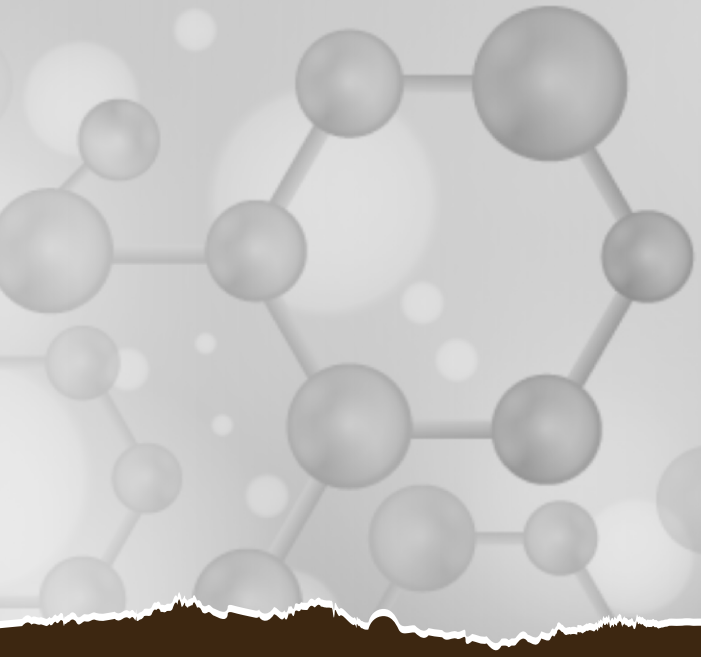
FACULTY OF HEALTH AND LIFE SCIENCES



The Faculty of Health and Life Sciences aims to produce professionals and researchers who are equipped with the knowledge and skills to meet the challenges of national and international trends. To achieve this objective, a team of highly qualified and dedicated faculty members is engaged. Life sciences deals with multiple scientific disciplines at molecular level of humans, animals, plants and microbes. Research in these domains led to the benefit of human health and environment. Based on this, along with interdisciplinary approaches, the Faculty envisions addressing the multifaceted challenges of the future. Therefore, academic programs are supported by well-equipped labs that strengthen the applied aspect of the domain. The Faculty has also established a strong liaison with research and development organizations and the industry. The Faculty comprises Department of Bioinformatics and Biosciences. The Department offers BS in Biotechnology, Microbiology and Biochemistry. MS and PhD programs in Biosciences with different specializations. Alumni of the faculty are playing dynamic roles in academia and research.

DEPARTMENT OF BIOINFORMATICS AND BIOSCIENCES

The Department promotes excellence in interdisciplinary biological research by encouraging independent and original work and training. Furthermore, to enhance the understanding of concepts and to have a hand-on experience, most of the courses are supported by lab and research based assignments. To accomplish this, the department has established state-of-the-art lab facilities, including fully equipped labs, tissue culture facility, green house and computer labs. The Department now offers BS programs in Biotechnology, Microbiology and Biochemistry as well as the graduate programs in Biosciences. 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. Biotechnology is the use of living organisms to create new products and processes. This field is an application of scientific and engineering principles to process materials by the use of biological agents to deliver goods and services. It is an applied science and has a great scope in medical, pharmaceutical, agricultural, food and environmental sciences. Microbiology is the study of microscopic organisms such as viruses, bacteria, algae, fungi, slime molds and protozoa. Microbiologists can pursue their careers in various fields such as agriculture, food, environment, industrial microbiology, public health, pharmaceuticals, resource management, and academia. Biochemistry is the study of structure and function of biomolecules as well as the cellular mechanisms associated with these biomolecules. Graduates in biochemistry can pursue their careers in various domains such as agriculture, public health, diagnostics, treatments, pharmaceuticals, management, and academia. A number of general courses in the area of humanities, social sciences, religion and ethics, health & physical education, languages and communication skills are made compulsory in order to provide the students with a social, psychological and religious understanding thereby ensuring a balanced personality.

BS Biotechnology

■ Program Educational Objectives (PEOs)

(i) The graduates will contribute competently in the industry related to biotechnology by applying requisite technical skills.

(ii) The graduates will demonstrate advancement in profession by enhancing their knowledge and skills in their relevant field.

(iii) The graduates will demonstrate commitment to ethical values and contribute positively towards the society.

■ Program Learning Outcomes (PLOs)

(i) **Knowledge:** An ability to apply fundamental and specialized knowledge of Biotechnology to the solution of complex biotechnological problems.

(ii) **Hypothesis Formulation:** An ability to identify, formulate, research literature, analyze complex biotechnology problems, reaching substantiated conclusions towards formulation of hypothesis using fundamental principles of biotechnology.

(iii) **Experiment/ Process Design:** An ability to design experimental solutions to validate biotechnology hypothesis and design process while maintaining biotechnology standards, cultural, societal, and environmental considerations.

(iv) **Investigation:** An ability to investigate complex issues in biotechnology in a methodical way including literature survey, and development of systems, analysis and interpretation of experimental data, and synthesis of information to derive valid conclusions.

(v) **Modern Tool Usage:** An ability to select and apply appropriate techniques, resources, and modern tools, including prediction and modeling, to complex biotechnology 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 biotechnology practice and solution to complex biotechnology problems.

(vii) **Management Skills:** An ability to demonstrate management skills and apply biotechnology 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 biotechnology practice.

(x) **Communication:** An ability to communicate effectively, orally as well as in writing, on complex biotechnology activities with the biotechnology 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.

Admission Requirements

(i) Higher Secondary School Certificate or equivalent securing atleast 45% marks in aggregate.

(ii) CUST Admission Test/HEC Approved Test.

Degree Requirements

The candidate for the BS Biotechnology degree is required to successfully earn 132 Cr. Hrs. as per the following details:

	Area	Cr. Hrs.
(a)	General Education	39
(b)	Distribution Requirement	18
(c)	Discipline Specific Requirement	-
	• Major Courses	54
	• Elective Courses	15
(d)	Design Project	06
(e)	Practical Lab Learning	00
(f)	Internship	00
(g)	Community Service	00
	Total	**132**

General Education (39 Cr. Hrs.)

Course Title	Code	Cr. Hrs.
Islamic Studies / Ethics	BBTG1013	3
English-I	BBTG1113	3
Introduction to Psychology	BBTG1213	3
Basic Mathematics	BBTG1313	3
Computing and Analytics	BBTG1413	3
Language-I	BBTG15x3	3
Pakistan Studies	BBTG1023	3
English-II	BBTG1123	3
Introduction to Sociology	BBTG1223	3
Calculus	BBTG1323	3
Statistical Methods in Biology	BBTG1423	3
Language-II	BBTG15x3	3
English-III	BBTG2133	3

■ Distribution Requirements (18 Cr. Hrs.)

Course Title	Code	Cr. Hrs.
Accounting-I	ACBS2003	3
Bioethics and Biosafety	BS3823	3
Introduction to Management	MGBS4003	3
Functional Genomics	BS4523	3
Machine Learning	CSBS4613	3
Introduction to Data Science	CSBS4883	3

■ Discipline Specific Requirements

a)–Major Courses (54 Cr. Hrs.)

Course Title	Code	Cr. Hrs.
Cell Biology	BS1113	3
Cell Biology Lab	BS1111	1
Introduction to Microbiology	BS1143	3
Introduction to Microbiology Lab	BS1141	1
Introduction to Immunology	BS1153	3
Introduction to Immunology Lab	BS1151	1
Biophysics	BS2143	3
Animal and Plant Physiology	BS2153	3
Chemistry	BS2213	3
Biochemistry	BS2223	3
Biochemistry Lab	BS2221	1
Molecular Genetics	BS2423	3
Molecular Genetics Lab	BS2421	1
Introduction to Bioinformatics	BS2713	3
Introduction to Bioinformatics Lab	BS2711	1

Microbial Biotechnology	BT3373	3
Industrial Biotechnology	BT3733	3
Introduction to Biotechnology	BS3813	3
Health Biotechnology	BT3843	3
Agriculture Biotechnology	BT3853	3
Genetic Engineering	BT4453	3
Environmental Biotechnology	BT4873	3

b)–Elective Courses (15 Cr. Hrs., Any Five)

Course Title	Code	Cr. Hrs.
Microbial Ecology	MB2323	3
Medical Microbiology	MB3313	3
Mycology	MB3353	3
Epidemiology	BS3363	3
Pharmacogenomics	BS3463	3
Water and Wastewater Treatment	BS3523	3
Tissue and Cell Culture	BS3713	3
Fungal Biotechnology	BS3743	3
Veterinary Microbiology	MB3783	3
Soil Microbiology	MB4323	3
Food Microbiology	MB4333	3
Environmental Law and Policy	BS4623	3
Nano Biotechnology	BS4793	3
Pharmaceutical Biotechnology	BS4843	3
Food Biotechnology	BS4853	3
Endocrinology	BS3183	3
Bio Entrepreneurship	BS4893	3
Gene Therapy	BS4463	3

■ Design Project (6 Cr. Hrs)

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

Course Title	Code	Cr. Hrs.
Design Project-I	BS4912	2
Design Project-II	BS4924	4

■ Practical Lab Learning (PLXXX0x0)

Each student is required to complete training spread over 4 semesters in one of the following:

a) Entrepreneurship (PLENX0x0)

b) Extracurricular Activities (PLSPX0x0)

c) Co-Curricular Activities (PLYCX0x0)

■ Internship (BS4200)

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

■ Community Service (VIS4000)

It is mandatory for every student to get involved in 65 hours community service during summer (not allowed when student is registered for internship) following their 4^{th} semester or after completion of 50 credit hours.

■ Program Duration

This is a four-year degree program comprising of 8 semesters with minimum of 135 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.

■ CGPA Requirement

A student is required to earn a minimum 2.00/4.00 CGPA on the completion of his/her degree requirements.

Note: Degree requirements may be modified from time to time as per the directions of the concerned regulatory body.

SCHEME OF STUDIES
BS Biotechnology Program

☐ Semester-I (18 Cr. Hrs.)

Course Code	Course Title	Category	Cr. Hrs.
BBTG1113	English-I	General (EN1)	3
BBTG1213	Introduction to Psychology	General (SS1)	3
BBTG1313	Basic Mathematics	General (NS1)	3
BBTG1413	Computing and Analytics	General (QR1)	3
BBTG15x3	Language-I	General (AH1)	3
BBTG1013	Islamic Studies/Ethics	General (CV1)	3

☐ Semester-II (18 Cr. Hrs)

Course Code	Course Title	Category	Cr. Hrs.
BBTG1123	English-II	General (EN2)	3
BBTG1223	Introduction to Sociology	General (SS2)	3
BBTG1323	Calculus	General (NS2)	3
BBTG1423	Statistical Methods in Biology	General (QR2)	3
BBTG15x3	Language-II	General (AH2)	3
BBTG1023	Pakistan Studies	General (CV2)	3

☐ Semester-III (18 Cr. Hrs)

Course Code	Course Title	Category	Cr. Hrs.
BBTG2133	English-III	General (EN3)	3
BS1113	Cell Biology	Major	3
BS1111	Cell Biology Lab	Major	1
BS1153	Introduction to Immunology	Major	3
BS1151	Introduction to Immunology Lab	Major	1
BS1143	Introduction to Microbiology	Major	3
BS1141	Introduction to Microbiology Lab	Major	1
ACBS2003	Accounting -I	Distribution	3

☐ **Semester-IV (18 Cr. Hrs)**

Course Code	Course Title	Category	Cr. Hrs.
BS2223	Biochemistry	Major	3
BS2221	Biochemistry Lab	Major	1
BS2423	Molecular Genetics	Major	3
BS2421	Molecular Genetics Lab	Major	1
BS2713	Introduction to Bioinformatics	Major	3
BS2711	Introduction to Bioinformatics Lab	Major	1
MGBS4003	Introduction to Management	Distribution	3
BS3823	Bioethics and Biosafety	Distribution	3

☐ **Semester-V (15 Cr. Hrs)**

Course Code	Course Title	Category	Cr. Hrs.
BS2143	Biophysics	Major	3
BS2213	Chemistry	Major	3
BT3373	Microbial Biotechnology	Major	3
BS2153	Animal and Plant Physiology	Major	3
CSBS4883	Introduction to data Science	Distribution	3
PLXX4010	Practical Learning Lab-I	Compulsory	0

☐ **Semester-VI (15 Cr. Hrs)**

Course Code	Course Title	Category	Cr. Hrs.
CSBS4613	Machine Learning	Distribution	3
BS4523	Functional Genomics	Distribution	3
BT3733	Industrial Biotechnology	Major	3
BS3183	Introduction to Biotechnology	Major	3
BT3853	Agriculture Biotechnology	Major	3
PLXX4020	Practical Learning Lab-II	Compulsory	0

☐ **Semester-VII (14 Cr. Hrs)**

Course Code	Course Title	Category	Cr. Hrs.
BT4873	Environmental Biotechnology	Major	3
BT3843	Health Biotechnology	Major	3
MB4323	Soil Microbiology	Elective	3
BS4793	Nano-Biotechnology	Elective	3
BS4912	Project Design-1	Project	2
PLXX4030	Practical Learning Lab-III	Compulsory	0

☐ **Semester-VIII (16 Cr. Hrs)**

Course Code	Course Title	Category	Cr. Hrs.
BT4453	Genetic Engineering	Major	3
BS3743	Fungal Biotechnology	Elective	3
BS3463	Pharmacogenomics	Elective	3
BS3523	Water and Wastewater Treatment	Elective	3
BS4924	Project Design-II	Project	4
PLXX4040	Practical Learning Lab-IV	Compulsory	0

BS Microbiology

■ Program Educational Objectives (PEOs)

(i) The graduates will contribute competently in the industry related to microbiology by applying requisite technical skills.

(ii) The graduates will demonstrate advancement in profession by enhancing their knowledge and skills in the related field.

(iii) The graduates will demonstrate commitment to ethical values and contribute positively towards the society.

■ Program Learning Outcomes (PLOs)

(i) **Knowledge:** An ability to apply fundamental and specialized knowledge of Microbiology to the solution of complex microbiology problems.

(ii) **Hypothesis Formulation:** An ability to identify, formulate, research literature, analyze complex microbiology problems, reaching substantiated conclusions towards formulation of hypothesis using fundamental principles of microbiology.

(iii) **Experiment/ Process Design:** An ability to design experimental solutions to validate microbiology hypothesis and design process while maintaining microbiology standards, cultural, societal, and environmental considerations.

(iv) **Investigation:** An ability to investigate complex issues in microbiology in a methodical way including literature survey, and development of systems, analysis and interpretation of experimental data, and synthesis of information to derive valid conclusions.

(v) **Modern Tool Usage:** An ability to select and apply appropriate techniques, resources, and modern tools, including prediction and modeling, to complex microbiology 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 microbiology practice and solution to complex microbiology problems.

(vii) **Management Skills:** An ability to demonstrate management skills and apply microbiology 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 microbiology practice.

(x) **Communication:** An ability to communicate effectively, orally as well as in writing, on complex microbiology activities with the microbiology 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.

Admission Requirements

(i) Higher Secondary School Certificate or equivalent securing at least 45% marks in aggregate.

(ii) CUST Admission Test/HEC Approved Test

Degree Requirements

Each candidate for the BS Microbiology is required to successfully earn 132 Cr. Hrs. as per the following details:

	Area	Cr. Hrs.
(a)	General Education	39
(b)	Distribution Requirement	18
(c)	Discipline Specific Requirement	-
	• Major Courses	54
	• Elective Courses	15
(d)	Design Project	06
(e)	Practical Lab Learning	00
(f)	Internship	00
(g)	Community Service	00
	Total	**132**

General Education (39 Cr. Hrs.)

Course Title	Code	Cr. Hrs.
Islamic Studies / Ethics	BMBG1013	3
English-I	BMBG1113	3
Introduction to Psychology	BMBG1213	3
Basic Mathematics	BMBG1313	3
Computing and Analytics	BMBG1413	3
Language-I	BMBG15x3	3
Pakistan Studies	BMBG1023	3
English-II	BMBG1123	3
Introduction to Sociology	BMBG1223	3
Calculus	BMBG1323	3
Statistical Methods in Biology	BMBG1423	3
Language-II	BMBG15x3	3
English-III	BMBG2133	3

■ Distribution Requirements (18 Cr. Hrs.)

Course Title	Code	Cr. Hrs.
Accounting-I	ACBS2003	3
Bioethics and Biosafety	BS3823	3
Introduction to Management	MGBS4003	3
Functional Genomics	BS4523	3
Machine Learning	CSBS4613	3
Introduction to Data Science	CSBS4883	3

■ Discipline Specific Requirements

a)–Major Courses (54 Cr. Hrs.)

Course Title	Code	Cr. Hrs.
Cell Biology	BS1113	3
Cell Biology Lab	BS1111	1
Introduction to Microbiology	BS1143	3
Introduction to Microbiology Lab	BS1141	1
Introduction to Immunology	BS1153	3
Introduction to Immunology Lab	BS1151	1
Biophysics	BS2143	3
Chemistry	BS2213	3
Biochemistry	BS2223	3
Biochemistry Lab	BS2221	1
Microbial Ecology	MB2323	3
Molecular Genetics	BS2423	3
Molecular Genetics Lab	BS2421	1
Introduction to Bioinformatics	BS2713	3
Introduction to Bioinformatics Lab	BS2711	1

Medical Microbiology	MB3313	3
Virology	MB3333	3
Mycology	MB3353	3
Microbial Genetics	MB3413	3
Introduction to Biotechnology	BS3813	3
Soil Microbiology	MB4323	3
Food Microbiology	MB4333	3

b)–Elective Courses (15 Cr. Hrs., Any Five)

Course Title	Code	Cr. Hrs.
General Ecology	BS2123	3
Biodiversity and Conservation	BS2173	3
Endocrinology	BS3183	3
Epidemiology	BS3363	3
Parasitology	MB3383	3
Pharmacogenomics	BS3463	3
Infection and Pathogenicity	MB3683	3
Industrial Biotechnology	BT3733	3
Fungal Biotechnology	BS3743	3
Veterinary Microbiology	MB3783	3
Health Biotechnology	BT3843	3
Agriculture Biotechnology	BT3853	3
Genetic Engineering	BT4453	3
Environmental Law and Policy	BS4623	3
Nano Biotechnology	BS4793	3
Food Biotechnology	BS4853	3
Statistical Methods for Genomic Research	MB4873	3
Bio Entrepreneurship	BS4893	3

■ Design Project (6 Cr.Hrs)

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

Course Title	Code	Cr. Hrs.
Design Project-I	BS4912	2
Design Project-II	BS4924	4

■ Practical Lab Learning (PLXXX0x0)

Each student is required to complete training spread over 4 semesters in one of the following:

a) Entrepreneurship (PLENX0x0)

b) Extracurricular Activities (PLSPX0x0)

c) Co-Curricular Activities (PLYCX0x0)

■ Internship (BI4200)

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

■ Community Service (VIS4000)

It is mandatory for every student to get involved in 65 hours community service during summer (not allowed when student is registered for internship) following their 4^{th} semester or after completion of 50 Cr.Hrs.

■ Program Duration

This is a four-year degree program comprising of 8 semesters with minimum of 135 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.

■ CGPA Requirement

A student is required to earn a minimum 2.00/4.00 CGPA on the completion of his/her degree requirements.

Note: Degree requirements may be modified from time to time as per the directions of the concerned regulatory body.

SCHEME OF STUDIES
BS Microbiology Program

☐ Semester-I (18 Cr. Hrs.)

Course Code	Course Title	Category	Cr. Hrs.
BMBG1113	English-I	General (EN1)	3
BMBG1213	Introduction to Psychology	General (SS1)	3
BMBG1313	Basic Mathematics	General (NS1)	3
BMBG1413	Computing and Analytics	General (QR1)	3
BMBG15x3	Language-I	General (AH1)	3
BMBG1013	Islamic Studies/Ethics	General (CV1)	3

☐ Semester-II (18 Cr. Hrs.)

Course Code	Course Title	Category	Cr. Hrs.
BMBG1123	English-II	General (EN2)	3
BMBG1223	Introduction to Sociology	General (SS2)	3
BMBG1323	Calculus	General (NS2)	3
BMBG1423	Statistical Methods in Biology	General (QR2)	3
BMBG15x3	Language-II	General (AH2)	3
BMBG1023	Pakistan Studies	General (CV2)	3

☐ Semester-III (18 Cr. Hrs.)

Course Code	Course Title	Category	Cr. Hrs.
BMBG2133	English-III	General (EN3)	3
BS1113	Cell Biology	Major	3
BS1111	Cell Biology Lab	Major	1
BS1153	Introduction to Immunology	Major	3
BS1151	Introduction to Immunology Lab	Major	1
BS1143	Introduction to Microbiology	Major	3
BS1141	Introduction to Microbiology Lab	Major	1
ACBS2003	Accounting-I	Distribution	3

☐ **Semester-IV (18 Cr. Hrs.)**

Course Code	Course Title	Category	Cr. Hrs.
BS2223	Biochemistry	Major	3
BS2221	Biochemistry Lab	Major	1
BS2423	Molecular Genetics	Major	3
BS2421	Molecular Genetics Lab	Major	1
BS2713	Introduction to Bioinformatics	Major	3
BS2711	Introduction to Bioinformatics Lab	Major	1
MGBS4003	Introduction to Management	Distribution	3
BS3823	Bioethics and Biosafety	Distribution	3

☐ **Semester-V (15 Cr. Hrs.)**

Course Code	Course Title	Category	Cr. Hrs.
BS2143	Biophysics	Major	3
BS2213	Chemistry	Major	3
MB2323	Microbial Ecology	Major	3
MB3333	Virology	Major	3
CSBS4883	Introduction to Data science	Distribution	3
PLXX4010	Practical Learning Lab-I	Compulsory	0

☐ **Semester-VI (15 Cr. Hrs.)**

Course Code	Course Title	Category	Cr. Hrs.
CSBS4613	Machine Learning	Distribution	3
MB3353	Mycology	Major	3
MB3413	Microbial Genetics	Major	3
BS3813	Introduction to Biotechnology	Major	3
BS4523	Functional Genomics	Distribution	3
PLXX4020	Practical Learning Lab-II	Compulsory	0

☐ **Semester-VII (14 Cr. Hrs.)**

Course Code	Course Title	Category	Cr. Hrs.
MB3313	Medical Microbiology	Major Course	3
MB4323	Soil Microbiology	Major	3
BS4793	Nano-Biotechnology	Elective	3
BS4853	Food Biotechnology	Elective	3
BS4912	Project Design-1	Project	2
PLXX4030	Practical Learning Lab-III	Compulsory	0

☐ **Semester-VIII (16 Cr. Hrs.)**

Course Code	Course Title	Category	Cr. Hrs.
MB4333	Food Microbiology	Major	3
MB3783	Veterinary Microbiology	Elective	3
BT3853	Agriculture Biotechnology	Elective	3
BS3363	Epidemiology	Elective	3
BS4924	Project Design-II	Project	4
PLXX4040	Practical Learning Lab-IV	Compulsory	0

BS Biochemistry

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(i) The graduates will contribute competently in the industry related to biochemistry by applying requisite technical skills.

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(iii) The graduates will demonstrate commitment to ethical values and contribute positively towards the society.

■ Program Learning Outcomes (PLOs)

(i) **Knowledge:** An ability to apply fundamental and specialized knowledge of biochemistry to the solution of complex biochemistry problems.

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(iv) **Investigation:** An ability to investigate complex issues in biochemistry in a methodical way including literature survey, and development of systems, analysis and interpretation of experimental data, and synthesis of information to derive valid conclusions.

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Degree Requirements

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	Area	Cr. Hrs.
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(b	Distribution Requirement	18
(c)	Discipline Specific Requirement	-
	• Major Courses	54
	• Elective Courses	15
(d)	Design Project	06
(e)	Practical Lab Learning	00
(f)	Internship	00
(g)	Community Service	00
	Total	**132**

General Education (39 Cr. Hrs.)

Course Title	Code	Cr. Hrs.
Islamic Studies/ Ethics	BBCG1013	3
English-I	BBCG1113	3
Introduction to Psychology	BBCG1213	3
Basic Mathematics	BBCG1313	3
Computing and Analytics	BBCG1413	3
Language-I	BBCG15X3	3
Pakistan Studies	BBCG1023	3
English-II	BBCG1123	3
Introduction to Sociology	BBCG1223	3
Calculus	BBCG1323	3
Statistical Methods in Biology	BBCG1423	3
Language-II	BBCG15X3	3
English-III	BBCG2133	3

■ Distribution Requirements (18 Cr. Hrs.)

Course Title	Code	Cr. Hrs.
Accounting-I	ACBS2003	3
Bioethics and Biosafety	BS3823	3
Introduction to Management	MGBS4003	3
Functional Genomics	BS4523	3
Machine Learning	CSBS4613	3
Introduction to Data Science	CSBS4883	3

■ Discipline Specific Requirements

a)–Major Courses (54 Cr. Hrs.)

Course Title	Code	Cr. Hrs.
Cell Biology	BS1113	3
Cell Biology Lab	BS1111	1
Introduction to Microbiology	BS1143	3
Introduction to Microbiology Lab	BS1141	1
Introduction to Immunology	BS1153	3
Introduction to Immunology Lab	BS1151	1
Chemistry	BS2213	3
Biochemistry	BS2223	3
Biochemistry Lab	BS2221	1
Molecular Genetics	BS2423	3
Molecular Genetics Lab	BS2421	1
Introduction to Bioinformatics	BS2713	3
Introduction to Bioinformatics Lab	BS2711	1
Human Physiology	BC3113	3
Enzymology	BC3133	3
Introduction to Biotechnology	BS3813	3
Bio-membrane and Signaling	BC3143	3
Clinical Biochemistry	BC3123	3

Clinical Biochemistry Lab	BC3121	1
Nutritional Biochemistry	BC3413	3
Nutritional Biochemistry Lab	BC3411	1
Environmental Biochemistry	BC3313	3
Plant Biochemistry	BC3213	3
Plant Biochemistry Lab	BC3211	1

b)–Elective Courses (15 Cr. Hrs., Any Five)

Course Title	Code	Cr. Hrs.
Cancer Biology	BC3153	3
Proteomics	BC3423	3
Cell and Tissue Culture	BC3223	3
Pharmacology	BC3163	3
Endocrinology	BS3183	3
Medical Microbiology	MB3313	3
Antimicrobials and Chemotherapeutics	BC4433	3
Virology	MB3333	3
Drug Development	BC4443	3
Neurochemistry	BC4453	3
Toxicology	BC4333	3
Water and Mineral Metabolism	BC4323	3

■ Design Project (6 Cr.Hrs)

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

Course Title	Code	Cr. Hrs.
Design Project-I	BS4912	2
Design Project-II	BS4924	4

■ Practical Lab Learning (PLXXX0x0)

Each student is required to complete training spread over 4 semesters in one of the following:

a) Entrepreneurship (PLENX0x0)

b) Extracurricular Activities (PLSPX0x0)

c) Co-Curricular Activities (PLYCX0x0)

■ Internship (BS4200)

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

■ Community Service (VIS4000)

It is mandatory for every student to get involved in 65 hours community service during summer (not allowed when student is registered for internship) following their 4^{th} semester or after completion of 50 Cr.Hrs.

■ Program Duration

This is a four-year degree program comprising of 8 semesters with minimum of 135 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.

■ CGPA Requirement

A student is required to earn a minimum 2.00/4.00 CGPA on the completion of his/her degree requirements.

Note: Degree requirements may be modified from time to time as per the directions of the concerned regulatory body.

SCHEME OF STUDIES
BS Biochemistry Program

☐ Semester-I (18 Cr. Hrs.)

Course Code	Course Title	Category	Cr. Hrs.
BBCG1113	English-I	General (EN1)	3
BBCG 1213	Introduction to Psychology	General (SS1)	3
BBCG 1313	Basic Mathematics	General (NS1)	3
BBCG 1413	Computing and Analytics	General (QR1)	3
BBCG 15x3	Language-I	General (AH1)	3
BBCG 1013	Islamic Studies/Ethics	General (CV1)	3

☐ Semester-II (18 Cr. Hrs.)

Course Code	Course Title	Category	Cr. Hrs.
BBCG1123	English-II	General (EN2)	3
BBCG1223	Introduction to Sociology	General (SS2)	3
BBCG1323	Calculus	General (NS2)	3
BBCG 423	Statistical Methods in Biology	General (QR2)	3
BBCG15x3	Language-II	General (AH2)	3
BBCG1023	Pakistan Studies	General (CV2)	3

☐ Semester-III (18 Cr. Hrs.)

Course Code	Course Title	Category	Cr. Hrs.
BBCG 2133	English-III	General (EN3)	3
BS1113	Cell Biology	Major	3
BS1111	Cell Biology Lab	Major	1
BS1153	Introduction to Immunology	Major	3
BS1151	Introduction to Immunology Lab	Major	1
BS1143	Introduction to Microbiology	Major	3
BS1141	Introduction to Microbiology Lab	Major	1
ACBS2003	Accounting-I	Distribution	3

☐ **Semester-IV (18 Cr. Hrs.)**

Course Code	Course Title	Category	Cr. Hrs.
BS2223	Biochemistry	Major	3
BS2221	Biochemistry Lab	Major	1
BS2423	Molecular Genetics	Major	3
BS2421	Molecular Genetics Lab	Major	1
BS2713	Introduction to Bioinformatics	Major	3
BS2711	Introduction to Bioinformatics Lab	Major	1
MGBS4003	Introduction to Management	Distribution	3
BS3823	Bioethics and Biosafety	Distribution	3

☐ **Semester-V (16 Cr. Hrs.)**

Course Code	Course Title	Category	Cr. Hrs.
BC3113	Human Physiology	Major	3
BC3133	Enzymology	Major	3
BS2213	Chemistry	Major	3
BC3123	Clinical Biochemistry	Major	3
BC3121	Clinical Biochemistry Lab	Major	1
CSBS4883	Introduction to Data Sciences	Distribution	3
PLXX4010	Practical Learning Lab-I	Compulsory	0

☐ **Semester-VI (16 Cr. Hrs.)**

Course Code	Course Title	Category	Cr. Hrs.
CSBS4613	Machine Learning	Distribution	3
BC3413	Nutritional Biochemistry	Major	3
BC3411	Nutritional Biochemistry Lab	Major	1
BS4523	Functional Genomics	Distribution	3
BC3143	Bio-membrane and Signaling	Major	3
BS3813	Introduction to Biotechnology	Major	3
PLXX4020	Practical Learning Lab-II	Compulsory	0

☐ **Semester-VII (15 Cr. Hrs.)**

Course Code	Course Title	Category	Cr. Hrs.
BC3153	Cancer Biology	Elective	3
BC3313	Environmental Biochemistry	Major	3
BC3213	Plant Biochemistry	Major	3
BC3211	Plant Biochemistry Lab	Major	1
MB3313	Medical Microbiology	Elective	3
BS4912	Project Design-1	Project	2
PLXX4030	Practical Learning Lab-III	Compulsory	0

☐ **Semester-VIII (13 Cr. Hrs.)**

Course Code	Course Title	Category	Cr. Hrs.
BC4333	Toxicology	Elective	3
BC3223	Cell and Tissue Culture	Elective	3
MB3333	Virology	Elective	3
BS4924	Project Design-II	Project	4
PLXX4040	Practical Learning Lab-IV	Compulsory	0

MS Biosciences

Admission Requirements

(i) A minimum of 16 years of education leading to BS Bioinformatics/M.Sc. Biotechnology/Biological Sciences or equivalent

(ii) Minimum 2.00/4.00 CGPA or 50% marks

(iii) Admission Test/HEC Approved Test

Degree Requirements

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

(i) 24 Cr. Hrs course work with 6 Cr. Hrs. Thesis

(ii) Course work only (10 Courses)

Core Courses (12 Cr. Hrs)

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

Course Title	Code	Cr. Hrs.
Advanced Molecular Genetics	BI5633	3
Advanced Bioinformatics	BI5753	3
Applied Biotechnology	BI5733	3
Advanced Microbiology and Immunology	BI5193	3

Elective Courses (12 Cr. Hrs)

Course Title	Code	Cr. Hrs.
Advanced Endocrinology	BI5763	3
Eukaryotic Regulatory Mechanisms	BI5723	3
Drug Design and Development	BI5213	3
Advanced Environmental Biotechnology	BI5833	3
Advanced Protein Chemistry	BI5523	3
Bioremediation and Biodegradation	BI5843	3
Climate Change Adaptation and Mitigation	BI5143	3
Advanced Systems Biology	BI5513	3
Molecular Dynamics Simulation	BI5773	3
Medical Genetics	BI5423	3
Advanced Cancer Cytogenetics	BI5413	3

Advanced Topics in Bioinformatics	BI5153	3
Pathways and Networks in Biology	BI6113	3
Protein Engineering and Enzyme Technology	BI5533	3
Molecular Biophysics	BI5663	3
Advanced Cancer Biology	BI5683	3
Advanced Medical Entomology	BI6123	3
Advanced Clinical Biochemistry	BI5223	3
Advanced Microbial Genomics	BI6413	3
Advanced Human Genetics	BI5483	3
Gene Chip Technology	BI6423	3
Advanced Nano-biotechnology	BI6713	3
Advanced Forensic Biology	BI5163	3
Medicinal Plants	BI5623	3
Advanced Epidemiology	BI6143	3
Sustainable Ecosystems	BI5323	3
Climatology	BI5333	3
Biosafety and Biosecurity	BI6723	3
Research Methodology	BS6823	3

Research Thesis

Course Title	Code	Cr. Hrs.
Research Thesis	BI6916	6

CGPA Requirement

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

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 Bioisciences is 4 years.

PhD Biosciences

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 biosciences 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

(i) MS/MPhil degree in relevant discipline

(ii) Minimum CGPA 3.0/4.0 (Semester System) or 60% marks (Annual System)

(iii) Admission Test/GAT General/HEC Test

(iv) Interview

Degree Requirements

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

(i) 18 Cr. Hrs. Course Work with minimum CGPA 3.00/4.00

(ii) Comprehensive Examination

(iii) 30 Cr. Hrs. Research Work

(iv) Synopsis Defense

(v) Dissertation Foreign Reviews

(vi) Publication of research paper(s) in HEC approved journal.

(vii) Dissertation Final Defense

Note: PhD scholars are required to comply with the following timeline:

Activity	Preferred Time	Maximum
Course Work	2 Semesters	3 Semesters
Comprehensive Exam	3 Semesters	6 Semesters
Synopsis Qualification	4 Semesters	6 Semesters
Thesis Submission	6 Semesters	12 Semesters