



**UNIVERSITY OF KARACHI**

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**Self-Assessment Report**  
**Department of Biotechnology,**  
**University of Karachi**

**M.Sc. Programme**

Submitted to

**Quality Enhancement Cell**  
**University of Karachi**

**ASSESSMENT/PROGRAMME TEAM**

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## INTRODUCTION

The Department of Biotechnology, University of Karachi is the oldest institution in country for teaching biotechnology at M.Sc. level which established in 1996. Since then the department continues to develop and progress. Today Department of Biotechnology offers B.Sc. (Hons), M.Sc., M.Phil. and Ph.D. degree Programs.

The department is determined to keep the pace of development in the field of biotechnology and offers diversified subjects like Environmental Biotechnology, Food Biotechnology, Agriculture Biotechnology, Protein Bioinformatics, Advances in Genetics Engineering, Stem cell Culture, Tissue Engineering & Therapeutics, Biotransformation, Biotechnology and Health Care and Enzyme Technology. Highly qualified and experienced faculty is engaged in imparting quality education and conducting research. The faculty members have published various research articles in journals of national and international repute and have presented various oral and poster presentations at both national and international levels. The department regularly invites eminent scientists and academicians to deliver seminars on current topics of national importance to apprise the students and faculty members on recent advances related to the field of biotechnology.

To enlighten the overall experience as a university student, department of Biotechnology provides opportunities and encourages its students to get involved in extracurricular activities. Students of this department have been participating in Model United Nations' programs, sports, debate and poetry competitions and art contests. In this regard several bright students have all Karachi, all Sindh and all Pakistan trophies on their credit. Our students have also achieved most prestigious foreign scholarships like SUSI and Fulbright offered under USEFP Programs. Students also take active part in student's week activities and organize different events.

Graduates of this dynamic discipline have a wide variety of career opportunities in teaching and research institutes, pharmaceutical organizations, forensics and clinical laboratories, tissue culture laboratories, agro-based industry, food industry, polymer and textile industry, cosmetic industry, fuel industry, environmental organizations, forestry, fisheries, wildlife department, horticulture department and processing, certifying and patenting companies. Currently many of the graduates hold key positions in various national and multinational organizations as well as serving abroad and are making significant contributions in their field of specialization.

Dr. Raheela Rahmat Zohra  
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**CRITERION-1**

**PROGRAMME MISSION, OBJECTIVES AND OUTCOMES**

**Criterion-1: Programme Mission, Objectives and Outcomes**

**Mission Statement of the Department of Biotechnology**

To impart innovative knowledge-based education that establishes an impregnable foundation for comprehending developments in the rapidly advancing field of biotechnology and to produce graduates with the technical and cognitive skills needed to be competitive in the field locally and globally.

**Mission Statement of the M.Sc. Program:**

To foster world-class biotechnologists with a potential to innovate, invent and disseminate knowledge for the benefit of society and environment.

**Standard 1-1: The Programme must have documented measurable objectives that support college and Institution mission statements.**

**Objectives of the Program:**

1. To develop a positive attitude in students for lifelong learning
2. To make students able to work effectively, responsibly, ethically and safely as an individual or team
3. To make students competent to integrate knowledge from multiple disciplines of biotechnology and to customize it in teaching, research and industry to solve problems
4. To train students to venture small to various level of entrepreneurship with the understanding of science-based business

**Table: Programme Objectives Assessment**

<b>S. No.</b>	<b>Objectives</b>	<b>How Measured</b>	<b>When Measured</b>	<b>Improvement Identified</b>	<b>Improvement Made</b>
1	To develop a positive attitude in students for lifelong learning	Through quizzes, posters assignments, and exams	Throughout and at the end of the semester	—	—
2	To make students able to work effectively, responsibly, ethically and safely as an individual or team	By assessing group activities internships seminar and exam	During and at the end of the semester	Needs more Internship	Activities increased
3	To make students competent to integrate knowledge from multiple disciplines of biotechnology and to customize it in teaching, research and industry to solve problems	By taking Presentations, writing project, assignments and exams	During and at the end of the semester	Digital Library required	Funds requested
4	To train students to venture small to various level of entrepreneurship with the understanding of science-based business	Writing a business plan & developing a prototype	During and at the end of the semester	Lacks university-industry liaison	In Progress

**Standard 1-2: The programme must have documented outcomes for graduating students. It must be demonstrated that the outcomes support the programme objectives and that graduating students are capable of performing these outcomes.**

## **Program Outcomes**

After completion of the M.Sc. in Biotechnology, students will be able to:

1. develop positive learning attitude and will be ready to compete for higher research degrees nationally and internationally.
2. use knowledge in teaching, research and in industry effectively and safely.
3. to start small to various level entrepreneurship using science based learning.

**Standard 1-3: The results of programme's assessment and the extent to which they are used improve the programme must be documented.**

### **a) Strengths and Weaknesses of the Programme**

#### **i) Strengths:**

The strength of the department is its qualified well trained faculty having expertise in diversified fields of biotechnology.

#### **ii) Weaknesses**

Current laboratories and classroom facilities are not enough for advanced training of students.

### **b) Future Development Plans**

Establishment of digital and research laboratories, liaisons with industry and establishment of research collaboration with national and international research institutes.



**Standard 1-4: The department must assess its overall performance periodically.**

a) Student Enrolment

S. No	Year	M.Sc. (P)	M.Sc.
1	2015	45	65
2	2016	36	60
3	2017	18	40

b) Student/Faculty Ratio 8:1

c) Time for M.Sc. 2 years  
1 year after B.Sc. (Hons)

d) The average student grade point (CGPA) 2.5

e) Student/Faculty Satisfaction

The facilities and capacity of the Department is gradually being upgraded and both faculty and students are satisfied with its progress.

**CRITERION-2**

**CURRICULUM DESIGN AND ORGANIZATION**

**Criterion-2 Curriculum Design and Organization****Programme of Studies offered****Year / Semester wise Scheme of Studies of M.Sc Programme****M.Sc. (Previous) (Semester I)**

S. No	Course Code	Course Title
1	511	Virology I
2	513	Physiology and Metabolism of Industrially Important Microorganisms
3	515	Genetic Engineering
4	517	Environmental Biotechnology
5	519	Principles of Biochemical Engineering-I

**M.Sc. (Previous) (Semester II)**

S. No	Course Code	Course Title
6	512	Virology II
7	514	Molecular Biophysics
8	516	Research Methodology and Techniques
9	518	Gene Expression and Control
10	520	Principles of Biochemical Engineering-II

**M.Sc. (Final) (Semester III)**

S. No	Course Code	Course Title
11	601.1	Biostatistics
12	621	Business Applications in Biotechnology
13	623	Applied Enzymology
14	625	Agriculture Biotechnology
15	627	Animal Cell and Tissue Culture
16	629	Applied Immunology

**M.Sc. (Final) (Semester IV)**

S. No	Course Code	Course Title
17	622	Biosafety and Bioethics
18	624	Food Biotechnology
19	626	Plant Tissue Culture and Regeneration
20	628	Protein Bioinformatics
21	630	Medical Biotechnology

**Note: Students can take a research project (3 Credit hours) or thesis (6 Credit hours) in lieu of 1 or 2 courses of third or fourth semester respectively.**

**Standard 2-1: The Curriculum must be consistent and support the programme’s documented objectives**

Following table manifests how the programme content (Courses) meets the Programme Objectives.

Courses	Programme’s Objectives			
	1	2	3	4
Major Courses	All Courses		All Courses	516, 621
Practical (Field and Lab)	All Courses	All Practicals	All Practicals	516, 621
Thesis/Dissertation		✓	✓	

**Standard 2-2: Theoretical background, problem analysis and solution design must be stressed within the programme’s core material.**

Following table indicates the elements covered in core courses:

Elements	Courses
i) Theoretical Background	All courses offered by the Department
ii) Problem Analysis	516, 601.1, 621, 629, 628 Internships/Thesis/Dissertation
iii) Solution Design	516, 520, 621, 623 Internships/Thesis/Dissertation

**Standard 2-3: The curriculum must satisfy the core requirements for the programme, as specified by the respective accreditation body.**

**Standard 2-4: The curriculum must satisfy the major requirements for the programme, as specified by the respective accreditation body/council.**

The Curriculum of Department of Biotechnology has been approved by statutory bodies of the University of Karachi.

**2-5: The curriculum must satisfy the general education, arts and other discipline requirements for the Programme as specified by the accreditation body.**

N.A

**Standard 2-6: Information technology component of the curriculum must be integrated throughout the programme.**

Protein Bioinformatics (Biotech:628) covers information technology component of the curriculum of the program.

**Standard 2-7: Oral and written communication skills of the student must be developed and applied in the programme.**

Courses# 516, 621, 622, and seminars in various courses and internship programs help students in developing communication skills.

**CRITERION-3**

**LABORATORY AND COMPUTING FACILITIES**

### **CITERION-3: Laboratory and Computing Facilities**

#### **Laboratory Facilities**

The department of biotechnology has 04 functional laboratories in the department building for students and faculty. These laboratories need upgradation for training of students for research.

#### **Computer Facilities**

The department of biotechnology has only four Core 2duo refurbished computers for academic labs and available for students, faculty and administrative office. Currently, we are in dire need of at least 15-20 up to date computers to fulfill the curriculum requirements.

#### **Internet Facility**

Karachi University Wifi

Karachi University Main Communication Network (LAN)

#### **Standard 3-1: Laboratory manuals/ documentation instruction for experiments must be available and readily accessible to faculty and students**

Hand outs / Instructions for experiments of all courses are available.

#### **Standard 3-2: There must be adequate support personnel for instruction and maintaining the laboratories.**

Few trained persons are available for instruction and maintaining the laboratories, more proficient lab staff is required.

#### **Standard 3-3: The University computing infrastructure and facilities must be adequate to support programme's objectives**

- |                                |               |
|--------------------------------|---------------|
| <b>i) Computing Facilities</b> | Inadequate    |
| <b>ii) Multimedia</b>          | 01 Multimedia |
| <b>iii) Website</b>            |               |
| <b>iv) Internet</b>            |               |

**CRITERION-4**

**STUDENT SUPPORT AND ADVISING**



**Criterion-4 Student Support and Advising**

Student advisor has been appointed for students' support and guidance. Also students are encouraged to interact with teachers to get advice relevant to their issues.

**Standard 4-1: Courses must have been offered with sufficient frequency and number for students to complete the programme in a timely manner.**

Programme	Classes per Week	Practical Classes per Week	Research Guidance
M.Sc.	Two Classes/per course	2 Practical Hours/per course	As required

**Standard 4-2: Course in the major must be structured to ensure effective interaction between students, faculty and teaching assistants.**

There is effective interaction between students, faculty and teaching assistants during class lectures and laboratory exercises.

**Standard 4-3: Guidance on how to complete the programme must be available to all students and access to academic advising must be available to make course decisions and career choices**

The student advisor and chairperson help students by providing information regarding career opportunities available for them. Moreover information regarding internships, job opportunities, seminars and workshops are placed on the notice board by the chairperson of the Department.

**CRITERION-5**

**PROCESS CONTROL**

**Criterion-5: Process Control**

**Standard 5-1: The process by which students are admitted to the programme 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.**

Admission Process as per University of Karachi.

**Standard 5-2: The process by which students are registered in the programme and monitoring of students progress to ensure timely completion of the programme must be documented. This process must be periodically evaluated to ensure that it is meeting its objectives.**

Courses are completed on time. Additional classes are adjusted after any unscheduled closure. Monitoring procedures for students are documented regularly.

**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 institutional mission statement. These processes must be periodically evaluated to ensure that it is meeting with its objectives.**

**Faculty Recruitment / Retaining Policy**

**Appointments / Promotions Procedure:**

It is as per University Code Book.

**Basic Pay Scale (BPS)**

<b>BPS</b>	<b>18</b>
<b>BPS</b>	<b>19</b>
<b>BPS</b>	<b>20</b>
<b>BPS</b>	<b>21</b>

**a. Lecturer (BPS- 18):**

**Minimum Qualification**

B.S or M.Sc. in Biotechnology with First Division.

**b. Assistant Professor (BPS- 19):**

**Minimum Qualification**

Ph.D in Biotechnology

or

M.Phil in Biotechnology with 4 years relevant experience.

or

M.Sc in Biotechnology with 6 years relevant experience.

**c. Associate Professor (BPS- 20)**

**Minimum Qualification:** Ph.D

**Experience:** 10 years Teaching / Research experience in HEC recognized institute.

**Minimum Number of Publications:** 10 Research Publications in HEC / BASR recognized journals.

**d. Professor (BPS-21)**

**Minimum Qualification:** Ph.D

**Experience:** 15 years Teaching / Research experience in HEC recognized institute.

**Minimum Number of Publications:** 15 Research Publications in HEC / BASR recognized Journals.

**Bases for Appointments / Promotions:** Through selection board conducted by University of Karachi.

**Standard 5-4: The process and procedure 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.**

Students are encouraged to participate in the class. They are given individual and group assignments which are discussed in class.

**Standard 5-5: The process that ensures that graduates have completed the requirements of the programme must be based on standards, effective and clearly documented procedures. This process must be periodically evaluated to ensure that it is meeting its objectives.**

1. Punctuality of the students in classes is stressed.
2. Exams are held regularly.
3. Only those students promoted to the next year who have cleared at least 80% courses.

**CRITERION-6**

**FACULTY**

**Criterion-6 Faculty**

**Standard 6-1: There must be enough full time faculty who are committed to the programme to provide adequate coverage of the programme areas / courses with continuity and stability. The interest of all faculty members must be sufficient to teach all courses, plan, modify and update courses. The majority must hold a Ph.D. degree in the discipline.**

There are 09 regular faculty members who are able to teach, plan, modify and update courses. Most of the faculty members are Ph.D. or M.Phil. degree holders.

**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 programmes for faculty development must be in place.**

Faculty members regularly participate in seminars, conferences, workshops at national / international levels. Those who are engaged in improving qualification are provided relaxation in their teaching load.

**Standard 6-3: All faculty members should be motivated and have job satisfaction to excel in their profession.**

Job satisfaction is there but faculty members are required to be motivated by fair & timely promotions by the University of Karachi.

**CRITERION-7**

**INSTITUTIONAL FACILITIES**

## **Criterion-7 Institutional Facilities**

**Standard 7-1: The Institution must have the infrastructure to support new trends in learning such as E-learning.**

### **a) Departmental library and Internet Facility**

- Departmental seminar library has stock of about 500 books related to various fields of biotechnology and is updated periodically.
- Having problem with departmental internet facility that will be resolved soon.

### **b) Main Library**

A well established main library has various sections that provides:

- numerous books
- scientific journals
- digital library having access to journals & e-books

### **c) Offices**

Department has adequate offices for the faculty members.

### **d) Class Rooms**

There are three lecture rooms which are sufficient for the students.

**Standard 7-2: The library must possess on up-to-date technical collection relevant to the programme and must be adequately staffed with professional personnel.**

Seminar library has up-to-date technical collection with a professional person as librarian.

**Standard 7-3: Class rooms must be adequately equipped and offices must be adequate to enable faculty to carry out their responsibility.**

### **Classrooms**

Classrooms are adequately equipped however, multimedia projectors are required.

### **Faculty Offices**

Faculty offices are adequate but not fully equipped.



**CRITERION-8**

**INSTITUTIONAL SUPPORT**

**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 teacher and scholars.**

Institutional support is not sufficient enough. Financial resources are required to meet the program's objectives.

**Standard 8-2: There must be an adequate number of high quality graduate students, research assistants and Ph.D. Students**

Degree Programme	Years		
	2015	2016	2017
M.Sc.	45	36	18

Student/Faculty Ratio (for the last three years) 8:1

**Standard 8-3: Financial resources must be provided to acquire and maintain library holding, laboratories and computing facilities.**

The University of Karachi provides limited financial resources to maintain library, laboratories and computing facilities. HEC is also requested to provide additional financial resources for strengthening the Department of Biotechnology.

## **Faculty CVs**

## **Survey's Results**

