Department of Biotechnology
Lahore College for Women University, Lahore.

Self-Assessment Report
BS Program

Submitted to

Quality Enhancement Cell

Lahore College for Women University, Lahore

Task accomplished by:

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T A B L E O F C O N T E N T S

INTRODUCTION

Biotechnology is the application of biological organisms, system or process to produce substances or process useful to mankind. New and modern biotechnology grew out of advances in biological sciences such as genetics, microbiology, and biochemistry and information technology. Teaching and research in the field of biotechnology must be strengthened in Pakistan not only to assimilate the progress made in the world but also to undertake research for solving our own specific problems. This would be possible only by producing well-trained scientific manpower in our country. It is therefore urgently required that well- planned academic programmes in biotechnology are incorporated in our education system.

Realizing the importance of strengthening teaching and research in this field, Lahore College for Women University, Lahore has established a state of the art Biotech and Microbiology department to cater the challenges of 21st century. This department will hopefully help in producing well-trained professionals who shall be instrumental in establishing and developing this crucial science and technology in Pakistan. Therefore, a great deal of attention must be paid to human resources and infrastructure development.

Mission of the Department

During education in graduate and postgraduate level the focus of the study will be on following disciplines:

1) Agriculture Biotechnology
2) Industrial Biotechnology
3) Plant Genomics
4) Microbial fermentation and enzyme production
5) Forensic Biotechnology
6) Bioinformatics
7) Proteomics
8) Clinical Bacteriology and parasitology

The aim of this education will be to:

1) Train human resources particularly women in this advanced and challenging field
2) Develop skills which are definitely job oriented
3) Produce skills which can help in solving the problems.
4) Establish a forum for exchange of information on national and international level.

- To develop the scientific attitude and demonstrate professional skills in teaching, research and managerial positions in wide range of professions in national and international organizations.

  The core values of the department are:

  - ➡ Quality
  - ➡ Honesty and character building
  - ➡ Value Addition
  - ➡ Hard work

- Care
- Esteem
- Assurance
- Accountability
- Impartiality
- Transparency
- Conviction
- Team spirit

Teaching Methodology:

In all courses included make an excellent mix-match of various methods including lectures, practicals, seminars, assignments, workshops, tutorials and group discussions using audio-visual aids. The teaching culminates in developing the ability in students to collect, recognize and interpret the information through various sources like the library and the internet. This creates originality amongst students enabling them to work with gravity of purpose with sharp learning skills.

CRITERION 1: PROGRAM MISSION, OBJECTIVES AND OUTCOMES

Quality Policy of Department of Biotechnology:

Our aim is to achieve excellence through development of productive skills for biotechnology professionals/research scholars to handle multifarious challenging needs. To achieve this commitment, we focus on the integration of understanding of biological problems e.g. at the genetic, molecular, microbial and ecological levels of analysis. We continually improve the effectiveness of our quality management system through human resource development and active faculty/student participation.

Standard 1.1: The program must have documented measurable objectives that support Faculty / College and institution mission statements.

Name of Programs	Duration	No. of Modules	Total Credit Hrs
B.S. Biotechnology	4 years degree program	8 semesters (Course work + Research)	136

1.1: PROGRAM'S OBJECTIVES

1.1.1 BS Biotechnology (4 years degree Program)

Curriculum for the degree consists of HEC approved courses. In year 1 and 2 the students learn the basic, foundation and compulsory courses according to the weightage given by the HEC. These courses include i) Compulsory Courses, ii) Core Courses from Biotechnology, iii) Supporting Minor Courses from Botany, zoology and Chemistry iv)

Elective Courses e.g., Statistics, Psychology etc. In the final years the students study the advanced courses and work on research projects (Annexure I).

1.1.1.1 B.S. BIOTECHNOLOGY Program Objectives:

1. To impart knowledge about biotechnology through wide range of subjects related to natural sciences
2. To teach different methods of exploration, investigation, organization of data and its utilization in practical life with reference to biotechnology
3. To enable students to acquire knowledge base of facts about use of living systems and organisms to develop or make useful products and to develop or make useful products, their interaction with their internal and external environment and interdisciplinary relationship.
4. To prepare and train students for advanced studies and specialization in recently emerging technological and interdisciplinary fields such as plant biotechnology, cell and tissue culture, fermentation biotechnology, bioinformatics, molecular biology, biochemistry, proteomics and genomics. After completing the degree students will be able to apply knowledge to the respective fields and would go for consideration of the larger role of biology in society.

1.1.2 Strategies are based on:

i) Designing the program as per requirements of the students.
ii) Develop curriculum according to the need of the program.
iii) Regular revision of curriculum to keep them abreast with the national and international developments.
iv) Providing all resources including class room facilities, multimedia, computers, and properly equipped laboratories.
v) Updating the knowledge of teachers through workshops and training programs.
vi) Encouraging the establishment of linkages at national and international level.
vii) Establish liaison with the potential employers and provide economical consultancy services.
viii) Develop moral basis of the students to impart concept of teams, honesty and discipline through ethical attitudes.

1.1.3 Assessment of Educational Objectives of each Program:

Research degrees are assessed by the completion of an advanced research project. Taught courses are assessed through a combination of coursework and projects related to the study. The educational objectives of each program are regularly assessed as indicated in the Table below:

Table 1: BS Programs Objectives Assessment

OBJECTIVES (1)	HOW MEASURED (2)	WHEN MEASURED (FREQUENCY) (3)	IMPROVEMENT IDENTIFIED (4)	IMPROVEMENT MADE (CORRECTIVE & PREVENTIVE ACTION) (5)
As given in Para 1.1	1. Regular assessment of student knowledge and ability to exhibit the skill by the teacher:	Regular	1) Regularity of attendees required 2) Work based teaching 3) Improving writing skills especially in English 4) Course / curriculum revision to enhance outcomes and make it more work based 5) Enhancing communication skills 6) Guidance to student	1) Attendance rules applied more strictly 2) Teachers training and development 3) Student encouraged to enhance their writing skills 4) Student encouraged to join language courses 5) Course / curriculum revised 6) Students encouraged to attend the National and International workshops /Seminars /Conference
	i) Class tests	1 pre mid term		
	ii) Class exercises relating to problem	1 pre mid-term, 1 post mid term		
	iii) Presentation of relevant topic	Once in a semester		
	iv) Quizzes	As per course requirement		
	2. Written examination	Twice during each semester		
	3. Practical assignment in each modules	Once in a semester		
	4. Discussions	Once in a week		
	5. Research report final semester pertaining to practical problem	Once during program		
	6.Teaching/ Learning Process Survey (teachers' evaluation by the student)	Once in a semester	Shortcomings as per survey identified	Teachers are intimated the survey report who make effort to improve which is monitored in next survey
	7. Faculty Survey Form	Once in a semester	1) More time to be spent on the following during teaching: a) Case studies b) Presentation by students 2) Revision of program a) Personal developm	All the improvements identified have been implemented

			ent topic like ethic, moral & code of conduct b) Improvement in quality of Administrative support	
	8. Suggestion received from students	As and when received	1) Administrative and personal problems of students 2) Laboratory facilities	Complaints are addressed immediately
	9. Students / Quality Assurance Advisor liaison			
	New Introductions 1. Employer Surveys:	Once a year		-
	2. Alumni Survey:	Once a year		-
	3. Survey of Graduating Students:	Once a year		-
	4. Latest Research Student Progress Review	As per requirement	Regular Assistance from the concerned quarters	Support and the cooperation from other organizations as per requirement of the project.
	5. Faculty Resume	Once a year	1) Qualification 2) Training	1) Sent for higher studies 2) Internal and external training arranged

Standard 1.2: The program must have documented outcomes for graduating students. It must be demonstrated that the outcomes support the program objectives and that graduating students are capable of performing these outcomes.

1.2.1 BS Biotechnology Program's Outcomes:

1. Use of the scientific methods and experimental designs for problem solving.
2. Ability to develop hypothesis, formulate appropriate test, observe and acquire results, critically discuss the results and make conclusions.
3. Critical thinking skills in the analysis of data and hypothesis involving logical reasoning and statistical analysis.

4. Knowledge about the diversity and importance of use of living systems and organisms to develop or make useful products, their interaction with their internal and external environment and interdisciplinary relationship.

Table 2: BS Program Outcomes

Program Objectives	Program Outcomes			
	1	**2**	**3**	**4**
1	X			X
2	X	X	X	
3	X	X	X	
4		X	X	X

Standard 1.3: The results of program's assessment and the extent to which they are used to improve the program must be documented.

1.3.1. a. Actions taken on the basis of assessment:

1) Syllabus revision
2) Teachers training
3) Labs development
4) Faculty development

1.3.1.b. Strengths of Department:

i) Teamwork
ii) Infrastructure
iii) Work Environment
iv) Science Laboratories, Common Science Library, Internet facilities

1.3.1. c. Weaknesses of Department:

i) Departmental Library
ii) Trained Laboratory Personals
iii) Strengthening of existing Laboratory facilities

Standard 1.4: The department must assess its overall performance periodically using quantifiable measures.

1.4.1: <u>Performance Measures:</u>

Biotechnology department assesses the overall performance using quantifiable measures e.g. statistical method.

i) Student's enrollment
ii) Student teacher ratio
iii) Number of Publications
iv) Books in Library

v) Workshops and seminars

vi) Purchase of equipment

vii) Other Performance indicators

Table 3: Student's enrollment

Program	Year of Enrollment	No. of Enrolled Students
BS Biotechnology	2018	67
BS Biotechnology	2017	55
BS Biotechnology	2016	66
Total		188

Table 4: Student Teacher Ratio

Year	No of students	Teachers (teaching graduate & Postgraduate)	No of students per teacher
2016	508	9	65:1
2017	511	11	61:1
2018	506	13	65:1

Table 5: No. of Students Passed Out

Program	Passing out Year	No. of Students
BS	2018	41
	2017	52
	2016	38

Table 6: Number of Publications

Year	Papers published
2016	33
2017	14
2018	18

Table 7: Books in Library

Year	Purchased
2018	None
2017	30
2016	Nil
2015	Nil
2014	32
2013	38
2012	52
2011	40
2010	-

Table 8: Workshops and seminars organized

Year	2016	2017	2018
No. of Workshops and seminars	4	5	3

Table 9: Purchase of Equipment

Year	2016	2017	2018
No. of Equipment exceeding the price of Rs. 100,000	3	None	None

Table 10: Linkages with other institutes and industry

S. No.	Institute/ Industry	
	National	International
1	Agriculture Department, Government of the Punjab	University of Davis California
2	University of Lahore	
3	Children's Hospital	
4	Pakistan Program for Collaborative Research(PPCR)	
5	VRI (Veterinary institute of research	
6	University of health sciences	
7	CAMB (university of Punjab)	
8	Citrus research Centre, Sargodha.	
9	PCSIR	
10	Dr. Panjwani Center for Molecular Medicine and Drug Research, International Center for Chemical and Biological Sciences, University of Karachi, Karachi, Pakistan	

Table 11: Other Performance Indicators

Sr.	Contents	2016	2017	2018
1	QMS Certification	NIL	NIL	NIL
2	Programs Offered	MS, PH.D, MSc.	MS, MS Replica, PH.D, MSc.	MS, MS Replica, PH.D, M.Sc.
3	Membership of Professional Bodies	BOS, University Faculty Board,	BOS, University Faculty Board,	BOS, University Faculty Board,

		Advance Science & Research Board, NCRC, different committee member	Advance Science & Research Board, NCRC, different committee member	Advance Science & Research Board, NCRC, different committee member
4	Revision of Syllabi	1	1	1

1.4.2: Research Areas

The Faculty is involved in research in the following areas:

- Plant Biotechnology
- Plant Genomics
- Algal Biotechnology
- Genetic Manipulation and Protein Engineering
- Microbiology
- Industrial Biotechnology
- Microbial Biotechnology
- Industrial and Clinical Microbiology
- Health Biotechnology
- Human Genetics
- NanoBiotechnology
- Pharmaceutical Biotechnology
- Environmental Biotechnology
- Fermentation Biotechnology
- Proteomics
- Bio-informatics
- Molecular Virology

1.4.3: Collaborations

- Center of Excellence in Molecular Biology
- PCSIR laboratories
- School of Biological Sciences
- PARAS Foods pvt Ltd. (Pakistan Atomic Energy Commission)
- Children's Hospital
- University of Veterinary and Animal Sciences
- University of Health Sciences
- Veterinary Institute of Research
- Monsanto
- Citrus Research Institute Sargodha
- Shaker Gunj Mill, Jhang.

- Dr. Panjwani Center for Molecular Medicine and Drug Research, International Center for Chemical and Biological Sciences, University of Karachi, Karachi, Pakistan

1.4.4: ACADEMIC CALENDER (Annexure I)

CRITERION 2: CURRICULUM DESIGN AND ORGANIZATION

➡ Curriculum of Biotechnology for each program is developed on the basis of detailed guidelines given by the HEC.

PROGRAM BS. Biotechnology (Annexure II)

Table 12: Road Map for BS 2018-2022 (136 Credit Hours)

Semester I (15)	Semester II (17)	Semester III (18)	Semester IV (18)	Semester V (18)	Semester VI (18)	Semester VII (16)	Semester VIII (16)
CC/Eng-101 3(3+0)	CC/Eng-102 3(3+0)	CC/Eng-201 3(3+0)	CC/Phy-201 3 (3+0)	CC/Stat-301 3(3+0)	Maj/Biotech-306 3(2+1)	Maj/Biotech-401 3 (3+0)*	EC/Biotech** 3(3+0)
Language in Use	Academic Reading and Writing	Commun-ication Skills	Physics for biologists	Probability & Biostatistics	Genetic Resources & Conservation	Health Biotechnology	Elective-III
CC/Isl-101 2(2+0)	CC/PS-101	CC/CS-201 3(2+1)	CC/Math-201 3(3+0)	Maj/Biotech-301 3(2+1)	Maj/Biotech-307 3(3+0)*	Maj/Biotech-402 1 (1+0)	Maj/Biotech-406 1(1+0)
Islamic Education/ Ethics	Pakistan Studies	Computer Application	Biomathematics	Introduction to Biotechnology	Microbial Biotechnology	Seminar-I	Seminar-II
Min/Bot-102 3(2+1)	CC/Math-101 3(3+0)	Min/Chem-201 3(2+1)	Maj/Biotech-203 3(2+1)	Maj/Biotech-302 3(2+1)	Maj/Biotech-308 3(2+1)	Maj/Biotech-403 3(3+0)*	EC/Biotech** 3(3+0)
Diversity of Plants (Ecology, Biodiversity & Evolution-I)	Mathematics-I (pre-calculus)	Physico-Organic Chemistry-II (Organic Chemistry)	Analytical Chemistry & Instrumentation	Immunology	Agriculture Biotechnology	Environment Biotechnology	Elective-IV
Min/Chem-101 3(2+1)	Min/Chem-102 3(2+1)	EC/Geo-201 or EC/Psy-201 or EC/Stat-201	EC/Geo-202 or EC/Psy-202 or EC/Stat-202 3(3+0) or EC/Stat-203	Maj/Biotech-303 3(1+2)	Maj/Biotech-309 3(3+0)	Maj/Biotech-404 3(2+1)	Maj/Biotech-407 6(0+6)

General Inorganic Chemistry	Physico-Organic Chemistry-I (Physical Chemistry)	Human Geography or Psychology of Adjustment or Statistical Inference	Geography of Pakistan or Organization & Social Psychology or Introduction to regression analysis & Experimental Design or Data Analysis Using SPSS	Methods in Molecular Biology	Food Biotechnology	Genomics and Proteomics	**Research Project OR Internship OR Special Paper**
Maj/Biotech-101	Min/Zool-101 3(2+1)	Maj/Biotech--201 3(2+1)	Maj/Biotech-204 3(2+1)	Maj/Biotech-304 3(2+1)	Maj/Biotech-310 3(3+0)	EC/Biotech** 3(3+0)	CC/Biotech-401 2(2+0)
Cell Biology	Animal Diversity (Ecology, Biodiversity & Evolution-II)	Biochemistry-I	Biochemistry-II	Principles of Biochemical Engineering	Research methodology & skill Enhancement	Elective-II	Biosafety & Bioethics
	Maj/Biotech-102 3(2+1)	Maj/Biotech-202 3(2+1)	Maj/Biotech-205 3(2+1)	Maj/Biotech-305 ics3(1+2)	EC/Biotech** 3(3+0)	Maj/Biotech-405 3(3+0)*	
	Microbiology	Genetics (Classical Genetics)	Molecular Biology	Bioinfor-matics	Elective-I	Industrial Biotechnology	

** From the list of approved courses

Table 13: Curriculum Course Requirements – BS Biotechnology

Definition of credit hours: 1 credit hour is equivalent to 15-16 teaching hours/semester.

Curriculum Breakup	**Credit Hours**
HUMANITIES AND SOCIAL SCIENCES • Language in use • Academic reading and writing • Communication Skills • Advanced academic reading and writing • Islamic Education • Pakistan Studies • Mathematics-I (pre-calculus) • Human Geography or Psychology of Adjustment or Statistical Inference • Biomathematics • Geography of Pakistan or Organization & Social Psychology or Introduction to regression analysis & Experimental Design or Data Analysis Using SPSS	25

STATISTICS AND COMPUTER COURSES • Computer Applications • Probability & Biostatistics	6
SUPPORTIVE COURSES • Diversity of Plants • General Inorganic Chemistry • Physico-organic Chemistry-I • Physico-organic Chemistry-II • Animal Diversity	16
CORE COURSES • Cell Biology • Microbiology • Biochemistry-I • Genetics • Analytical Chemistry& instrumentation • Biochemistry-II • Molecular Biology • Introduction to Biotechnology • Immunology • Methods in Molecular Biology • Principles of Biochemical Engineering • Bioinformatics • Genetic Resources & Conservation • Microbial Biotechnology • Agriculture Biotechnology • Health Biotechnology • Environment Biotechnology • Genomics & Proteomics • Industrial Biotechnology • Biosafety & Bioethics • Seminar I & II	68
SPECILIZATIONS AND RESEARCH • Elective-I • Elective-II • Elective-III • Elective-IV • Research Methodologies & skill enhancement • Thesis	21
Total Credit Hours	**136**

Table 14: Details of Curriculum break up – BS Biotechnology
New scheme required

Semester	**Course Number**	**Stats and computer/Supportive courses**		**Core Courses**	**Specialization and Research**	**Humanities and Social Sciences**
		Stats and computer	**Supportive courses**			
1	CC/Eng-101 CC/Isl-101 Min/Bot-102 Min/Chem-101 Maj/Biotech-101		Min/Bot-102 Min/Chem-101	Maj/Biotech-101		CC/Eng-101 CC/Isl-101,
2	CC/Eng-102 CC/PS-101 CC/Math-		Min/Chem-102 Min/Zool-	Maj/Biotech-102		CC/Eng-102, CC/PS-101 CC/Math-

	101 Min/Chem-102 Min/Zool-101 Maj/Biotech-102		101			101
3	CC/Eng-201 CC/CS-201 Min/Chem-201 EC/Geo-201 EC/Psy-201 EC/Stat-201 Maj/Biotech-201 Maj/Biotech-202	CC/CS-201	Min/Chem-201	Maj/Biotech-201 Maj/Biotech-202		CC/Eng-201 EC/Geo-201 or EC/Psy-201 or EC/Stat-201
4	CC/Phy-201 CC/Math-201 EC/Geo-202 EC/Psy-202 EC/Stat-202 EC/Stat-203 Maj/Biotech-203 Maj/Biotech-204 Maj/Biotech-205			Maj/Biotech-203 Maj/Biotech-204 Maj/Biotech-205 CC/Phy-201		CC/Math-201 EC/Geo-202 or EC/Psy-202 or EC/Stat-202 EC/Stat-203
5	EC/Stat-301 Maj/Biotech-301 Maj/Biotech-302 Maj/Biotech-303 Maj/Biotech-304 Maj/Biotech-305	EC/Stat-301		Maj/Biotech-301 Maj/Biotech-302 Maj/Biotech-303 Maj/Biotech-304 Maj/Biotech-305		
6	Maj/Biotech-306 Maj/Biotech-307 Maj/Biotech-308 Maj/Biotech-309 EC/Biotech** Maj/Biotech-310			Maj/Biotech-306 Maj/Biotech-307 Maj/Biotech-308 Maj/Biotech-309	Maj/Biotech-310 EC/Biotech**	
7	Maj/Biotech-401 Maj/Biotech-402 Maj/Biotech-403 Maj/Biotech-404 EC/Biotech** Maj/Biotech-			Maj/Biotech-401 Maj/Biotech-402 Maj/Biotech-403 Maj/Biotech-404 Maj/Biotech-405	EC/Biotech**	

	405					
8	EC/Biotech** Maj/Biotech-406 EC/Biotech** Maj/Biotech-407*** CC/Biotech-401			Maj/Biotech-406	Maj/Biotech-407*** EC/Biotech** EC/Biotech**	CC/Biotech-401
Total (135)		**6**	**15**	**68**	**21**	**25**

Standard 2.1: The curriculum must be consistent and supports the program's documented objectives.

➡ BS Biotechnology program contents/courses meet the program objectives as shown in the table.

Table 2.1(A): BS Courses versus Program Objectives

Courses/Groups of Courses	**Objectives**			
	1	**2**	**3**	**4**
CC/Eng-101	X		X	
CC/Isl-101	X		X	
Min/Bot-102	X	X	X	
Min/Chem-101		X	X	X
Maj/Biotech-101	X	X	X	
CC/Eng-102	X		X	
CC/PS-101	X		X	
Min/Zool-101	X	X	X	
CC/Math-101	X	X	X	
Min/Chem-102		X	X	X
Maj/Biotech-102	X	X	X	
CC/Eng-201	X		X	
CC/CS-201		X	X	
Min/Chem-201	X		X	X
EC/Geo-201 or EC/Psy-201 or EC/Stat-201	X		X	
Maj/Biotech-201	X	X	X	
Maj/Biotech-202	X	X	X	
CC/Phy-201	X		X	X
CC/Math-201		X	X	X
EC/Geo-202 or EC/Psy-202 or EC/Stat-202	X	X		X
Maj/Biotech-203	X	X	X	
Maj/Biotech-204	X	X	X	
Maj/Biotech-205	X	X	X	
EC/Stat-301		X		X
Maj/Biotech-301	X	X	X	
Maj/Biotech-302	X	X	X	
Maj/Biotech-303	X	X	X	
Maj/Biotech-304	X	X	X	
Maj/Biotech-305	X	X	X	
Maj/Biotech-306	X	X	X	
Maj/Biotech-307	X	X	X	
Maj/Biotech-308	X	X	X	
Maj/Biotech-309	X	X	X	
EC/Biotech**	X	X	X	
Maj/Biotech-401	X	X	X	
Maj/Biotech-402	X	X	X	
Maj/Biotech-403	X	X	X	

Maj/Biotech-404	X	X	X	
EC/Biotech**	X	X	X	
Maj/Biotech-405	X	X	X	
Maj/Biotech-406	X	X	X	
Maj/Biotech-407***	X	X	X	
EC/Biotech**	X	X	X	
EC/Biotech**	X	X	X	
CC/Biotech-401		X	X	X

Standard 2.2: Theoretical background, problems analysis and solution design must be stressed within the program's core material

Program: BS Biotechnology

The modules of all the programs adequately address:

1) Theoretical background
2) Problem solving
3) Solution design
4) Application of the theoretical knowledge

- ➡ Some of the modules include the theoretical background and contain problem solving and solution design while others deal with Theoretical background, Problem analysis and Solution design separately.
- ➡ Great emphasis of the program is on problem solving strategies and design of solution. The product of the task results in the application of the theoretical knowledge in the applied fields of natural sciences.

Table 2.2(A): Standard 2-2 requirement

Elements	**Courses**
Theoretical background	17
Problem analysis	5 + research
Solution design	5 + research
Application of the theoretical knowledge	Research

Standard 2.3: The curriculum must satisfy the core requirements for the program, as specified by the respective accreditation body.

The curriculum satisfies both the core requirements of credit hours and criteria of admission lay down by Lahore College for Women University and HEC and are in par with the international standards.

Standard 2.4: The curriculum must satisfy the major requirements for the program as specified by the respective accreditation body.

The curriculum satisfies major requirements of the program. No formal accreditation with any professional body. The programs and curriculum has the approval of Board of Studies of Biotechnology.

Standard 2.5: The curriculum must satisfy general education, arts, and professional and other discipline requirements for the program, as specified by the respective accreditation body/council.

The curriculum satisfies general education disciplines requirements. No formal accreditation with any professional body but it fulfills all the necessary/basic requirements of the accreditation body. The programs and curriculum has the approval of Board of Studies of Biotechnology and Lahore College for Women University.

Standard 2.6: Information technology component of the curriculum must be integrated throughout the program.

Requirement for the information technology component is fulfilled by various courses as well as through the presentations made by each student in almost every semester.

Standard 2.7: Oral and written communication skills of the student must be developed and applied in the program.

Oral and written communication skills of the student are developed by the structurally designed courses for English, seminars, question answers, debates and by the class participation of the students.

CRITERION 3: LABORATORIES AND COMPUTING FACILITIES

Standard 3.1: Laboratory manuals/ documentation/ instructions for experiments must be available and readily accessible to faculty and students.

- The BS program has been provided with adequate laboratory manuals and related documents. Instructions to the students are available with the Module Leaders and before, they are made accessible to the students. Every laboratory has formulated safety guidelines with major equipment and electric gadgets which are clearly displayed in each laboratory.
- Laboratories are adequately equipped

Standard 3.2: There must be adequate support personnel for instruction and maintaining the laboratories:

- There is laboratory staff available for routine laboratories maintenance (chemical, glassware and laboratory instruments). The program leaders and the module leaders supervise each experiment and provide practical guidance to each student.

Standard 3.3: The university computing infrastructure and facilities must be adequate to support program's objectives:

- The computing infrastructure of the Biotechnology department is inadequate (see criterion 8).

CRITERION 4: STUDENT SUPPORT AND ADVISING

Standard 4.1: Courses must be offered with sufficient frequency and number for students to complete the program in a timely manner:

- The strategy for programs (courses) offering is controlled. The BS courses are offered once a year.

Standard 4.2: Courses in the major area of study must be structured to ensure effective interaction between students, faculty and teaching assistants:

- The effective student/faculty interaction in programs taught by more than one faculty members is streamlined by coordination of these faculty members and the commonality is maintained through any curriculum which is adopted for the particular module.
- The programs are structured to ensure effective interaction between students, faculty and the Head of Department. The students requiring extra help are provided services through tutorials, questions and answers. Questions are encouraged by the faculty from the students. Seminars are arranged where the students are free to discuss the topics relating to the program. Debates are initiated. The students are free to interact with the class in charge and Head of department in case of any shortcoming.

Standard 4.3: Guidance on how to complete the program must be available to all students and access to academic advising must be available to make course decisions and career choices:

- The students are provided guidance regarding the completion of the programs and having access to qualified faculty as well as student counseling. The students are encouraged to bring forward their suggestions and complaints through a complaint box which is maintained in the Institute. The students once in semester carry-out the teacher's evaluation.

- The counseling of the students are done in the following way:
  - c) Module leaders are the first available source to the students for guidance
  - d) Program managers provide further guidance followed-up by guidance from the senior faculty members e.g. Head of department and the Quality Assurance Advisor. The counseling is regarding the program, its effectiveness, teacher careers available to the students and any other difficulty of personal nature.
- The counseling is also availed at the Student counseling center of the university which deals with various issues.

CRITERION 5: PROCESS CONTROL

Standard 5.1: The process by which students are admitted to the program must be based on quantitative and qualitative criteria and clearly documented. This process must be periodically evaluated to ensure that it is meeting its objectives:

BS Biotechnology [4 Year Degree Program]

This is a 4 year degree program with minimum 136 credit hours. The program is divided in 8 semesters with 2 semesters each year.

Eligibility and Admission Criteria

Female students who have passed Intermediate with Pre-Medical/Pre-Engineering, or A Level, or equivalent securing more than 60% marks can apply for admission. Admission is strictly made on merit.

Standard 5.2: The process by which students are registered in the program and monitoring of students' progress to ensure timely completion of the program must be documented. This process must be periodically evaluated to ensure that it is meeting its objectives:

- Advertisements are made in leading newspapers and on Lahore College for Women University website. The student academic progress is monitored regularly by the Module Leader and regular written examination system. The process of registration and monitoring are reviewed once in a year three months before the date of admission.

Standard 5.3: The process of recruiting and retaining highly qualified faculty members must be in place and clearly documented. Also processes and procedures for faculty evaluation, promotion must be consistent with institution mission statement. These processes must be periodically evaluated to ensure that it is meeting its objectives:

- The standards are clearly indicated in the University Calendar which is followed. Qualifications which are required for each subject are kept in mind. The criteria for recruiting are qualification, experience which is judged through analysis of CVs, written test and personal interviews. In case of permanent faculty members, the recruiting is done by a board constituted by Lahore College for Women University whereas; visiting

faculty members are recruited by a board constituted by the Institute. The input of the students for maintaining the quality of the teachers is done by evaluating the teachers regularly once in a semester by the students. The results of these studies are sent to the teachers who are asked to improve and in extreme cases, replacements are made.

- An Annual Confidential Report (ACR) is initiated by the Dean annually for each member of staff and retention of the staff, their increment and promotion are based on ACRs.
- The faculty members performing well are rewarded by increment and honorariums. Good working conditions provided job satisfaction, pays, providing facilities like Ph.D. programs and scholarships are incentive to faculty member who perform well.

Standard 5.4: The process and procedures used to ensure that teaching and delivery of course material to the students emphasizes active learning and that course learning outcomes are met. The process must be periodically evaluated to ensure that it is meeting its objectives:

- There are process and procedure to ensure that the teaching and delivery of the program material to the students emphasizes active learning. For instance, exercises, tasks, activities, assignments and projects based on practicality of the knowledge are given to the students and research thesis is initiated at the end of the program. Process is monitored and assessed regularly.

Standard 5.5: The process that ensures that graduates have completed the requirements of the program must be based on standards, effective and clearly documented procedures. This process must be periodically evaluated to ensure that it is meeting its objectives

- In order to ensure that graduates / outgoing students have completed the requirement of the programs are based on standards.
- The semester rules have been adopted by Biotechnology department and the module leaders, Program managers, QEC and the Head of Department ensure their compliance.
- The operation is reviewed once a year and is documented as Management of Academic Programs.

CRITERION 6: FACULTY

Standard 6.1: There must be enough full time faculty members who are committed to the program to provide adequate coverage of the program areas/courses with continuity and stability. The interests and qualifications of all faculty members must be sufficient to teach all courses, plan, modify and update courses and curricula. All faculty members must have a level of competence that would normally be obtained through graduate work in the discipline. The majority of the faculty must hold a Ph.D. in the discipline:

- There is adequate full time faculty which provides adequate coverage of the program with continuity and stability. The interest and the qualifications of all faculty members

are pre-judged and monitored for each course forming a part of the program. The level of competency of the faculty members are evaluated at time of induction and monitored during teaching.

Program areas	Module in area and semester per year	Number of faculty members in each area	Number of faculty with Ph.D. degree
Area 1. **(Graduate)**	46 Courses + Research 02 Semesters per year	12	11

Program areas	Module in area and semester per year	Number of faculty members						Number of faculty with Ph.D. degree
		2016		2017		2018		
		Teachers	TAs	Tea-chers	T.As	Tea-chers	T.As	
Area 1. **(Graduate)**	46 Courses + Research 02 Semesters per year	10	2	11	2	12	2	11

Standard 6.2: All faculty members must remain current in the discipline and sufficient time must be provided for scholarly activities and professional development. Also, effective programs for faculty development must be in place:

➡ All the faculty members remain current in the disciplines and sufficient time is provided for scholarly activities and professional development. The newly inducted faculty is given enough time to familiarize with the working environment of the Institute. During this time they are monitored. Faculty is provided with centralized training by Registrar's office through NAHE and professional faculty development program of Learning Innovation Division (LID), HEC. They are encouraged to attend international seminars. Some of the faculty members had opportunity to get training and research experiences from foreign universities/institutions.

Standard 6.3: All faculty members should be motivated and have job satisfaction to excel in their profession:

- The faculty members are motivated and efforts are made to provide job satisfaction so that they excel in their profession. The satisfaction of the faculty and their input is measured by faculty survey form.

CRITERION 7: INSTITUTIONAL FACILITIES

Standard 7.1: The institution must have the infrastructure to support new trends in learning such as e-learning

Academic Building:

1. Class rooms: 05
2. General Labs: 02
3. Research Labs 03
4. Computer Lab 01
5. Seminar Room: 01
6. H.O.D Office 01
7. Store Rooms 01

- Overhead Projectors and multimedia are used in the class rooms.
- Internet facility is available throughout department.
- Access to HEC digital library.

Standard 7.2: The library must possess an up-to-date technical collection relevant to the program and must be adequately staffed with professional personnel:

- Almost 194 up-to-date books are available in Science library covers all the areas of programs.
- University provides digital library facility and common science library is available for books borrowing.
- There is no departmental Library or reading room facility available for the students in the department.

Standard 7.3: Class-rooms must be adequately equipped and offices must be adequate to enable faculty to carry out their responsibilities:

- 5 class rooms adequately equipped, office of HOD, Staffroom for faculty

CRITERION 8: INSTITUTIONAL SUPPORT

Standard 8.1: There must be sufficient support and financial resources to attract and retain high quality faculty and provide the means for them to maintain competence as teachers and scholars:

- Teachers are recruited on the basis of criterion established by the University.
- Existing faculty is sent to different courses of teaching organized to update the knowledge.

➡ Secretarial support is provided to the teachers to meet the working needs.

Standard 8.2: There must be an adequate number of high quality graduate students, research assistants and Ph.D. students

Program	Year	No. of Students
B.S. Biotechnology	2016-2020	60
B.S. Biotechnology	2017-2021	62
B.S. Biotechnology	2018-2022	58

Standard 8.3: Financial resources must be provided to acquire and maintain Library holdings, laboratories and computing facilities:

Financial Year	**Books (Library)**	**Chemicals (Laboratories)**	**Plant and Machinery (Equipment)**
2015-2016	Nill	0.25 Million	0.25 Million
2017-2018	Nill	0.25 Million	0.25 Million
2018-2019	Nill	0.3 Million	0.4 Million

Lahore College for Women University, Lahore

Academic Calendar (Session: 2018-2022)

BS/B.Com/BBA/BSCS/BE/BPA/B.Arch

M.A./M.Sc/MS

	Fall Semester	Spring Semester	Summer Semester
Start of Semester	15th Oct 2018	18th Feb 2019	1st Aug - 31st Aug 2019
Allocation of Assignment	1st Nov - 7th Nov 2018	4th Mar - 9th Mar 2019	
1st Mid Term Test	19th Nov - 24th Nov 2018	25th Mar - 30th Mar 2019	
Presentation / Quiz	3rd Dec - 21st Dec 2018	15th Apr - 25th Apr 2019	
2nd Mid Term Test	2nd Jan - 9th Jan 2019	6th May - 11th May 2019	
Follow-up Week	28th Jan - 1st Feb 2019	27th May - 31st May 2019	
Final Term	4th Feb - 17th Feb 2019	17th Jun - 6th July 2019	

Note:

1. Academic Calendar should be followed strictly. In case of University is closed, owing to the circumstances beyond control, then special make-up classes will be arranged converting weekend or holidays to working days to cover the lapsed period of the students.
2. Theses/Internships/Projects/Dissertations should be submitted in time.
3. The students of Session 2015-2019, 2013-2017 who are fail/improve CGPA, can appear with the regular sessions.
4. The students of Session 2017-2019, 2016-2020, 2017-2021 and 2018-2022 will clear their Probation only in the Summer Semester Examinations.
5. Students must attain 75% attendance to qualify to appear in the final examinations.
6. No student can improve their CGPA after the issuing of Degree.
7. Convocation is expected from January-March 2019. The results declared till 30th November 2018, will be included in the Convocation.

Prof. Dr. Tahira Aziz Mughal
Controller of Examinations

Lahore College for Women University, Lahore

Academic Calendar (Session: 2014, 2015, 2016, 2017)

BS/B.Com/BBA/BSCS/BE/BPA/B.Arch

M.A./M.Sc/MS

	Fall Semester	Spring Semester	Summer Semester	Thesis Submission Date
Start of Semester	3rd Sep 2018	26th Jan 2019	1st Aug - 31st Aug 2019	15th July 2019
Allocation of Assignment	17th - 22nd Sep 2018	11th Feb - 15th Feb 2019		
1st Mid Term Test	1st Oct - 6th Oct 2018	25th Feb - 1st Mar 2019		
Presentation / Quiz	1st Nov - 14th Nov 2018	18th Mar - 5th Apr 2019		
2nd Mid Term Test	19th Nov - 23rd Nov 2018	22nd Apr - 26th Apr 2019		
Follow-up Week	17th Dec - 21st Dec 2018	6th May - 10th May 2019		
Final Term	16th Jan - 25th Jan 2019	10th Jun - 21st Jun 2019		

Note:

1. Academic Calendar should be followed strictly. In case of University is closed, owing to the circumstances beyond control, then special make-up classes will be arranged converting weekend or holidays to working days to cover the lapsed period of the students.
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Prof. Dr. Tahira Aziz Mughal
Controller of Examinations

SCHEME OF STUDY

BS (4-Year) Biotechnology
2018-2022

YEAR ONE

SEMESTER-I

Course No.	Course Title	Credit Hours
CC/Eng-101	Language in use (English-I)	3(3+0)
CC/Isl-101	Islamic Education/Ethics	2(2+0)
Min/Bot-102	Diversity of Plants (Ecology, Biodiversity & Evolution – I)	3(2+1)
Min/Chem-101	General Inorganic Chemistry (Inorganic Chemistry)	3(2+1)
Maj/Biotech-101	Cell Biology	4(3+1)
Maj/Biotech-102	Microbiology	3(2+1)
	Total Credits	**15**

SEMESTER-II

Course No.	Course Title	Credit Hours
CC/Eng-102	Academic reading & writing (English-II)	3(3+0)
CC/PS-101	Pakistan Studies	2(2+0)
CC/Math-101	Mathematics-I (pre-calculus)	3(3+0)
Min/Chem-102	Physico-Organic Chemistry - I (Physical Chemistry)	3(2+1)
Min/Zool-101	Animal Diversity (Ecology, Biodiversity & Evolution – II)	3(2+1)
Maj/Biotech-103	Genetics (Classical Genetics)	3(2+1)
	Total Credits	**17**

YEAR TWO

SEMESTER-III

Course No.	Course Title	Credit Hours
CC/Eng-201	Communication Skills (English-III)	3(3+0)
CC/CS-201	Computer Application (Introduction to Computer Science)	3(2+1)
Min/Chem-201	Physico-Organic Chemistry - II (Organic Chemistry)	3(2+1)
EC/Geo-201 EC/Psy-201 EC/Stat-201	Human Geography Psychology of Adjustment Statistical Inference **(Choose Any One)**	3(3+0)
Maj/Biotech-201	Biochemistry-I	3(2+1)
Maj/Biotech-202	Analytical Chemistry & Instrumentation	3(2+1)
	Total Credits	**18**

SEMESTER-IV

Course No.	Course Title	Credit hours
CC/Phy-201	Physics for Biologists	3(3+0)
CC/Math-201	Biomathematics	3(3+0)
CC/Stat-201	Probability & Biostatistics	3(3+0)
Maj/Biotech-205	Molecular Biology	3(2+1)
Maj/Biotech-203	Immunology	3(2+1)
Maj/Biotech-204	Biochemistry-II	3(2+1)
	Total	**18**

YEAR THREE

SEMESTER-V

Course No.	Course Title	Credit Hours
Maj/Biotech-301	Introduction to Biotechnology	3(3+0)
Maj/Biotech-302	Methods in Molecular Biology	3(1+2)
Maj/Biotech-303	Principles of Biochemical Engineering	3(2+1)
Maj/Biotech-304	Bioinformatics	3(1+2)
EC/Geo-202 EC/Psy-202 EC/Stat-202	Geography of Pakistan Organization & Social Psychology Introduction to Regression Analysis & Experimental Design **(Choose Any One)**	3(3+0)
	Total	**18**

SEMESTER-VI

Course No.	Course Title	Credit Hours
Maj/Biotech-305	Genetic Resources & Conservation	3(2+1)
Maj/Biotech-306	Microbial Biotechnology	3(3+0)*
Maj/Biotech-307	Agriculture Biotechnology	3(2+1)
Maj/Biotech-308	Food Biotechnology	3(3+0)*
EC/Biotech**	Elective-I	3(3+0)
Maj/Biotech-309	Genomics and Proteomics	3(2+1)
	Total	**18**

YEAR FOUR

SEMESTER-VII

Course No.	Course Title	Credit Hours
EC/Biotech**	Elective-II	3(3+0)
Maj/Biotech-401	Health Biotechnology	3(3+0)*
Maj/Biotech-402	Industrial Biotechnology	3(3+0)*
Maj/Biotech-403	Environment Biotechnology	3(3+0)*
Maj/Biotech-404	Research Methodology & Skill Enhancement	3(3+0)
Maj/Biotech-405	Seminar-I	1(1+0)
	Total	**16**

YEAR FOUR - SEMESTER EIGHT

Course No.	Course Title	Credit Hours
EC/Biotech**	Elective-III	3(3+0)
EC/Biotech**	Elective-IV	3(3+0)
CC/Biotech-401	Biosafety & Bioethics	3(3+0)
Maj/Biotech-406	Seminar-II	1(1+0)
Maj/Biotech-407***	Research Project OR Internship OR Special Paper	6(0+6)
	Total	**16**

TOTAL CREDIT HOURS: 15
+17+18+18+18+18+16+16 = 136

**Weightage of theory and practical credits may be changed by an institution depending on the laboratory facilities available*

***The elective courses will be offered by the students from Annexure A on the availability of faculty member expertise and number of students*

****Research will be offered in 7th semester*

LIST OF ELECTIVE COURSES

401	Pharmaceutical Biotechnology	3(3+0)
402	Plant Biotechnology	3(2+1)
403	Fungal Biotechnology	3(2+1)
404	Waste Management	3(2+1)
405	Water and Waste-water Treatment	3(3+0)
406	Biofuels and Biorefineries	3(3+0)
407	Molecular Diagnostics	3(2+1)
408	Biosensors	3(3+0)
409	Radiobiology	3(2+1)
410	Marine Biotechnology	3(3+0)
411	Nanobiotechnology	3(3+0)
412	Virology	3(2+1)
413	Cell and Tissue Culture	3(2+1)
414	Fermentation Biotechnology	3(3+0)
415	Clinical Biotechnology	3(3+0)
416	Forensic Biotechnology	3(2+1)

**Weightage of theory and practical credits may be changed by an institution depending on the laboratory facilities available*