DEPARTMENT OF BOTANY
LAHORE COLLEGE FOR WOMEN UNIVERSITY, LAHORE

SELF-ASSESSMENT REPORT
PhD

Submitted to

Quality Enhancement Cell,
Lahore College for Women University, Lahore
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T A B L E O F C O N T E N T S

CRITERION 1
PROGRAM MISSION, OBJECTIVES AND OUTCOMES

Department of Botany

Department of Botany was established in Lahore College for Women in the year 1922. B.Sc. Botany program was launched in 1956. The department started offering M.Sc. in the year 1994. After gaining the status of University in 2002 BS Botany (four years degree program) started in 2005, MS program in 2008 and MS leading to PhD / PhD programs were started in 2009.

Mission statement of University

1. Being the largest Women University of the country the University aims to highlight the role of women in country's development.
2. To enlighten the females of Pakistan in general and Punjab in particular with educational power to serve the country in different fields.
3. To make Lahore College for Women University one of the best institutes for learning and research.

Mission statement of Department

The mission of the department is

- To teach traditional and advanced concepts in plant sciences.
- To perform basic and applied research for advancement in the field of Botany
- To provide trained manpower for Educational research, Forest, Agriculture & industrial organizations and other sectors such as medicinal research, textile sector, leather industry, pharmaceutical and biotechnological companies.
- To conduct activity centered programs where observation and experimentation are stressed.

OBJECTIVES

- To enable students to investigate and discover scientific concepts.
- To modify, rectify and enhance students' investigative abilities.
- To evaluate student performance.
- To diagnose students' weaknesses.
- To develop healthy teacher-student relationship
- To provide human resources in field of plant sciences according to according to market demand.

The courses are tailored to assist a teacher in conducting an activity centered program where observation and experimentation are focused. An activity oriented approach provide students, the opportunity to investigate and discover scientific concepts. Thus students shall be able to modify, rectify and enhance their scientific skills.

The core values of the department are:

- Merit
- Honesty and character building
- Value Addition
- Hard work
- Care
- Respect
- Commitment
- Accountability
- Fairness
- Transparency
- Trust
- Team spirit

Teaching Methodology:

The courses are taught through a combination of various methods including lectures, practical, seminars, assignment, quiz/presentations, workshops, tutorials and group discussions using audio-visual aids. The teachers discuss the basic theme of the concerned topics subsequently guiding students to collect, recognize and interpret the additional information through other sources like library and internet etc. This creates originality amongst students learning skills enabling them to work with seriousness of purpose.

Quality Policy of Department of Botany

Our aim is to achieve excellence through provision of quality in basic subject of plant sciences and develop professionals/research scholars to handle multifarious challenge of natural science. To achieve this commitment we continually improve the effectiveness of our quality management system through human resource development and active faculty/student participation.

Successful completion of the courses would ultimately lead to the production of plant scientist with better understanding of the subject blended with deeper and broader vision of the subject. The scientists will be able to compete on solid ground on national, regional and international levels in research, academics, industry and other organizations, hence contributing positively towards the enhancement of scientific knowledge.

To achieve this commitment we continually improve the effectiveness of our quality management system through human resource development and active faculty/ student's participation.

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

Name of Programs	Duration	No. of Modules	Total Credit Hrs
BS Botany	4 years degree program	8 semesters	136
MS	Two year Degree program	4 Semesters + Research Work	30 Research work
Ph.D. (After Completion of 18 years of Education)	Course work + Comprehensive Viva Voce + Research Work	2 Semesters + Research Work	18 Research work

1.1 Program Objectives

1) To provide the students updated information in research related to plant sciences.
2) To provide female students an independent atmosphere to excel in academic field.
3) To provide students with the abilities, attitudes and skills they need to become effective employees in educational and research institutes.
4) To provide students with the skills necessary for continued further research.
5) To develop creative and management skills of the students.
6) To develop good communication skills in students in terms of technical presentations and report writing.
7) To enable students to investigate and discover scientific concepts by modifying, rectifying and enhancing their investigative abilities.

1.2 Strategies for achieving program mission and objectives

Strategies are based on:

1) Designing the program as per requirements of the students and their potential.
2) Curriculum development based on the design of the program.
3) Regular revision of curricula / programs to keep them in line with the national and international developments.
4) Providing all resources including class room facilities, multimedia, computers, and well equipped laboratories.
5) Employing qualified and experienced teachers and to update their knowledge through training.
6) Establishing linkages with other universities at National and International level as well as with forestry, agriculture, horticulture, floriculture and related industries through combined research projects.

7) Establishing liaison with industry and services that are the potential employers and provide economical consultancy services in the field of specialty.
8) Developing moral and ethical basis of the students to impart concept of team work, honesty and discipline through lectures, seminars, industrial and field visits.
9) Developing close interaction of the teachers with the students through extracurricular activities, social programs and field trips.
10) Educating, training and motivating faculty members.
11) Establishing quality management system in line with the guidelines of ISO 9001:2000 and HEC.
12) Fulfilling yearly quality objectives.

Table 4.1 Program Objectives Assessment

OBJECTIVES	HOW MEASURED	WHEN MEASURED (FREQUENCY)	IMPROVEMENT IDENTIFIED	IMPROVEMENT MADE
To provide the students updated information in research related to plant sciences	Through regular assessment of students' knowledge and ability to exhibit skills by means of quizzes, class tests, assignments, presentations and term papers.	**Class tests**: 2 tests in each term (Mid+Final) **Assignment**: 1 in each term **Class presentations/quiz**: 1 in each semester **Term paper**: 2 (Mid+Final) per semester **Comprehensive examination:** after completion of semester II	Discussion based teaching Improving language skills of students especially in English Course / curriculum revision to enhance outcomes and make it more work based Enhancing communication skills Guidance to student	Teachers encourage question-based and discussion-based lecture delivery Teachers training and development Course / curriculum revised Students encouraged to attend the National and International workshops /Seminars /Conferences Courses designed to fulfill the requirements of different fields of specialization in the department Students have to give presentations to enhance their English and communication skills
To provide students with the abilities, attitudes and skills they need to become effective employees in educational and research institutes	Through their involvement in different academic and non-academic activities	Throughout the PhD duration	Students assist the supervisors in different academic activities such as giving instructions for practicals of graduate students, invigilation duties performed during class tests or term tests of graduate students. Students are involved in organizing the events such	According to LCWU rules the PhD students can be assigned a workload of 2 Credit hours in the departments. This definitely gives them a chance to get experience regarding teaching and research activities. PhD students are hired as visiting faculty by the university to teach inter classes that helps them to boost their confidence and

			as seminars, workshops, lectures, competitions etc	teaching abilities.
To provide students with the skills necessary for continued further research.	Through their performance during their research project	**Academic report:** Academic reports of each student are submitted to the HOD biannually indicating their research accomplishments **Seminars:** Every student has to deliver a lecture in a seminar arranged for PhD students of the department to highlight their research accomplishments on regular basis	Students working under projects in collaboration with other institutes get a chance to work in an independent environment and learn about the working conditions of other institutes that also gives them confidence,	PhD students are encouraged to work in research institutes and universities at national and international level. Faculty members are encouraged to work in collaboration with other institutes.
To develop creative and management skills of the students	Through their involvement in curricular and co-curricular activities. By engaging them in purchase of materials required for their research projects.	Throughout the PhD duration.	Students are involved in organizing the events such as seminars, workshops, lectures, competitions etc. Students are awarded funds for their research activities after approval of their synopsis from ASRB. Students utilize these funds for purchase of chemicals, glassware, equipment etc. that trains them to learn how to run projects.	Students get experience of academic as well as administrative activities.
To develop good communication skills in students in	Through **class presentations Seminars** for PhD	Class presentations are required during each semester for each course offered	Class presentations help improving English language and	PhD students of Botany department have won several competitions as well as best

terms of technical presentations and report writing	students **Oral and poster presentations** in National and International Conferences/seminars **Research publications** in national and international journals	Seminars are conducted after approval of synopsis from ASRB Conference presentations are encouraged throughout the research period As per HEC requirement at least one publication in an impact factor journal is required for award of PhD degree	communication skills which are further polished through oral and poster presentations in different conferences and seminars in various institutes. A large number of publications of the department are contributed by the publications of PhD students.	poster and oral presentations awards on national and international level.
To enable students to investigate and discover scientific concepts by modifying, rectifying and enhancing their investigative abilities.	Through different research activities carried out during the research project	Throughout the period of PhD.	Students are encouraged to adopt rational thinking to solve different problems related to their research. Students are encouraged to search for solutions of different problems encountered during different research activities.	Students focus their activities on basic and applied research in different fields of plant sciences

Standard 1.2: These programs must have documented outcomes for BS/ MS/MS leading to Ph.D. and Ph.D. students. It must be demonstrated that the outcomes support the program objectives and that graduating students are capable of performing these outcomes.

PhD Botany Program Outcomes

1) Recent and updated knowledge in the respective field of specialization
2) An ability to apply knowledge of statistics and basic subjects of botany in the field of research and education
3) An ability to conduct experiments, and to analyze and interpret results critically.
4) An understanding of ethical and professional responsibility.
5) An ability to work effectively in teams.
6) An ability to communicate effectively.
7) An understanding of the LCW University objectives of female empowerment, competence and integrity
8) Have a commitment to quality, timeliness, and continuous improvement.
9) An ability to do work in field.
10) Trained to face the challenges of professional life.
11) Students are able to compete and carry out research at national and international levels

- Means for assessing the extent to which graduates are performing the stated program outcomes/learning objectives:

1. Conducting a survey of graduating seniors every semester.
2. Conduct a survey of alumni every two years.
3. Conduct a survey of employers every two years.
4. Carefully designed questions asked during senior project presentations. These questions should be related to program outcomes.
5. Outcome examinations.
6. The program outcomes are the byproducts of the program objectives and are interrelated. An example of interrelation between the program objectives and the program outcomes is shown in the following table.

Table 4.2: Outcomes versus Objectives

Program Objectives	Program Outcomes										
	1	2	3	4	5	6	7	8	9	10	11
To provide the students updated information in research related to plant sciences.	*	*	–	*	–	–	–	*	*	*	*
To provide female students an independent atmosphere to excel in academic field.	–	*	*	*	*	*	*	*	*	*	*
To provide students with the abilities, attitudes and skills they need to become effective employees in educational and research institutes.	*	*	*	*	*	*	*	*	*	*	*
To provide students with the skills necessary for continued further research	*	*	–	◊	◊	–	*	*	–	*	*
To develop creative and management skills of the students	–	–	*	*	–	◊	*	*	*	*	*
To develop good communication skills in students in terms of technical presentations and report writing.	–	–	–	◊	*	◊	*	◊	*	*	*
To enable students to investigate and discover scientific concepts by modifying, rectifying and enhancing their investigative abilities.	*	*	*	*	◊	–	*	*	*	*	*

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

Actions taken on the basis of assessment

1) Syllabus revision to make courses more up to date
2) Up gradation of research labs
3) Faculty development through trainings and workshops in collaboration with QEC, ORIC and HEC.
4) Research collaboration with other universities of Punjab in general and Lahore in particular to upgrade the standard of learning and research for each scholar.

Strengths of the program

1) Highly qualified faculty with 18 faculty members out of which 15 have completed their doctorate degree in different fields of Botany.
2) Four faculty members have completed their postdoctoral research from internationally known universities.

3) Availability of basic infrastructure to carry out research at PhD level.
4) Faculty members of the department regularly submit and win research projects that help in upgrading the research activities being carried out in the department.
5) Safe and friendly working environment.
6) Library, Computing and Internet facilities are available for faculty and students in the department.
7) Teamwork. Different research groups are established in the department based on areas of specialization of different faculty members.

Weaknesses of the program

1) More funds should be allocated for purchase of equipment, chemicals and consumables.
2) Strengthening and development of Labs is required for carrying out research work at PhD level.
3) There is no secretarial staff available in the department.
4) There is no lab technician in the department.
5) No store keeper

Future Plans

1. Strengthening of Prem Madan Herbarium
2. To strength the Botanical Garden of Department of Botany at LCWU, Lahore
3. Collaboration with other Universities, research institutes and related industries at national level.
4. Collaboration with other Universities and research institutes at international level.
5. Getting projects from national and international funding agencies.
6. MoU will be signed with Floriculture Department for Kitchen Gardening.
7. MoU will be signed with Forest Department of Punjab for research activities.

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

1.4.1 Performance Measures

The Department assesses the overall performance using quantifiable measures e.g. statistical method.

Table 3: **No. of Students Enrolled**

Program	Session	No. of Students
PhD	2017-onwards	06
	2018-onwards	05

ii) Table 4: Student-Faculty Ratio

Table 4a: Student-Faculty Ratio (for PhD Program)

Year	No. of Students	No. of Faculty Members	Student-Faculty ratio
2017	40	11	2.85
2018	45	14	3.21

Table 4b: Student-Faculty Ratio (BS, MS & PhD Programmes)

Year	No. of Students	No. of Faculty Members	Student-Faculty ratio
2018	47+162+45= 257	18	14:1
2017	51+165+40= 256	17	14:1

iii) Table 5: No. of Students Passed Out

Program	Passing out Year	No. of Students
PhD	2017	03
	2018	02

IV) Table 6: Percentage of Honor Students & Attrition Rate

Not applicable for PhD program

Year	%age of Honor Students **Criteria:** CGPA 3.75 and above	**Attrition Rate** (Admitted –pass out) *100 / Admitted
2017		
2018		

v) Table 7: Faculty Training, Seminars and workshops (Appendix A)

Year	No. of Trainings, Seminars and workshops
2017	0
2018	2

v) Papers Published at National & International Level

Table 8: Number of Publications (Appendix B)

Year	Papers published
2017	42
2018	49

vi) Books in Library

Number of books in Science library (Botany section): 11292

Number of books in departmental library (donated by an old employee): 473

Research Areas

The Faculty is involved in research in the following areas:

1	Molecular Genetics	12	Plant Tissue Culture
2	Biotechnology	13	Stress Physiology
3	Environmental Biotechnology	14	Food Engineering
4	Phytochemistry	15	Enzymology
5	Industrial Biotechnology	16	Molecular Mycology
6	Fungal Biotechnology	17	Molecular Systematics
7	Medicinal Plants	18	Biodiversity
8	Molecular Taxonomy	19	Plant Fungal Interactions
9	Phytopathology	20	Biochemistry
10	Plant Physiology	21	Nanobiotechnology
11	Plant Taxonomy		

Departmental Achievements (others)

1) Department has launched its first Journal "Journal Plantarum" approved by ASRB, LCWUL (Reg/LCWU/1191 dated: 15-05-2018).
2) Two faculty members of Department are running research Projects with HEC one with PARD
3) One Project under NRPU, HEC was completed by one Faculty member in the field of industrial biotechnology.
4) Three faculty members completed their PhD from LCWUL in 2017.
5) Two students of the department were awarded degrees on completion of their PhDs in 2018.
6) One faculty member completed her Post doc from Cornell University, NY, USA.
7) One faculty member presented "invited lecture" at 1st international conference held at University of Gujrat, Gujrat.

8) Dr. Tehreema Iftikhar, Associate Professor of Botany, was elected as Vice president (Punjab) of Pakistan Botanical Society for the year 2018-2019.
9) One faculty member received TWAS UNESCO associate ship for south China botanical garden for the period of three years.
10) Research collaborations have been developed with:
    i. Government College University Lahore
    ii. Lahore Medical College Lahore
    iii. Government College University Faisalabad
    iv. Institute of Agricultural sciences, University of Punjab Lahore, Pakistan
    v. National Rice Institute of China, China
    vi. Vegetable Research institute, Ayub Agriculture Research Centre, Faisalabad
    vii. Noor Fatima Textile industry, Faisalabad, Pakistan

CRITERION 2

CURRICULUM DESIGN AND ORGANIZATION

- In PhD program the courses offered are specialized focusing on the needs of particular specialization. Basic Maths and Basic science courses are included in the BS and MS programs.
- The curriculum of PhD Botany program is designed following the guidelines issued by HEC keeping in view the program objectives and outcomes. Curriculum standards are specified in terms of credit hours.
- A credit hour equals one class or two laboratory hours per week. The duration of a semester is approximately 14 – 16 weeks.

PROGRAM

PhD Botany (4 Year Degree Program)

Total Credit hours: 18

Note: Definition of credit hours = 1 credit hour is equivalent to 16 teaching hours.

Scheme of Study
Ph.D. (Botany)

YEAR 1

SEMESTER-I

Course No	Course Title	Credits
Bot-719	Research Reading-I	3 (3+0)
Bot-7*	Choose from Annexure A	3 (3+0)
Bot-7*	Choose from Annexure A	3 (3+0)
Total Credit Hours		**9**

SEMESTER-II

Course No	Course Title	Credits
Bot-735	Research Reading-II	3 (3+0)
Bot-7*	Choose from Annexure A	3 (3+0)
Bot-7*	Choose from Annexure A	3 (3+0)
Total Credit Hours		**9**

Total Credit Hours = 9+9 =18 CR

After completion of course work the student will have to clear comprehensive examination.
* The courses will be selected by the student from "Annexure A" according to area of specialization and depending on the availability of faculty member expertise and number of students.

List of Courses

Course Code	Title of courses	Credit Hours
Bot-701	Essential of Microbiology	3(3+0)
Bot-702	Basic Concepts in Enzymology	3(3+0)
Bot-703	Biotechnology: its Techniques and Applications	3(3+0)
Bot-704	Bioassay Techniques in Plant studies	3(3+0)
Bot-705	Biostatistics and Bioinformatics	3(3+0)
Bot-706	Molecular Advances in Phytosystematics	3(3+0)
Bot-707	Biotechnological Phytoremediation	3(3+0)
Bot-708	Plant Tissue Culture	3(3+0)
Bot-709	Commercial Application of Plant Tissue Culture	3(3+0)
Bot-710	Recent Trends in Ethnobotany	3(3+0)
Bot-711	Project Planning, Monitoring and Evaluation	3(3+0)
Bot-712	Industrial Production of Secondary Metabolites	3(3+0)
Bot-713	Bioprocessing	3(3+0)
Bot-714	Chemistry of Bio-Molecules	3(3+0)
Bot-715	Advances in Microbial Genetics	3(3+0)
Bot-716	Biotechnology	3(3+0)
Bot-717	Fermentation Technology	3(3+0)
Bot-718	Medicinal Plants of Pakistan	3(3+0)
Bot-719	Research Reading-I	3(3+0)
Bot-720	Environmental Biotechnology	3(3+0)
Bot-721	Biosafety and Bioethics	3(3+0)
Bot-722	Botanical Techniques and Instrumentation	3(3+0)
Bot-723	Protein Purification	3(3+0)
Bot-724	Forensic Biology	3(3+0)
Bot-725	Recombinant DNA Technology	3(3+0)
Bot-726	Biochemistry of Plant Phenolics	3(3+0)
Bot-727	Bioactive Principles of Medicinal Plants	3(3+0)
Bot-728	Principles and Techniques of Molecular Biology	3(3+0)
Bot-729	Plant Proteomics	3(3+0)
Bot-730	Plant Terpenoids	3(3+0)
Bot-731	Stress Physiology	3(3+0)
Bot-732	Fungal Biotechnology	3(3+0)
Bot-733	Phytochemistry	3(3+0)
Bot-734	Phytomedicine	3(3+0)
Bot-735	Research Reading-II	3(3+0)
Bot-736	Nano Biotechnology: Concepts, applications and perspectives	3(3+0)

Bot-737	Advances in Plant Physiology	3(3+0)
Bot-738	Advances in Plant Pathology	3(3+0)
Bot-739	Advanced Environmental Biology	3(3+0)
Bot-740	Ecophysiology of Halophytes	3(3+0)
Bot-741	Plant Microbe Interaction	3(3+0)

Table 4.3 **Curriculum course requirements**

Semester	**Course No:**	**Category (Credit Hours)**				
		Maths & Basic Sciences		**Core Courses**	**Humanities & Social Sciences**	**Technical Electives**
		Maths	**Basic Sciences**			
I	**3**	**----**	**---**	3	**----**	**----**
II	3	----	---	3	----	----
Total	6	**----**	**----**	6	**----**	**----**
Minimum Requirements	6	**----**	**----**	6	**----**	**----**

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

Table- 4.4: Courses versus Program Outcomes

Courses or Group of Courses	**Program Outcomes**								
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
Bot-701	√								
Bot-702	√								
Bot-703								√	
Bot-704		√							
Bot-705		√							
Bot-706	√								
Bot-707								√	√
Bot-708	√								
Bot-709		√						√	√
Bot-710	√	√							
Bot-711		√	√	√			√	√	√
Bot-712	√	√						√	
Bot-713	√	√							
Bot-714	√								
Bot-715	√	√						√	√
Bot-716	√								

Bot-717	√	√						√	√
Bot-718	√								
Bot-719		√	√	√	√		√	√	√
Bot-720	√	√							
Bot-721		√	√					√	√
Bot-722									
Bot-723	√	√							
Bot-724	√	√	√	√				√	√
Bot-725	√	√						√	√
Bot-726	√								
Bot-727	√								
Bot-728	√	√							
Bot-729	√								
Bot-730	√								
Bot-731	√	√							
Bot-732	√	√						√	√
Bot-733	√	√						√	√
Bot-734	√	√	√						
Bot-735	√	√	√				√	√	√
Bot-736	√	√						√	√
Bot-737	√	√							
Bot-738	√	√							
Bot-739	√	√							
Bot-740	√	√							
Bot-741	√	√							

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

- Some of the courses include the foundation basic, theoretical background and research design.
- During teaching great stress is lead to research design.
- **Program:** PhD Botany

The courses of PhD program adequately address:

I. Foundation and basic background
II. Theoretical background (Problem analysis)
III. Research design

Table 13: **Elements of Courses**

Elements	Courses	No. of Courses
Theoretical	Bot-701, Bot-702, Bot-706, Bot-707, Bot-708, Bot-709, Bot-710, Bot-714, Bot-715, Bot-716, Bot-717, Bot-718, Bot-720, Bot-721,	31

background	Bot-723, Bot-725, Bot-726, Bot-727, Bot-728, Bot-729, Bot-730, Bot-731, Bot-732, Bot-733, Bot-734, Bot-736, Bot-737 Bot-738, Bot-739, Bot-740, Bot-741	
Problem analysis	Bot-705, Bot-724, Bot-735	3
Research design	Bot-703, Bot-704, Bot-711, Bot-712, Bot-713, Bot-719, Bot-722	7

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 as laid down by Lahore College for Women University and HEC and is 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 program and curriculum has the approval of Board of Studies of Botany, Board of Faculty, Advanced Studies and Research Board and Academic Council of Lahore College for Women University.

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 satisfied 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 Botany, Board of Faculty, Board of Advanced Studies and Research and Academic Council of Lahore College for Women University.

Table A.1 Minimum Requirements for Each Program

Programs	**Maths & Basic Sciences**	**Engineering Topics**	**General Education**	**Others**
PhD Botany	NA	NA	NA	NA

(Program Semester Credit hours)

- Since PhD is an advanced degree in any field the curriculum is in accordance with the HEC policy guidelines for PhD program in Natural Sciences (in general) and Botany (in particular).
- The curriculum is designed keeping in view the latest trends in plant research. The programs and curriculum has the approval of Board of Studies of Botany, Board of Faculty, Board of Advanced Studies and Research and Academic Council of Lahore College for Women University.

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

- The students seeking admission in PhD Botany program during their BS and MS studies learn basic knowledge of IT and other statistical analyses software programs as per requirement of their area of research. During PhD research work students can improve their IT knowledge through seminars and other short courses offered by the university.

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 seminars, conferences, workshops, question answers, debates, class participation and field study trips of the students. Furthermore, class participation involves the individual student presentations in each course.
- During course work students have to give frequent presentations that also help them significantly to develop oral communication skills.
- PhD students have to present their synopsis before members of BOS and ASRB that boosts their confidence. They also have to deliver seminar in defense of their thesis as a prerequisite of their degree.

CRITERION 3
LABORATORIES AND COMPUTING FACILITIES

Department of Botany has 7 teaching and research laboratories all located in Post Graduate Block (PG I).

Location of labs: Department of Botany, post Graduate Block, LCWUL

Safety rules: Safety rules are displayed in the labs

Software available: All statistical and research relevant soft wares are provided to the student in the laboratory

Courses Taught: All the special courses offered by faculty are taught in the respective research laboratories

These laboratories are regularly used for

- Teaching specialized courses at BS, MS and PhD level.
- For carrying out research at BS, MS and PhD level.
- Laboratory practicals of different classes.
- To carry out research projects funded by HEC and other funding agencies.
- All the laboratories are provided with basic equipment as per specialization and requirement of the laboratories.
- Laboratory safety protocols / manuals and manuals for each equipment are available in each lab for student consultation.
- The laboratories are shared by faculty members of Botany Department which also use these labs for carrying out their official duties since there are no offices allocated to the faculty.

Laboratory Title	Objectives	Major Equipment		
Molecular Genetics and Biotechnology Lab	Students are equipped with molecular and plant biotechnology techniques	Autoclave Centrifuge machine Fluorescence microscope Hot air oven Drying oven Shaker	Hot plate Incubator Mini gel electrophoresis Oven PCR Machine pH meter	Refrigerator Spectrophotometer UV transilluminator Vortex mixer Weighing balance
Phytochemistry Lab	Students are equipped with Phytochemistry techniques	Chiller Colony counter Compound microscopes EC meter Growth chamber Hot air over (Bench top) Incubator Laminar air flow chamber	Lux meter Micropipettes pH meter Printer Refrigerator Rotary Evaporator Soxhlet apparatus Stereo binocular microscope Student microscopes	Thin Layer Chromatography Apparatus Vacuum pump Water bath Water distillation plant Weighing balance
Mycology and Industrial Biotechnology Lab	Students are equipped with Mycology and Industrial Biotechnology techniques	Colony counter Electric stirrer Magnetic stirrer Digital balance	Vortex mixer Laminar air flow cabinet Autoclave Shaking incubator	Refrigerator Fermenter Oven Microscopes
Molecular Taxonomy Lab	Students are equipped with Molecular Taxonomy techniques	Microtomes Water bath pH meter Shaker Oven	Magnetic stirrer Soxhlet apparatus Gel electrophoresis unit Microscopes Laminar air flow cabinet	PCR machine Centrifuge machine UV transilluninator Weighing balance Distillation unit

Plant Physiology and Fungal Biotechnology Lab	Students are equipped with Plant Physiology and Fungal Biotechnology techniques	Drying oven Weighing balance Centrifuge machine Osmometer	Water bath Autoclave Water distillation unit	Conductivity meter Magnetic stirrer IRGA Refrigerator
Plant Taxonomy Lab	Students are equipped with Plant Taxonomy techniques	Weighing balance Sledge microtome Rotary microtome Microscopes	Water bath Hot plate Autoclave Soxhlet apparatus	Incubator Desiccator UV Lamp
Tissue Culture and Biochemistry Lab	Students are equipped with Tissue Culture and Biochemistry techniques	Microwave Weighing balance Light Microscope	Laminar air flow cabinet Soxhlet apparatus	Microwave assisted extractor Fridge

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

- In PhD program the research activities are carried out under the supervision of respective supervisors following standard protocols. Instructions to the students are available with the Faculty members and they are made accessible to the students. Overall resources are less as compared to the similar departments in reputable institutions.
- Fire extinguishers and safety equipment have been made available to fulfill the safety regulations.

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

- Two Lecturer Assistants and four Laboratory attendants are available in the department which help PhD students in getting their materials (glassware and chemicals) from Department store.
- In Department of Botany the research labs are without support personnel. However, the relative faculty members are incharge of each research lab and always available for the students.
- There is a well equipped Central Research Lab of the university with adequate support personnel available full time for the PhD students.

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

- The computing infrastructure is present for the students (Natural Sciences Computer Lab). The computer laboratory has 50 computers (P-IV) for the use of the students. The number of computers is constantly under review.
- The university provides internet facility to the students as well as faculty members.
- Department has two multimedia that can be used by students and faculty members.

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. All courses of Botany are offered twice a year (spring semester and fall semester). The department offers courses following the academic calendar of LCWU.
- Courses are offered in two semesters (of 9 credit hours) to fulfill the minimum credit hour criteria of HEC (18 Credit hours).
- In PhD Botany there are no courses that are offered outside the department. All the courses are successfully managed by the faculty of the Department.

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

- In Botany Department each faculty member is allocated for a full course and no course is offered on shared basis. This ensures strong interaction between the student and the faculty.
- The program is structured to ensure effective interaction between students and faculty through lectures, student presentations, question answer sessions, quiz etc.

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:

1. Students get informed about program requirement at the time of admission through prospectus as eligibility criteria.
2. After admission an orientation session is organized by the department in which the chairperson introduces all the students with faculty and briefly informs them about the program requirements.
3. A faculty member is appointed as “PhD Coordinator” who guides the students and facilitates them during the program from admission till award of degree.
4. Student guideline booklets are provided by the University which help the students to understand the processes and procedures to get through the program.
5. University has its own Career Counseling and Job Placement (CCJP) centre where qualified staff provides assistance to students regarding jobs, personal problems and

issues related to studies and university administration. Any student requiring help can easily access the student counseling centre.

6. Seminars and lectures are arranged by QEC and CCJP in which renowned professionals guide the students regarding career planning related to their field of specialization.
7. Students are also provided international exposure in their research areas.

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:

- The Department of Botany follows the policy of Lahore College for Women University for admission in PhD degree program as described in the prospectus and following the guidelines of HEC. A candidate seeking admission in PhD Botany program should have completed 18 years of education with minimum CGPA 3.00/4.00 in MS Botany and with no 3rd division.
- All the applicants have to appear in University entry test and have to get 50% marks to qualify for the interview. Only the applicants who qualify the written test and interview are eligible to get admission in PhD program.

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 for admissions are made in leading newspapers and on Lahore College for Women University website. A candidate seeking admission in PhD Botany program should
    1. Have completed 18 years of education with minimum CGPA 3.00/4.00 in MS Botany.
    2. Have qualified National Testing Service (NTS) examination or equivalent (University PhD entry test) with a score of 50.
- The students are registered in the program twice a year, *i.e.*, in spring semester (February) and in fall semester (September).
- The student academic progress is monitored regularly by the Course 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 recruitment of faculty is done following the policy of HEC for hiring of university teachers.
- The standards are clearly indicated in the University statutes which are followed. Qualifications which are required for each course are kept in mind. The criteria for recruiting are qualification, experience and publications.
- In case of permanent faculty members, the recruiting is done by Selection Board constituted by Lahore College for Women University whereas; visiting faculty members are recruited by a board constituted by the Institute.
- Appointments on Tenure Track System with better incentive/attractive salary package are regularly made.
- Excellent working environment is provided in the department with research labs equipped with all the basic requirements for carrying out research activities at PhD level.
- 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 faculty member and retention of the faculty members, their increment and promotion are based on ACRs.
- The university also ensures fair, timely selection and promotion/appointment following HEC criteria.
- The faculty members performing well are rewarded by increment and honorariums. Good working conditions provide 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:

- The process and procedure to ensure that the teaching and delivery of the program material to the students emphasizes active learning. For instance, exercises based on practicality of the knowledge given to the students and research laboratories initiated at the end of the program. Process is monitored and assessed regularly.
- To ensure active learning and to achieve program objectives following steps are considered:

- Time table is strictly followed by the faculty members.
- QEC gets feedback from the students through faculty survey forms and course evaluation questionnaire during each semester.
- Courses are regularly updated as and when required to keep the students up to date with current knowledge in different fields of plant sciences.

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 Botany Department and QEC and the Head of Department ensure their compliance.
- The department ensures that the students are punctual during course work and maintain 75% attendance as per university rules.
- Department strictly follows the policy guidelines of HEC for award of PhD degree. For student of PhD course work of 18 credit hours is compulsory followed by comprehensive examination.
- For research work the synopsis needs approval from Board of Studies (BOS) of Botany department, Board of Faculty (BoF) and Advanced Study and Research Board (ASRB) of LCWU.
- For award of PhD degree the scholar should have published at least one paper in an HEC recognized impact factor journal.

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:

- The department of Botany is currently has 18 faculty members out of which 14 faculty members have PhD degree. All the faculty members have specialization in various fields of Botany related to research in plant sciences and fulfill the requirement of courses taught in PhD program.
- There is adequate full time faculty supplemented by visiting 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 module forming a part of the program. The level of competency of the faculty members are evaluated at time of induction and monitored during teaching.

Table 4.6: Faculty Distribution by Program Areas (PhD Botany)

Program Area of specialization	Courses in the Area and Average Number of Sections per year	Number of faculty members in each area	Number of faculty with Ph.D. degree
Molecular Genetics and Biotechnology	Biotechnology Recombinant DNA Technology Principles and Techniques of Molecular Biology Biotechnology: its Techniques and Applications Biotechnological Phytoremediation Environmental Biotechnology Principles and Techniques of Molecular Biology Advanced Environmental Biology	**01**	**01**
Phytochemistry	Biochemistry of Plant Phenolics Bioactive Principles of Medicinal Plants	**01**	**01**

	Plant Terpenoids Phytochemistry Phytomedicine Medicinal Plants of Pakistan Bioassay Techniques in Plant studies		
Industrial Biotechnology	Bioprocessing Fermentation Technology	**01**	**01**
Molecular Taxonomy	Molecular Advances in Phytosystematics Forensic Biology	**01**	**01**
Plant Taxonomy	Recent Trends in Ethnobotany Medicinal Plants of Pakistan	**01**	**01**
Plant Physiology	Stress Physiology Advances in Plant Physiology Ecophysiology of Halophytes	**02**	**01**
Mycology	Advances in Plant Pathology Essential of Microbiology Advances in Microbial Genetics Fungal Biotechnology Plant Microbe Interaction	**03**	**03**
Plant Tissue Culture and Biochemistry	Basic Concepts in Enzymology Chemistry of Biomolecules Protein Purification Plant Proteomics Nano Biotechnology: Concepts, Applications and Perspectives	**01**	**01**
Plant Biotechnology	Plant Tissue Culture Commercial Application of Plant Tissue Culture Industrial Production of Secondary Metabolites	**04**	**03**
Plant virology		**01**	**01**

* All the faculty resumes are attached in appendix ____ for ready reference.

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 their disciplines and sufficient time is provided for scholarly activities and professional development. Effective program for faculty

development is in place. They are provided centralized training through DFDI, QEC and ORIC in collaboration with HEC.

- They are encouraged to attend international seminars, workshops and conferences through providing them travel grants.
- Faculty members are awarded with research incentives for their outstanding research activities.
- Publications in HEC recognized journals are required in case of Natural Sciences for award of research incentive.
- University offers refund of publication fee for publications in HEC recognized impact factor journals.
- Faculty members also avail international fellowships on self-help basis.

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

- Frequent trainings for up gradation of faculty through lectures and workshops organized by the university
- Travel grants are available for the faculty members to attend conferences / workshops / seminars at national and international level.
- Incentive for paper publication in national and international journals (starting from 2015).
- Providing good working environment for both teaching and research.
- The faculty members are regularly 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

- Institutional facilities such as library, class rooms and research laboratories are adequate enough to support the program objectives.
- Department has established its own Library in collaboration with Al-Iffat Foundation.
- A central science library is present with adequate number of books related to different fields of Botany. Internet facility is also available in the department for faculty members and students.
- Both faculty and students have access to Digital Library provided by Higher Education Commission from where international research journals and research articles of interest can be downloaded.

1) Academic Building: (Dedicated/Owned)

i.	Class rooms:	05
ii.	General Labs:	02
iii.	Research Labs:	07
iv.	Seminar Room:	01
v.	Committee Room:	01
vi.	Library	01
vii.	HOD Office	01
viii.	Main Staff Room	01

2) Botanical Garden (main campus) 01

3) Video conferencing room --

4) Convocation Hall (capacity: 1300) --

5) Meeting / conference rooms Seminar room (Student Service Centre)

6) Student Hostels

7) Visiting Faculty Hostel

8) Sports Facilities:

a) Gymnasium
b) Play ground
c) Table Tennis

9) Transport

a) Busses
b) Coasters
c) Vans

d) Ambulance
e) Cars
f) Tractor/trolly

10) Health Centre

11) Day care centre (to accommodate children of Faculty, Staff and Students)

12) Masjid

13) Student Counseling Centre

14) Placement Bureau

15) Cafeteria

16) Fruit/juice shop

17) Book Shop

18) Faculty & Staff parking facility

19) Research facilities:

For research activities a well equipped Central Research Lab is present with latest equipment and facilities accessible to students of different departments. The department has basic equipment specifically related to plant research.

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:

- Department of Botany has established its own library in collaboration with Iffat Bokhari foundation. There is also a Central Science Library for Faculty of Natural Sciences. The libraries have adequate number of books related to academic and research needs of the Ph.D. program of the department.
- University also provides the facility of HEC Digital Library.
- Main Library
- Science Library
- Departmental Library
    - No. of Hardcopy Books:11292 (Science library)
    - Core Botany Books: 473 (Science library)
        - Digital Library (Through HEC)
        - Access to E - Books
        - Journals: Access to ACM, IEEE, Science direct, Springer Link etc. through HEC.
        - Book Bank: Exists (works under Student Service Centre)
        - Library Equipment

- Computers
- Scanner
- Photocopier
- Printer
- Timings: 8:00 A.M. to 6:00 P.M.

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

- Class rooms of the department are without multimedia. However, two multimedia projectors are available in the department and are used by the faculty members on shared basis as and when required. There are two general labs for practical activities of graduate and post graduate students. There is no common room available for the students. The department also uses its Research Laboratories for teaching purpose for Ph.D. students.

Adequacy of faculty offices

- There are no individual offices for faculty in the department. Faculty members perform their official duties in the research labs that are shared by 2-3 faculty members each.

CRITERION 8

INSTITUTIONAL SUPPORT

Appropriate support from the university in terms of infra structure and financial resources, is provided to the department to run the program successfully. This has provided an environment in which the program can achieve its objectives and retain its strength.

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 and Higher Education Commission of Pakistan.
- For faculty development the Directorate of Faculty Development (DFDI) is established that organizes different training, workshops and seminars for the faculty members in collaboration with HEC and ORIC. Faculty members are also encouraged to attend trainings and workshops in other institutions as well.
- Faculty Pay is as per the rules for public sector universities.
- Secretarial support is not adequate. Although office equipment is available for printing purposes etc

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

There is an adequate number of graduate and PhD students, while research assistants in the departments are only hired under some sponsored projects.

Program	**2016**	**2017**	**2018**
Graduate Students	23	27-1	23
Research assistants	1	-	1
Ph.D students	34	40	45

Table showing the number of students enrolled in Ph.D. degree program of Department of Botany, LCWU

Sr. No	**Year**	**No. of Ph.D. students**	**No. of Faculty Members**	**Student-Faculty ratio**
1.	2016	34	11	3.1
2.	2017	40	14	2.85
3.	2018	45	14	3.21

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

- The financial matters of Department of Botany are managed by the Vice Chancellor office, Treasurer Office, Registrar office and Planning and Development department. Each PhD student is allocated a sum of amount Rs. 160000/- per annum for two years and Rs. 80000/- in the third year by the University to carryout research activities.
- There are no financial resources provided for library and computing facility in the department.