Pharmacogenomics	BI 3463	3
Machine Learning for Bioinformatics	BI 4763	3
Food Biotechnology	BI 4853	3
Cancer Biology	BI 4123	3
Chemoinformatics	BI 4733	3
Cancer Cytogenetics	BI 4133	3
Computational Biology	BI 4773	3
Systems Biology	BI 4783	3
Genetic Engineering	BI 4453	3
Virology	BI 3333	3
Applications of Biotechnology	BI 4863	3
Bio-nanotechnology	BI 4793	3
Clinical Biochemistry	BI 4213	3
Environmental Biotechnology	BI 4873	3
Environmental Law and Policy	BI 4623	3
Population Genetics	BI 4473	3
Molecular Immunology	BI 4113	3

(c) Supporting Science Courses (19 Cr. Hrs.)

Course Title	Code	Cr. Hrs.
Introduction to Programming	CSBI1133	3
Introduction to Programming Lab	CSBI1131	1

Chemistry	BI 2213	3
Basic Mathematics	MTBI 1003	3
Calculus-I	MTBI 1013	3
Statistical Methods in Biology	MTBI 2033	3
Biophysics	BI 2143	3

(d) General Education (25 Cr. Hrs.)

Course Title	Code	Cr. Hrs.
Pakistan Studies	HMBI 1002	2
Islamic Studies / Ethics	HMBI 1012	2
English-I	HMBI 1013	3
English-II	HMBI 1023	3
Technical Report Writing	HMBI 2033	3
Humanities-I	HMBI 2xx3	3
Humanities-II	HMBI 2xx3	3
Management-I	HMBI 4xx3	3
Management-II	HMBI 4xx3	3

(e) Internship:

It is mandatory for every student to register in an 8 week summer internship program following their 6th semester or after the completion of 90 credit hours. A formal evaluation is carried out and Pass/Fail grade is awarded to the student.

(f) Community Service:

It is mandatory for every student to get involved

in 60 hours community service during summer (not allowed when student is registered for internship) following their 4th semester or after completion of 50 credit hours.

(g) Project:

A student may register final year project in the 7th semester of his/her degree program, or on the completion of 90 Cr. Hrs.

Course Title	Code	Cr. Hrs.
Design Project-I	BS 4912	2
Design Project-II	BS 4924	4

3. Program Duration

This is a four year degree program comprising of 8 semesters with minimum of 130 semester credit hours (Cr. Hrs). There will be a Fall and

a Spring semester in each year. The summer session will be utilized for internships or deficiency courses. The maximum duration to complete BS is 7 years.



Scheme of Study

BS Biosciences Program

Semester-1 (16Cr. Hrs.)

Course Code	Course Title	Course Category	Lec Hrs.	Lab. Hrs.	Cr. Hrs.
BI 1113	Cell Biology	Core	3	0	3
BI 1111	Cell Biology Lab	Core	0	3	1
CSBI 1133	Introduction to Programming	Supporting Sciences	3	0	3
CSBI 1131	Introduction to Programming Lab	Supporting Sciences	0	3	1
MTBI 1003	Basic Mathematics	Supporting Sciences	3	0	3
HMBI 1013	English-I	General Education	3	0	3
HMBI 1002	Pakistan Studies	General Education	2	0	2

Semester-2 (18 Cr. Hrs.)

Course Code	Course Title	Course Category	Lec Hrs.	Lab. Hrs.	Cr. Hrs.
BI 1123	General Ecology	Core	3	0	3
BI 1133	Microbiology and Immunology	Core	3	0	3
BI 1131	Microbiology and Immunology Lab	Core	0	3	1
MTBI 1013	Calculus-I	Supporting Sciences	3	0	3
BI 2213	Chemistry	Supporting Sciences	3	0	3
HMBI 1023	English-II	General Education	3	0	3
HMBI 1012	Islamic Studies / Ethics	General Education	2	0	2

Semester-3 (16 Cr. Hrs.)

Course Code	Course Title	Course Category	Lec Hrs.	Lab. Hrs.	Cr. Hrs.
BI 2223	Biochemistry	Core	3	0	3
BI 2221	Biochemistry Lab	Core	0	3	1
BI 2153	Animal and Plant Physiology	Core	3	0	3
BI 2143	Biophysics	Supporting Sciences	3	0	3
HMBI 2033	Technical Report Writing	General Education	3	0	3
HMBI 2xx3	Humanities-I	General Education	3	0	3

Semester-4 (16 Cr. Hrs.)

Course Code	Course Title	Course Category	Lec Hrs.	Lab. Hrs.	Cr. Hrs.
BI 2423	Molecular Genetics	Core	3	0	3
BI 2421	Molecular Genetics Lab	Core	0	3	1
BI 2173	Biodiversity and Conservation	Core	3	0	3
BI 2163	Developmental Biology	Core	3	0	3
MTBI 2033	Statistical Methods in Biology	Supporting Science	3	0	3
HMBI 2xx3	Humanities-II	General Education	3	0	3

Semester-5 (18 Cr. Hrs.)

Course Code	Course Title	Course Category	Lec Hrs.	Lab. Hrs.	Cr. Hrs.
BI 3193	Biosystematics and Classification	Core	3	0	3
BI 3183	Endocrinology	Core	3	0	3
BI 3513	Protein Chemistry	Core	3	0	3

BI	3813	Introduction to Biotechnology	Core	3	0	3
BI	3xx3	Elective-I	Elective	3	0	3
BI	3xx3	Elective II	Elective	3	0	3

Semester-6 (19 Cr. Hrs.)

Course Code	Course Title	Course Category	Lec Hrs.	Lab. Hrs.	Cr. Hrs.
BI	3163	Comparative Anatomy	3	0	3
BI	3823	Bio-ethics and Bio-safety	3	0	3
BI	3723	Biological Databases and Tools	3	0	3
BI	3721	Biological Databases and Tools Lab	0	3	1
BI	3173	Evolutionary Biology	3	0	3
BI	3xx3	Elective-III	3	0	3
BI	3xx3	Elective-IV	3	0	3

Semester-7 (14 Cr. Hrs.)

Course Code	Course Title	Course Category	Lec Hrs.	Lab. Hrs.	Cr. Hrs.
BI	4523	Functional Genomics	3	0	3
BI	4xx3	Elective-V	3	0	3
BI	4xx3	Elective-VI	3	0	3
HMBI	4xx3	Management-I	3	0	3
BI	4912	Project Part-I	0	6	2

Semester-8 (13 wCr. Hrs.)

Course Code	Course Title	Course Category	Lec Hrs.	Lab. Hrs.	Cr. Hrs.
BI 4xx3	Elective-VII	Elective	3	0	3
BI 4xx3	Elective-VIII	Elective	3	0	3
HMBI 4xx3	Management-II	General Education	3	0	3
BI 4924	Project Part-II	Design Project	0	12	4



MS Bioinformatics

1. Admission Requirements

- A minimum of 16 years of education leading to BS Bioinformatics/ Computer Science/ M.Sc. B i o t e c h n o l o g y / Biological Sciences or equivalent².
- Minimum 2.00/4.00 CGPA or 50% marks
- Admission Test / HEC Approved Test

2. Degree Requirements

A student admitted in this program will have to complete the degree requirements by following any one of the options given below:

Area	Cr. Hrs.
(a) 24 Cr. Hrs course work with 6 Cr. Hrs thesis	30
(b) 27 Cr. Hrs course work with 3 Cr. Hrs project	30
(c) Course work only (10 Courses)	30

3. Core Courses

Students are required to qualify all the core courses listed below:

Course Title	Code	Cr. Hrs.
Data Mining	CSBI 5113	3
Advanced Analysis of Algorithms	CSBI 5123	3
Advanced Molecular Genetics	BI 5633	3
Advanced Bioinformatics	BI 5723	3

²Applicants with undergraduate degree from non-relevant areas may be required to take some undergraduate courses to fulfill pre-requisite deficiencies as determined by the Graduate Admission Committee. The deficiency Cr. Hrs. will not be counted towards the minimum Cr. Hrs. requirement for the award of the MS degree.

4. Elective Courses (12 Cr. Hrs

Students are required to qualify all the core courses listed below:

Course Title	Code	Cr. Hrs.
Advanced Endocrinology	BI 5763	3
Eukaryotic Regulatory Mechanisms	BI 5723	3
Drug Design and Development	BI 5213	3
Advanced Environmental Biotechnology	BI 5833	3
Advanced Protein Chemistry	BI 5523	3
Bioremediation and Biodegradation	BI 5843	3
Climate Change Adaptation and Mitigation	BI 5143	3
Advanced Systems Biology	BI 5513	3
Molecular Dynamics Simulation	BI 5773	3
Medical Genetics	BI 5423	3
Advanced Cancer Cytogenetics	BI 5413	3
Advanced Topics in Bioinformatics	BI 5153	3
Pathways and Networks in Biology	BI 6113	3
Protein Engineering and Enzyme Technology	BI 5513	3
Advanced Database Systems	CSBI 5363	3
Neural Computing and Genetics Algorithms	BI 5613	3
Advanced Medical Image Processing	BI 5783	3
Stochastic Processes	EEBI 5413	3
Visualization methods for Science and Engineering	BI 5823	3
Molecular Biophysics	BI 5663	3
Advanced Cancer Biology	BI 5683	3
Advanced Medical Entomology	BI 6123	3
Advanced Clinical Biochemistry	BI 5223	3

Advanced Microbial Genomics	BI 6413	3
Advanced Human Genetics	BI 5483	3
Gene Chip Technology	BI 6423	3
Advanced Nano-biotechnology	BI 6713	3
Advanced Forensic Biology	BI 5163	3
Medicinal Plants	BI 5623	3
Advanced Epidemiology	BI 6143	3
Sustainable Ecosystems	BI 5323	3
Climatology	BI 5333	3
Biosafety and Biosecurity	BI 6723	3

5. Research Thesis/Project

Course Title	Code	Cr. Hrs.
Research Thesis	BI 6916	6
Research Project	BI 6913	3

6. CGPA Requirement

A student is required to earn a minimum 3.00/4.00 CGPA on the completion of his degree requirements.

7. Program Duration

This is normally a two year degree program comprising 4 semesters. There will be a Fall and a Spring semester in each year. The maximum duration to complete MS in Bioinformatics is 4 years.



MS Biosciences

1. Admission Requirements

- A minimum of 16 years of education leading to BS Bioinformatics/ M.Sc. Biological Sciences or equivalent³.
- Minimum 2.00/4.00 CGPA or 50% marks
- Admission Test / HEC Approved Test

2. Degree Requirements

A student admitted in this program will have to complete the degree requirements by following any one of the options given below:

Area	Cr. Hrs.
a) 24 Cr. Hrs course work with 6 Cr. Hrs thesis	30
b) 27 Cr. Hrs course work with 3 Cr. Hrs project	30
c) Course work only (10 Courses)	30

3. Core Courses (12 Cr. Hrs)

Students are required to qualify all the core courses listed below:

Course Title	Code	Cr. Hrs.
Advanced Molecular Genetics	BI 5633	3
Advanced Bioinformatics	BI 5723	3
Applied Biotechnology	BI 5753	3

³Applicants with undergraduate degree from non-relevant areas may be required to take some undergraduate courses to fulfill pre-requisite deficiencies as determined by the Graduate Admission Committee. The deficiency Cr. Hrs. will not be counted towards the minimum Cr. Hrs. requirement for the award of the MS degree.

Students are required to take at least 12 Cr. Hrs. from the list of Elective Courses given below:

4. Elective Courses (12 Cr. Hrs)

Course Title	Code	Cr. Hrs.
Advanced Endocrinology	BI 5763	3
Eukaryotic Regulatory Mechanisms	BI 5723	3
Drug Design and Development	BI 5213	3
Advanced Environmental Biotechnology	BI 5833	3
Advanced Protein Chemistry	BI 5523	3
Bioremediation and Biodegradation	BI 5843	3
Climate Change Adaptation and Mitigation	BI 5143	3
Advanced Systems Biology	BI 5513	3
Molecular Dynamics Simulation	BI 5773	3
Medical Genetics	BI 5423	3
Advanced Cancer Cytogenetics	BI 5413	3
Advanced Topics in Bioinformatics	BI 5153	3
Pathways and Networks in Biology	BI 6113	3
Protein Engineering and Enzyme Technology	BI 5513	3
Molecular Biophysics	BI 5663	3
Advanced Cancer Biology	BI 5683	3
Advanced Medical Entomology	BI 6123	3
Advanced Clinical Biochemistry	BI 5223	3
Advanced Microbial Genomics	BI 6413	3
Advanced Human Genetics	BI 5483	3
Gene Chip Technology	BI 6423	3
Advanced Nano-biotechnology	BI 6713	3

Advanced Forensic Biology	BI 5163	3
Medicinal Plants	BI 5623	3
Advanced Epidemiology	BI 6143	3
Sustainable Ecosystems	BI 5323	3
Climatology	BI 5333	3
Biosafety and Biosecurity	BI 6723	3
Medicinal Plants	BI 5623	3
Advanced Epidemiology	BI 6143	3
Sustainable Ecosystems	BI 5323	3
Climatology	BI 5333	3
Biosafety and Biosecurity	BI 6723	3

5. Research Thesis/Project

Course Title	Code	Cr. Hrs.
Research Thesis	BI 6916	6
Research Project	BI 6913	3

6. CGPA Requirement

A student is required to earn a minimum 3.00/4.00 CGPA on the completion of his degree requirements.

7. Program Duration

This is normally a two year degree program comprising 4 semesters. There will be a Fall and a Spring semester in each year. The maximum duration to complete MS in Bio Sciences is 4 years.

PhD Bioinformatics

The department offers a thought-provoking, multidisciplinary atmosphere for advanced studies and research through its state-of-the-art lab facilities, including fully equipped wet lab, tissue culture lab, green house, and computer labs. We have experienced and highly qualified faculty with diverse international exposure and backgrounds in the basic sciences, applied sciences and computational sciences pursuing diverse teaching and research interests in bioinformatics discipline. We follow an interdisciplinary approach that executes cutting edge research in a wide range of areas including computational biology, systems biology, medical informatics, agri-informatics, computer aided drug designing, cancer cytogenetics, human genetics, molecular phylogeny and chemo-informatics. We have close research collaborations with various institutes and R&D organizations.

Admission Requirements

- MS degree in relevant discipline*
- Minimum CGPA 3.0/4.0 (Semester System) or 60% marks (Annual System)
- Admission Test / HEC approved Test
- Interview

Degree Requirements

A PhD candidate shall be awarded degree on successful completion of the following requirements:

- a) 18 Cr. Hrs. Course Work with CGPA > 3
- b) Comprehensive Examination (written and oral)
- c) 30 Cr. Hrs. Research Work
- d) Synopsis Defense
- e) Thesis Foreign Evaluation
- f) Publication/Acceptance of at least one research paper.
- g) Local Defense

PhD scholars are required to comply with the following timeline:

Activity	Preferred Time	Maximum
Course Work	2 Semesters	3 Semesters
Comprehensive Exam	3 Semesters	5 Semesters
Synopsis Qualification	4 Semesters	6 Semesters
Thesis Submission	6 Semesters	10 Semesters

* Relevancy shall be established by the Graduate Admission Committee.

