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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, Biochemistry and Medical Lab Technology along with 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, Biochemistry and Medical Lab Technology 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 135 Cr. Hrs. as per the following details:

Area	Cr. Hrs.
a) General Education	30
b) Major Courses	72
c) Allied Courses	12
d) Elective Courses	12
e) Final Year Project	06
f) Internship	03
Total	135

■ General Education (30 Cr. Hrs.)

Course Title	Code	Cr. Hrs.
Functional English	BBTG1113	3
Sociology	BBTG1412	2
Chemistry	BBTG1322	2
Chemistry Lab	BBTG1321	1
Basic Mathematics	BBTG1593	3
Ideology and Constitution of Pakistan	BBTG1022	2
English Literature	BBTG2222	2
Expository Writing	BBTG1123	3
Entrepreneurship	BBTG2712	2
Statistics	BBTG1563	3
Islamic Studies/Ethics	BBTG1012	2
Applications of Information and Communication Technologies	BBTG1612	2
Applications of Information and Communication Technologies Lab	BBTG1611	1
Civics and Professional Ethics	BBTG2812	2

■ Major Courses (72 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
Biochemistry	BS2223	3
Biochemistry Lab	BS2221	1
Molecular Biology	BS2523	3
Molecular Biology Lab	BS2521	1
Introduction to Genetics	BS2433	3
Introduction to Bioinformatics	BS2713	3
Introduction to Bioinformatics Lab	BS2711	1
Research Methods	BS3323	3
Microbial Biotechnology	BT3373	3
Protein Chemistry	BS3513	3
Industrial Biotechnology	BT3733	3
Tissue and Cell Culture	BS3713	3
Introduction to Biotechnology	BS3813	3
Bioethics and Biosafety	BS3823	3
Health Biotechnology	BT3843	3
Agriculture Biotechnology	BT3853	3
Genetic Engineering	BT4453	3
Functional Genomics	BS4523	3
Nano-Biotechnology	BS4793	3
Environmental Biotechnology	BT4873	3

■ Allied Courses (12 Cr. Hrs.)

Course Title	Code	Cr. Hrs.
Accounting-I	ACBS2003	3
Introduction to Management	MGBS4003	3
Programming for Biologists	CSBS2413	3
Artificial Intelligence in Biological Sciences	CSBS4623	3

■ Elective Courses (12 Cr. Hrs.)

Course Title	Code	Cr. Hrs.
Virology	MB3333	3
Mycology	MB3353	3
Food Microbiology	MB4333	3
Medical Microbiology	MB3313	3
Epidemiology	BS3363	3
Parasitology	MB3383	3
Microbial Genetics	MB3413	3
Soil Microbiology	MB4323	3
Enzymology	BC3133	3
Bio-Membrane and Signaling	BC3143	3
Environmental Biochemistry	BC3313	3
Toxicology	BC4333	3
Human Physiology	BC3113	3
Clinical Biochemistry	BC3123	3
Clinical Biochemistry Lab	BC3121	1
Plant Biochemistry	BC3213	3
Plant Biochemistry Lab	BC3211	1
Nutritional Biochemistry	BC3413	3
Nutritional Biochemistry Lab	BC3411	1

■ Internship (BS4203)

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.

Course Title	Code	Cr. Hrs.
Internship	BS4203	3

■ Community Service (VIS4000)

Each student is required to complete 65 hours community work, usually after 1st semester which would be a prerequisite to clear the student for the award of degree.

■ 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.



SCHEME OF STUDIES

BS Biotechnology Program

□ Semester-I (17 Cr. Hrs.)

Course Code	Course Title	Cr. Hrs.
BBTG1113	Functional English	3
BBTG1593	Basic Mathematics	3
BBTG1612	Applications of Information and Communication Technologies	2
BBTG1611	Applications of Information and Communication Technologies Lab	1
BBTG1412	Sociology	2
BBTG1012	Islamic Studies/Ethics	2
BS1113	Cell Biology	3
BS1111	Cell Biology Lab	1

□ Semester-II (18 Cr. Hrs)

Course Code	Course Title	Cr. Hrs.
BBTG1123	Expository Writing	3
BBTG1022	Ideology and Constitution of Pakistan	2
BBTG1563	Statistics	3
BBTG1322	Chemistry	2
BBTG1321	Chemistry Lab	1
BS1433	Introduction to Genetics	3
BS1143	Introduction to Microbiology	3
BS1141	Introduction to Microbiology Lab	1

□ Semester-III (18 Cr. Hrs)

Course Code	Course Title	Cr. Hrs.
CSBS2413	Programming for Biologist	3
BS2223	Biochemistry	3
BS2221	Biochemistry Lab	1
BS1153	Introduction to Immunology	3

BS1151	Introduction to Immunology Lab	1
BBTG2222	English Literature	2
BS2143	Biophysics	3
BBTG2712	Entrepreneurship	2

☐ **Semester-IV (16 Cr. Hrs)**

Course Code	Course Title	Cr. Hrs.
BS3813	Introduction to Biotechnology	3
BS2523	Molecular Biology	3
BS2521	Molecular Biology Lab.	1
BS2713	Introduction to Bioinformatics	3
BS2711	Introduction to Bioinformatics Lab	1
CSBS2413	Artificial Intelligence in Biological Sciences	3
BBTG 2812	Civics and Professional Ethics	2

☐ **Semester-V (18 Cr. Hrs)**

Course Code	Course Title	Cr. Hrs.
BGBS4003	Introduction to Management	3
BS3823	Bioethics and Biosafety	3
BS3513	Protein Chemistry	3
BS2153	Animal and Plant Physiology	3
BT3843	Health Biotechnology	3
BS3xx3	Elective-I	3

☐ **Semester-VI (15 Cr. Hrs)**

Course Code	Course Title	Cr. Hrs.
BS3323	Research Methods	3
BT3733	Industrial Biotechnology	3
BT3373	Microbial Biotechnology	3
BS3xx3	Elective-II	3
ACBS2003	Accounting 1	3

□ Semester-VII (14 Cr. Hrs)

Course Code	Course Title	Cr. Hrs.
BT3853	Agriculture Biotechnology	3
BT4453	Genetic Engineering	3
BS3713	Tissue and Cell Culture	3
BS3xx3	Elective-III	3
BS4912	Final Year Project-I	2

□ Semester-VIII (16 Cr. Hrs)

Course Code	Course Title	Cr. Hrs.
BS4523	Functional Genomics	3
BS4793	Nano-Biotechnology	3
BT4873	Environmental Biotechnology	3
BS3xx3	Elective-IV	3
BS4924	Final Year Project-II	4



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 135 Cr. Hrs. as per the following details:

Area	Cr. Hrs.
a) General Education	30
b) Major Courses	72
c) Allied Courses	12
d) Elective Courses	12
e) Final Year Project	06
f) Internship	03
Total	135

■ General Education (30 Cr. Hrs.)

Course Title	Code	Cr. Hrs.
Functional English	BMBG1113	3
Sociology	BMBG1412	2
Chemistry	BMBG1322	2
Chemistry Lab	BMBG1321	1
Basic Mathematics	BMBG1593	3
Ideology and Constitution of Pakistan	BMBG1022	2
English Literature	BMBG2222	2
Expository Writing	BMBG1123	3
Entrepreneurship	BMBG2712	2
Statistics	BMBG1563	3
Islamic Studies/Ethics	BMBG1012	2
Applications of Information and Communication Technologies	BMBG1612	2
Applications of Information and Communication Technologies Lab	BMBG1611	1
Civics and Professional Ethics	BMBG2812	2

■ Major Courses (72 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
Biochemistry	BS2223	3
Biochemistry Lab	BS2221	1
Microbial Ecology	MB2323	3
Molecular Biology	BS2523	3
Molecular Biology Lab	BS2521	1
Introduction to Genetics	BS2433	3
Introduction to Bioinformatics	BS2713	3
Introduction to Bioinformatics Lab	BS2711	1
Research Methods	BS3323	3
Medical Microbiology	MB3313	3
Virology	MB3333	3
Mycology	MB3353	3
Epidemiology	BS3363	3
Parasitology	MB3383	3
Microbial Genetics	MB3413	3
Protein Chemistry	BS3513	3
Introduction to Biotechnology	BS3813	3
Bioethics and Biosafety	BS3823	3
Food Microbiology	MB4333	3
Soil Microbiology	MB4323	3
Functional Genomics	BS4523	3

■ Allied Courses (12 Cr. Hrs.)

Course Title	Code	Cr. Hrs.
Accounting-I	ACBS2003	3
Introduction to Management	MGBS4003	3
Programming for Biologists	CSBS2413	3
Artificial Intelligence in Biological Sciences	CSBS4623	3

■ Elective Courses (12 Cr. Hrs.)

Course Title	Code	Cr. Hrs.
Microbial Biotechnology	BT3373	3
Industrial Biotechnology	BT3733	3
Health Biotechnology	BT3843	3
Agriculture Biotechnology	BT3853	3
Tissue and Cell Culture	BS3713	3
Genetic Engineering	BT4453	3
Nanobiotechnology	BS4793	3
Environmental Biotechnology	BT4873	3
Enzymology	BC3133	3
Bio-Membrane and Signaling	BC3143	3
Environmental Biochemistry	BC3313	3
Toxicology	BC4333	3
Human Physiology	BC3113	3
Clinical Biochemistry	BC3123	3
Clinical Biochemistry Lab	BC3121	1
Plant Biochemistry	BC3213	3
Plant Biochemistry Lab	BC3211	1
Nutritional Biochemistry	BC3413	3
Nutritional Biochemistry Lab	BC3411	1

■ Internship (BI4203)

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.

Course Title	Code	Cr. Hrs.
Internship	BS4203	3

■ Community Service (VIS4000)

Each student is required to complete 65 hours community work, usually after 1st semester which would be a prerequisite to clear the student for the award of degree.

■ 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.



SCHEME OF STUDIES

BS Microbiology Program

□ Semester-I (17 Cr. Hrs.)

Course Code	Course Title	Cr. Hrs.
BMBG 1113	Functional English	3
BMBG 1593	Basic Mathematics	3
BMBG1612	Applications of Information and Communication Technologies	2
BMBG1611	Applications of Information and Communication Technologies Lab	1
BMBG 1412	Sociology	2
BMBG 1012	Islamic Studies/Ethics	2
BS1113	Cell Biology	3
BS1111	Cell Biology Lab	1

□ Semester-II (18 Cr. Hrs.)

Course Code	Course Title	Cr. Hrs.
BMBG 1123	Expository Writing	3
BMBG 1022	Ideology and Constitution of Pakistan	2
BMBG1563	Statistics	3
BMBG1322	Chemistry	2
BMBG1321	Chemistry Lab	1
BS1433	Introduction to Genetics	3
BS1143	Introduction to Microbiology	3
BS1141	Introduction to Microbiology Lab	1

□ Semester-III (18 Cr. Hrs.)

Course Code	Course Title	Cr. Hrs.
CSBS2413	Programming for Biologist	3
BS2223	Biochemistry	3
BS2221	Biochemistry Lab	1
BS1153	Introduction to Immunology	3
BS1151	Introduction to Immunology Lab	1

BMBG2222	English Literature	2
BS2143	Biophysics	3
BMBG2712	Entrepreneurship	2

☐ **Semester-IV (16 Cr. Hrs.)**

Course Code	Course Title	Cr. Hrs.
BS3813	Introduction to Biotechnology	3
BS2523	Molecular Biology	3
BS2521	Molecular Biology Lab.	1
BS2713	Introduction to Bioinformatics	3
BS2711	Introduction to Bioinformatics Lab	1
CSBS2413	Artificial Intelligence in Biological Sciences	3
BMBG 2812	Civics and Professional Ethics	2

☐ **Semester-V (18 Cr. Hrs.)**

Course Code	Course Title	Cr. Hrs.
BGBS4003	Introduction to Management	3
BS3823	Bioethics and Biosafety	3
BS3513	Protein Chemistry	3
MB2323	Microbial Ecology	3
MB3313	Medical Microbiology	3
BS3xx3	Elective-I	3

☐ **Semester-VI (15 Cr. Hrs.)**

Course Code	Course Title	Cr. Hrs.
BS3323	Research Methods	3
MB3333	Virology	3
MB3353	Mycology	3
BS3xx3	Elective-II	3
ACBS2003	Accounting-I	3

□ **Semester-VII (14 Cr. Hrs.)**

Course Code	Course Title	Cr. Hrs.
BS3363	Epidemiology	3
MB3383	Parasitology	3
MB3413	Microbial Genetics	3
BS3xx3	Elective-III	3
BS4912	Final Year Project-I	2

□ **Semester-VIII (16 Cr. Hrs.)**

Course Code	Course Title	Cr. Hrs.
BS4523	Functional Genomics	3
MB4333	Food Microbiology	3
MB4323	Soil Microbiology	3
BS3xx3	Elective-IV	3
BS4924	Final Year Project-II	4



BS Biochemistry

■ Program Educational Objectives (PEOs)

- (i) The graduates will contribute competently in the industry related to biochemistry 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 biochemistry to the solution of complex biochemistry problems.
- (ii) **Hypothesis Formulation:** An ability to identify, formulate, research literature, analyze complex biochemistry problems, reaching substantiated conclusions towards formulation of hypothesis using fundamental principles of biochemistry.
- (iii) **Experiment/ Process Design:** An ability to design experimental solutions to validate biochemistry Hypothesis and design process while maintaining biochemistry standards, cultural, societal, and environmental considerations.
- (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.

- (v) **Modern Tool Usage:** An ability to select and apply appropriate techniques, resources, and modern tools, including prediction and modeling, to complex biochemistry activities, with an understanding of the limitations.
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- (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 biochemistry practice.
- (x) **Communication:** An ability to communicate effectively, orally as well as in writing, on complex biochemistry activities with the biochemistry 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 Biochemistry is required to successfully earn 135 Cr. Hrs. as per the following details:

Area	Cr. Hrs.
a) General Education	30
b) Major Courses	72
c) Allied Courses	12
d) Elective Courses	12
e) Final Year Project	06
f) Internship	03
Total	135

■ General Education (30 Cr. Hrs.)

Course Title	Code	Cr. Hrs.
Functional English	BBCG1113	3
Sociology	BBCG1412	2
Chemistry	BBCG1322	2
Chemistry Lab	BBCG1321	1
Basic Mathematics	BBCG1593	3
Ideology and Constitution of Pakistan	BBCG1022	2
English Literature	BBCG2222	2
Expository Writing	BBCG1123	3
Entrepreneurship	BBCG2712	2
Statistics	BBCG1563	3
Islamic Studies/Ethics	BBCG1012	2
Applications of Information and Communication Technologies	BBCG1612	2
Applications of Information and Communication Technologies Lab	BBCG1611	1
Civics and Professional Ethics	BBCG2812	2

■ Major Courses (72 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
Biochemistry	BS2223	3
Biochemistry Lab	BS2221	1
Molecular Biology	BS2523	3
Molecular Biology Lab	BS2521	1
Introduction to Genetics	BS2433	3
Introduction to Bioinformatics	BS2713	3
Introduction to Bioinformatics Lab	BS2711	1
Research Methods	BS3323	3
Human Physiology	BC3113	3
Clinical Biochemistry	BC3123	3
Clinical Biochemistry Lab	BC3121	1
Enzymology	BC3133	3
Bio-Membrane and Signaling	BC3143	3
Plant Biochemistry	BC3213	3
Plant Biochemistry Lab	BC3211	1
Environmental Biochemistry	BC3313	3
Nutritional Biochemistry	BC3413	3
Nutritional Biochemistry Lab	BC3411	1
Protein Chemistry	BS3513	3
Introduction to Biotechnology	BS3813	3
Bioethics and Biosafety	BS3823	3
Toxicology	BC4333	3
Functional Genomics	BS4523	3

■ Allied Courses (12 Cr. Hrs.)

Course Title	Code	Cr. Hrs.
Accounting-I	ACBS2003	3
Introduction to Management	MGBS4003	3
Programming for Biologists	CSBS2413	3
Artificial Intelligence in Biological Sciences	CSBS4623	3

■ Elective Courses (12 Cr. Hrs.)

Course Title	Code	Cr. Hrs.
Virology	MB3333	3
Mycology	MB3353	3
Food Microbiology	MB4333	3
Medical Microbiology	MB3313	3
Epidemiology	BS3363	3
Parasitology	MB3383	3
Microbial Genetics	MB3413	3
Soil Microbiology	MB4323	3
Microbial Biotechnology	BT3373	3
Industrial Biotechnology	BT3733	3
Health Biotechnology	BT3843	3
Agriculture Biotechnology	BT3853	3
Tissue and Cell Culture	BS3713	3
Genetic Engineering	BT4453	3
Nanobiotechnology	BS4793	3
Environmental Biotechnology	BT4873	3

■ Internship (BS4203)

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.

Course Title	Code	Cr. Hrs.
Internship	BS4203	3

■ Community Service (VIS4000)

Each student is required to complete 65 hours community work, usually after 1st semester which would be a prerequisite to clear the student for the award of degree.

■ Program Duration

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■ CGPA Requirement

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



SCHEME OF STUDIES

BS Biochemistry Program

□ Semester-I (17 Cr. Hrs.)

Course Code	Course Title	Cr. Hrs.
BBCG 1113	Functional English	3
BBCG 1593	Basic Mathematics	3
BBCG1612	Applications of Information and Communication Technologies	2
BBCG1611	Applications of Information and Communication Technologies Lab	1
BBCG 1412	Sociology	2
BBCG 1012	Islamic Studies/Ethics	2
BS1113	Cell Biology	3
BS1111	Cell Biology Lab	1

□ Semester-II (18 Cr. Hrs.)

Course Code	Course Title	Cr. Hrs.
BBCG 1123	Expository Writing	3
BBCG 1022	Ideology and Constitution of Pakistan	2
BBCG1563	Statistics	3
BBCG1322	Chemistry	2
BBCG1321	Chemistry Lab	1
BS1433	Introduction to Genetics	3
BS1143	Introduction to Microbiology	3
BS1141	Introduction to Microbiology Lab	1

□ Semester-III (18 Cr. Hrs.)

Course Code	Course Title	Cr. Hrs.
CSBS2413	Programming for Biologist	3
BS2223	Biochemistry	3
BS2221	Biochemistry Lab	1
BS1153	Introduction to Immunology	3

BS1151	Introduction to Immunology Lab	1
BBCG2222	English Literature	2
BS2143	Biophysics	3
BBCG2712	Entrepreneurship	2

☐ **Semester-IV (16 Cr. Hrs.)**

Course Code	Course Title	Cr. Hrs.
BS3813	Introduction to Biotechnology	3
BS2523	Molecular Biology	3
BS2521	Molecular Biology Lab.	1
BS2713	Introduction to Bioinformatics	3
BS2711	Introduction to Bioinformatics Lab	1
CSBS2413	Artificial Intelligence in Biological Sciences	3
BBCG 2812	Civics and Professional Ethics	2

☐ **Semester-V (15 Cr. Hrs.)**

Course Code	Course Title	Cr. Hrs.
BGBS4003	Introduction to Management	3
BS3823	Bioethics and Biosafety	3
BS3513	Protein Chemistry	3
BC3113	Human Physiology	3
BS3xx3	Elective-I	3

☐ **Semester-VI (16 Cr. Hrs.)**

Course Code	Course Title	Cr. Hrs.
BS3323	Research Methods	3
BC3143	Bio-Membrane and Signaling	3
BC3123	Clinical Biochemistry	3
BC3121	Clinical Biochemistry Lab	1
BS3xx3	Elective-II	3
ACBS2003	Accounting-I	3

□ **Semester-VII (15 Cr. Hrs.)**

Course Code	Course Title	Cr. Hrs.
BC3313	Environmental Biochemistry	3
BC3133	Enzymology	3
BC3213	Plant Biochemistry	3
BC3221	Plant Biochemistry Lab	1
BS3xx3	Elective-III	3
BS4912	Final Year Project-I	2

□ **Semester-VIII (17 Cr. Hrs.)**

Course Code	Course Title	Cr. Hrs.
BS4523	Functional Genomics	3
BC4333	Toxicology	3
BC3413	Nutritional Biochemistry	3
BC3411	Nutritional Biochemistry Lab	1
BS3xx3	Elective-IV	3
BS4924	Final Year Project-II	4



BS Medical Lab Technology

■ Program Educational Objectives (PEOs)

- (i) The graduate will contribute competently in the industry by applying requisite technical skills.
- (ii) The graduate will demonstrate advancement in biological profession by enhancing their knowledge and skills.
- (iii) The graduate will demonstrate ethical values and contribute positively towards the society.

■ Program Learning Outcomes (PLOs)

- (i) **Knowledge:** An ability to apply fundamental and specialized knowledge of medical sciences to the solution of complex health 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 medical technologies.
- (iii) **Experiment/ Process Design:** An ability to design experimental solutions to validate medical science hypothesis and design process while maintaining scientific standards, cultural, societal, and environmental considerations.
- (iv) **Investigation:** An ability to investigate complex issues related to health biology 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 biological 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 medical practice and solution to complex diagnostic problems.
- (vii) **Management Skills:** An ability to demonstrate management skills and apply scientific 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 biosciences practice.
- (x) **Communication:** An ability to communicate effectively, orally as well as in writing, on complex medical science activities with the biosciences 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 Medical Lab Technology is required to successfully earn 135 Cr. Hrs. as per the following details:

Area	Cr. Hrs.
a) General Education	30
b) Major Courses	72
c) Allied Courses	12
d) Elective Courses	12
e) Final Year Project	06
f) Internship	03
Total	135

■ General Education (30 Cr. Hrs.)

Course Title	Code	Cr. Hrs.
Functional English	MLTG1113	3
Sociology	MLTG1412	2
Chemistry	MLTG1322	2
Chemistry Lab	MLTG1321	1
Basic Mathematics	MLTG1593	3
Ideology and Constitution of Pakistan	MLTG1022	2
English Literature	MLTG2222	2
Expository Writing	MLTG1123	3
Entrepreneurship	MLTG2712	2
Statistics	MLTG1563	3
Islamic Studies/Ethics	MLTG1012	2
Applications of Information and Communication Technologies	MLTG1612	2
Applications of Information and Communication Technologies Lab	MLTG1611	1
Civics and Professional Ethics	MLTG2812	2

■ Major Courses (72 Cr. Hrs.)

Course Title	Code	Cr. Hrs.
Introduction to Microbiology	BS1143	3
Introduction to Microbiology Lab	BS1141	1
Introduction to Immunology	BS1153	3
Introduction to Immunology Lab	BS1151	1
Biochemistry	BS2223	3
Biochemistry Lab	BS2221	1
Research Methods	BS3323	3
Introduction to Genetics	BS2433	3
Molecular Biology	BS2523	3
Molecular Biology Lab	BS2521	1
Introduction to Bioinformatics	BS2713	3
Human Anatomy	MLT2613	3
Human Anatomy Lab	MLT2611	1
Clinical Biochemistry	MLT3123	3
Clinical Biochemistry Lab	MLT3121	1
Human Physiology	MLT3113	3
Human Physiology Lab	MLT3111	1
Medical Microbiology	MB3313	3
Parasitology	MB3383	3
Clinical Lab Management and Quality Control	MLT3623	3
General Pharmacology	MLT3633	3
Cytology and Histology	MLT3643	3
Serology	MLT3653	3
Serology Lab	MLT3651	1
Introduction to Biotechnology	BS3813	3
Bioethics and Biosafety	BS3823	3
Clinical Hematology	MLT4663	3
Clinical Hematology Lab	MLT4661	1
Blood Banking	MLT4653	3
Toxicology	MLT4633	3

■ Allied Courses (12 Cr. Hrs.)

Course Title	Code	Cr. Hrs.
Accounting-I	ACBS2003	3
Introduction to Management	MGBS4003	3
Programming for Biologists	CSBS2413	3
Artificial Intelligence in Biological Sciences	CSBS4623	3

■ Elective Courses (12 Cr. Hrs.)

Course Title	Code	Cr. Hrs.
Epidemiology	BS3363	3
Health Biotechnology	BT3843	3
Genetic Engineering	BT4453	3
Protein Chemistry	BS3513	3
Nanobiotechnology	BS4793	3

■ Internship (MLT4203)

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.

■ 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 4th 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.

SCHEME OF STUDIES

BS Medical Lab Technology Program

□ Semester-I (17 Cr. Hrs.)

Course Code	Course Title	Cr. Hrs.
MLTG1113	Functional English	3
MLTG1593	Basic Mathematics	3
MLTG1612	Applications of Information and Communication Technologies	2
MLTG1611	Applications of Information and Communication Technologies Lab	1
MLTG1412	Sociology	2
MLTG1012	Islamic Studies/Ethics	2
BS1143	Introduction to Microbiology	3
BS1141	Introduction to Microbiology Lab	1

□ Semester-II (18 Cr. Hrs.)

Course Code	Course Title	Cr. Hrs.
MLTG1123	Expository Writing	3
MLTG1022	Ideology and Constitution of Pakistan	2
MLTG1563	Statistics	3
MLTG1322	Chemistry	2
MLTG1321	Chemistry Lab	1
BS1433	Introduction to Genetics	3
BS1153	Introduction to Immunology	3
BS1151	Introduction to Immunology Lab	1

□ Semester-III (18 Cr. Hrs.)

Course Code	Course Title	Cr. Hrs.
CSBS2413	Programming for Biologist	3
BS2223	Biochemistry	3
BS2221	Biochemistry Lab	1
BS2523	Molecular Biology	3

BS2521	Molecular Biology Lab	1
MLTG1132	English Literature	2
BS2713	Introduction to Bioinformatics	3
MLTG2712	Entrepreneurship	2

☐ **Semester-IV (16 Cr. Hrs.)**

Course Code	Course Title	Cr. Hrs.
BS3813	Introduction to Biotechnology	3
MLT3613	Human Physiology	3
MLT3611	Human Physiology Lab	1
MLT3113	Human Anatomy	3
MLT3111	Human Anatomy Lab	1
CSBS2413	Artificial Intelligence in Biological Sciences	3
MLTG2812	Civics and Professional Ethics	2

☐ **Semester-V (15 Cr. Hrs.)**

Course Code	Course Title	Cr. Hrs.
MGBS4003	Introduction to Management	3
BS3823	Bioethics and Biosafety	3
MB3313	Medical Microbiology	3
MLT3623	Clinical Lab Management and Quality Control	3
BS3xx3	Elective-I	3

☐ **Semester-VI (16 Cr. Hrs.)**

Course Code	Course Title	Cr. Hrs.
BS3323	Research Methods	3
MLT3633	General Pharmacology	3
MLT3123	Clinical Biochemistry	3
MLT3121	Clinical Biochemistry Lab	1
BS3xx3	Elective-II	3
ACBS2003	Accounting-I	3

□ **Semester-VII (15 Cr. Hrs.)**

Course Code	Course Title	Cr. Hrs.
MLT3643	Cytology and Histology	3
BS3513	Protein Chemistry	3
MLT3653	Serology	3
MLT3651	Serology Lab	1
BS3xx3	Elective-III	3
BS4912	Project Design-I	2

□ **Semester-VIII (17 Cr. Hrs.)**

Course Code	Course Title	Cr. Hrs.
MLT4653	Blood Banking	3
MLT4633	Toxicology	3
MLT4663	Clinical Hematology	3
MLT4661	Clinical Hematology Lab	1
BS3xx3	Elective-IV	3
BS4924	Project Design-II	4





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

■ 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

■ 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) 30 Cr. Hrs. course work only (10 Courses)

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
Commercialization and Innovation	BI6813	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 Biois sciences 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 at least one research paper 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	5 Semesters
Synopsis Qualification	4 Semesters	6 Semesters
Thesis Submission	6 Semesters	12 Semesters