DEPARTMENT OF <u>MATHEMATICS</u>

LAHORE COLLEGE FOR WOMEN UNIVERSITY, LAHORE

SELF-ASSESSMENT REPORT

<u>PhD</u>

Submitted to

Quality Enhancement Cell,

Lahore College for Women University, Lahore

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CRITERION 1: PROGRAM MISSION, OBJECTIVES AND OUTCOMES

Standard 1-1: The program must have documented measurable objectives that support college and institution mission statements.

- Document institution, college and program mission statements.

   LCWU MISSION STATEMENT:

   "To provide quality education to empower women through knowledge and skills so as to participate actively in the socio-economic development of Pakistan; as well as to impact the attitudes and beliefs of its graduates through various programs and activities to emerge as responsible, peaceful and tolerant citizens of the world."

   www.lcwu.edu.pk

- State program objectives. Program educational objectives are intended to be statements that describe the expected accomplishments of graduates during the first several years following graduation from the program.

   The PhD Mathematics Program of Lahore College for Women University, Lahore is a three to five year program aligned with HEC guidelines, international standards and motherland's highly professional manpower requirements. It initiates with one year course work of 18 credit hours, comprehensive examination(qualifying examination for PhD candidacy) followed by the research work. The research work is assessed through seminars, conferences and workshop participations; research publications in HEC recognized journals, and finally evaluation of PhD thesis through foreign evaluations.

   The objective of PhD Mathematics program is
   1. to equip the PhD students with the innovative research skills of international standards in the areas of Applied Mathematics/Computational Mathematics/Pure Mathematics so that the successful graduates can serve nationally as well as globally through the best of knowledge, skills and ethics.

- Describe how each objective is aligned with program, college and institution mission statements.

   The objective of PhD Mathematics Program is completely aligned with the mission of university. The graduates who justify the said standards can easily put their share in academia (university teaching), research organization and industry as a part of research project group. Their genuine contributions in these capacities can act as catalyst for the socio-economic development of the country.

- Outline the main elements of the strategic plan to achieve the program mission and objectives.

Steps	Strategic Plan
Step-I	The candidates who have obtained Minimum 3.0 CGPA in (Semester System) or 60% Marks in M.Phil/MS Mathematics(2-Year) Program can apply for admission in PhD Mathematics
Step-II	Entry Test of 100 Marks with qualifying marks 60%.
Step-III	Admission in PhD Mathematics Program after qualifying entry test.

Step-IV	Course work of one year(Semester-I and II) with six papers of total 18 Cr. Hrs.
Step-V	Comprehensive Examination after two semesters.
Step-VI	Synopsis Writing.
Step-VII	Approval of synopsis by DPCC Mathematics.
Step-VIII	Approval of synopsis by BoS Mathematics.
Step-IX	Approval of synopsis by faculty board and ASRB.
Step-X	PhD Candidacy, research work and at least one publication in HEC recognized journal.
Step-XI	Thesis Writing.
Step-XII	Thesis evaluation by Foreign Examiners of technologically advanced countries (as per criteria provided by HEC).
Step-XIII	Public Defence and Viva Voce Examination by Local Examiners(as per criteria provided by HEC).
Step-XIV	Degree Awarding and Convocation.

- Provide for each objective how it was measured when it was measured and improvements identified and made. Table 4.1 provides a format for program objectives assessment.

Objectives	How Measured	When Measured	Improvements Identified (Based on outcome Examination)	Improvements Made
Awareness of Core Concepts	Assignments Exams, Quizzes Projects for course work	During and at the end of semester	There is no separate room for Ph.D. students.	Utilized free slots of rooms for BS/MS classes
Qualifying for research	Comprehensive Examination after Course Work	After 2nd semester		Students have a comprehensive knowledge of the subject.
Quantifying the research	Synopsis Evaluation at different level (DPCC, BoS, FB, ASRB)	After 6-9 months of comprehensive examination	No workstation/ laboratory for research students. They have to do their research work in library or computer lab for BS students. The students have to vacate the lab at the time of BS classes assigned in computer lab.	.
Practical Skills & tools	Academic Projects, Lab Assignments	After six months	Insufficient knowledge of the Software.	Training workshops are conducted.
Professional Practice &	Meeting with supervisor.	After one week.	No proper place for the meeting.	

Ethics	Progress Review Form by QEC			
Research Culture	Papers published, papers presented in conferences, research tours, research collaboration and regular seminars	During research and before the submission of draft copies of the thesis.	Sponsored research projects with private and public sector, active research groups.	
Performance evaluation	Survey of Department offering PhD	After each one year		
	Student course evaluation questionnaire	After each one year		
	Teachers evaluation form	After each one year		
	Survey of department offering PhD	After each one year		
	Department annual report Proforma	After each one year		
	Research proforma by Directorate of research(record of research publication, monographs, conferences, seminars and workshops)	After six months		
Originality of research	The Plagiarism Test	Before submission of draft copies of the thesis.		
Thesis submission	Thesis Evaluation by Foreign Examiners	After clearance of PhD Thesis by ASRB		
Thesis defense	Seminar and Viva-Voce Examination by Local Examiners	After positive evaluation reports by foreign examiners	Need a departmental seminar room.	

Table 4.1 Program Objectives Assessment

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.

Outcomes of PhD Mathematics Program LCWU, Lahore

After completing the PhD Mathematics Program, the students will be able to:

1. fully understand the core concepts of the subject, and serve as teachers/supervisors in universities;
2. apply computational skills effectively in various disciplines of computational and mathematical sciences;
3. efficiently contribute in applied sciences, astronomy and engineering, The students follow professional ethics to carry out their assignments;
4. produce researchers of international standards locally;
5. serve as researchers in industries and research organizations;
6. set the research projects for socio-economic growth of country;
7. emerge as responsible and tolerant individuals.

- Describe how the Program Outcomes support the Program Objectives. In Table 4.2 show the outcomes that are aligned with each objective.

Program Objectives	Program Outcomes						
	1	**2**	**3**	**4**	**5**	**6**	**7**
1	×	×	×				
2	×	×	×				
3	×	×	×	×	×	×	×
4		×	×	×	×	×	
5				×	×	×	×
6	×	×	×	×	×		
7						×	×
8	×	×	×	×	×	×	×
9	×	×	×	×	×	×	×
10							×

Table 4.2: Outcomes versus Objectives

- Describe the means for assessing the extent to which graduates are performing the stated program outcomes/learning objectives.

(i) By following the criteria devised by HEC, Pakistan for PhD Program.
(ii) By following the rules approved by ASRB and Academic Council of LCWU, Lahore.
(iii) By responding to the Departmental Six Monthly Progress Report Proforma for PhD Students.
(iv) By responding to the proformas designed by QEC, LCWU for evaluation of PhD Mathematics Program, LCWU, Lahore.

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

Describe the actions taken based on results of periodic assessments.

- Describe major future program improvements plans based on recent assessments.
  - In future the Department has planned to introduce the following areas of research for PhD Mathematics:
  (i) Simple Ergodic Theory (ii) Optimization Theory (iii) Combinatorial Mathematics (iv) Computational Fluid Dynamics(PDES context)

  - Establishment of seminar room for PhD Mathematics
  - Establish of separate research room for PhD Mathematics.
  - Establishment of research collaborations.

- List strengths and weaknesses of the program.
  - Strength: (i) The PhD Mathematics Program of Department of Mathematics, LCWU, Lahore, is approved by HEC, Pakistan.
  (ii) Highly professional and experienced PhD faculty.
  (iii) The PhD Mathematics Program is a regular program. It saves the time of research students.
  (iv) HEC criteria for award of PhD Degree are fulfilled. Therefore the successful graduates are acceptable globally.
  (v) Hostel facility for PhD students.
  (vi) Library.

  - Weakness: (i) There is no separate room for PhD students.
  (iii) Unavailability of PhD seminar room.

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

1.4.1 Performance Measures:

Ta**ble 3: No. of Students Enrolled**

Program	Session	No. of Students
P.hD	2013-2017	Nil
	2014-2018	01
	2015-2019	01

ii)   Table 4: Student-Faculty Ratio

Year	No. of Students	No. of Faculty Members	Student-Faculty ratio
2014-2015	01	06	1:6
2013-2014	Nil	Nil	Nil
2012- 2013	Nil	Nil	Nil

iii) **Table 5: <u>No. of Students Passed Out: <u>Nil</u></u>**

Program	Passing out Year	No. of Students
PhD	2015	Nil
	2014	Nil
	2013	Nil
	2012	Nil

IV) **Table 6:<u>Percentage of Honor Students & Attrition Rate</u>**

Year	%age of Honor Students **Criteria:** CGPA 3.75 and above	Attrition Rate (Admitted –pass out) *100 Admitted
2015	01(Course work)	Zero %
2014	01(Course work)	Zero %
2013	___	___
2012	___	___

v) **Table 7: <u>Faculty Training, Seminars and workshops (Appendix A)</u>**

Year	No. of Trainings, Seminars and workshops
2013	Nil
2014	Nil
2015	Two workshops and four trainings

vi) **<u>Papers Published at National & International Level</u>**

Table 8: <u>Number of Publications (Appendix B)</u>

Year	Papers published
2015	7
2014	21
2013	05
2012	11

vii) **<u>Books in Library:</u>**
The total number of books in Library are 975.

Research Areas

The Faculty is involved in research in the following areas:

Name of Faculty Member	Area of research
Dr. Imrana Kousar	Graph Theory, Algebraic Number Theory
Dr. Misbah Irshad	CAGD, Soft Computing, Digital Image Processing
Dr. Maria Hussain	CAGD(Computer Aided Geometric Design)
Dr. Uzma Bashir	CAGD/Geometric Modelling
Dr. Shazia Javed	Digital Signal Processing, Optimization Theory
Dr. Tahira Sumbal Shaikh	CAGD(Computer Aided Geometric Design)
Dr. Salma Kanwal	Graph Theory
Dr. Saima Kamran	Graph Theory
Dr. Sehrish Iftikhar	General Relativity & Quantum Cosmology

Collaborations: <u>Nil</u>

<u>Departmental Achievements (others).</u>

Three of the staff members availed travel grants to participate in workshops and international conferences.

<u>Honors and Awards:</u> <u>Nil</u>

<u>CRITERION 2: CURRICULUM DESIGN AND ORGANIZATION</u>

Title of degree program:
PhD Mathematics

PhD Curriculum:

The curriculum for Ph.D. Mathematics is designed according to the detailed curriculum development guidelines issued by HEC.

Scheme of Study for Ph.D. Mathematics comprises two semesters of reading courses (18 Credit Hours*) followed by research work.

Semester I (09 Credit Hours)		Semester II (09 Credit Hours)		Semester III – Semester IV
01 Course from Annexure A	03	01 Course from Annexure A	03	
01 Course from Annexure B or C	03	01 Course from Annexure B or C	03	Comprehensive + Thesis
01 Course from AnnexureB or C	03	01 Course from AnnexureB or C	03	

List of courses for Ph.D. Mathematics:

	Course Code	Course Title with Details	Credit Hours
ANNEXURE A	Math-701	Advanced Functional Analysis AvancedFuctioanl Analysis.docx	3(3+0)
	Math-702	Advanced Numerical Analysis Advanced Numerical Analysis.docx	3(3+0)
	Math-703	Special Theory of Relativity Special Theory of Relativity.docx	3(3+0)
	Math-704	Riemannian Geometry Riemannian Geometry.docx	3(3+0)
	Math-705	Operations Research Operations Research.docx	3(3+0)
	Math-706	Research Methodology	3(3+0)
	Math-707	Algebraic Topology Algebraic Topology.docx	3(3+0)
	Math-708	Advanced Mathematical Physics Advanced MATHEMATICAL PHYSICS.docx	3(3+0)
	Math-709	Research Reading	3(3+0)
ANNEXURE B **(Pure Mathematics)**	Math-710	Advanced Group Theory-I Advanced Group Theory I.docx	3(3+0)
	Math-711	Advanced Group Theory-II Advanced Group Theory II.docx	3(3+0)
	Math-712	Topological Vector Spaces Topological Vector Spaces.docx	3(3+0)
	Math-713	Algebraic Number Theory Algebraic Number Theory.docx	3(3+0)
	Math-714	Theory of Rings and Modules Rings & Modules.docx	3(3+0)
	Math-715	Field Extension and Galois Theory Field Extensions and Galois Theory.docx	3(3+0)
	Math-716	Lattices and Boolean Algebra Lattices and Bolean Algebras.docx	3(3+0)
ANNEXURE C **(Computational Mathematics)**	Math-717	Design Theory DESIGN THEORY.docx	3(3+0)
	Math-718	Numerical Solutions of PDEs Numerical solution of PDE's.docx	3(3+0)
	Math-720	General Theory of Relativity General Theory of Relativity.docx	3(3+0)
	Math-721	Computer Aided Geometric Design CAGD.docx	3(3+0)
	Math-722	Optimization Theory Optimization Theory.docx	3(3+0)
	Math-723	Approximation Theory Approximation theory.docx	3(3+0)
	Math-724	Numerical Solutions of Integral Equations numerical solution of integral eq.docx	3(3+0)
	Math-725	Advanced Graph Theory Advanced GRAPH THEORY.docx	3(3+0)
	Math-726	Combinatorics COMBINATORICS.docx	3(3+0)
	Math-727	Perturbation Techniques PERTURBATION techniques.docx	3(3+0)

Curriculum distribution:

Table 4.3 shows curriculum distribution of mathematics

Semester	Course No:	Category (Credit Hours)			
		Annexure A	**Annexure B**	**Annexure C**	**Thesis**
I	Math-702	3			
I	Math-721			3	
I	Math-727			3	
II	Math-709	3			
II	Math-715		3		
II	Math-722			3	
III-IV					
Total		6	3	9	
Minimum Requirements	-	-	-	-	

Table 4.3 **Curriculum course requirements**

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

- T**he program content (courses) meets the program objectives**:
  The courses are designed according to the need of the day and to equip the PhD students with the innovative research skills of international standards in the areas of Applied Mathematics/Computational Mathematics/Pure Mathematics so that the successful graduates can serve nationally as well as globally through the best of knowledge, skills and ethics.

- Complete the **Table 4.4 linking courses to program outcomes**. List the courses and tick against relevant outcomes. A sample of such a matrix is shown below.

Courses or Group of Courses	Program Outcomes						
	1	**2**	**3**	**4**	**5**	**6**	**7**
ANNEXURE A	×			×	×	×	×
ANNEXURE B	×			×			×
ANNEXURE C		×	×	×	×		×

Table- 4.4: Courses versus Program Outcomes

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

Table 13: <u>Elements of Courses</u>

Elements	**Courses (with codes)**	**No of Courses**
Theoretical background	Special Theory of Relativity (Math-703) Advanced Group Theory-I (Math-710) Advanced Group Theory-II (Math-711) Theory of Rings and Modules (Math-714) Lattices and Boolean Algebra (Math-716)	05
Problem solving and Solution design	Advanced Functional Analysis (Math-701) Advanced Numerical Analysis (Math-702) Riemannian Geometry (Math-704) Operations Research (Math-705) Research Methodology (Math-706) Algebraic Topology (Math-707) Advanced Mathematical Physics (Math-708) Research Reading (Math-709) Topological Vector Spaces (Math-712) Algebraic Number Theory (Math-713) Field Extension and Galois Theory (Math-715) Design Theory (Math-717) Numerical Solutions of PDEs (Math-718) General Theory of Relativity (Math-720) Computer Aided Geometric Design (Math-721) Optimization Theory (Math-722) Approximation Theory (Math-723) Numerical Solutions of Integral Equations (Math-724) Advanced Graph Theory (Math-725) Combinatorics (Math-726) Perturbation Techniques (Math-727)	20

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

The Ph.D. program comprises of 18 credits hours of course work, a comprehensive exam and a research thesis which meets HEC requirement.

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

The curriculum satisfies all the requirements of HEC for the Ph.D. in Mathematics program

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.

Not Applicable.

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

IT Components	Courses (with codes)	No of Courses
Require Matlab/ Mathematica /Maple	Advanced Numerical Analysis (Math-702) Numerical Solutions of PDEs (Math-718) Computer Aided Geometric Design (Math-721) Optimization Theory (Math-722) Numerical Solutions of Integral Equations (Math-724)	05

- These courses require skills of programming languages such as Matlab, Mathematica and Maple for numerical experiments and modelling applications.

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

- The seminar presented by students, and their participation in conferences, workshops and seminars improve their oral communication skills.

- The written communication skills are improved by research paper writing for journals of high academic standards and conference publications.

- The course of research methodology is designed to teach the students how to do productive research and to enhance their skills of academic writing.

CRITERION 3: LABORATORIES AND COMPUTING FACILITIES

There is laboratory for Ph.D. research students. They have to do their research work in library or computer lab of BS students. The students have to vacate the lab at the time of BS classes assigned in computer lab. The lab computers have registered version of Microsoft Office and Mathematica that is helpful for Ph.D. research students. However, they need registered versions of other software too. The most needed are:

- Matlab;
- Latex.

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

- The students and faculty have adequate and timely access to the Springer and Elsevier.
- Ph.D. research students use the lab of undergraduate (BS) students that consists of 40 computers, having latest version of windows installed in them along with some registered software like Microsoft Office and Mathematica.
- The Ph.D. students don't have any research room, neither are they are offered any work station or computer laboratory by the department. The facilities provided to research students are not sufficient as compared to similar departments in reputable institutions.

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

- Indicate for each laboratory, support personnel, level of support, nature and extent of instructional support .

The Computer Lab was established in 2017 but it lacked a Computer Lab Supervisor. The smooth lecturing of computing courses needs a lab assistant during practical hours. Unfortunately it is very hard for a course tutor to help out a class of 20 and above in an hour or two. Moreover the maintenance and security of the lab is hard to assure specially when it is shared by BS, MS as well as PhD students.

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

- Describe how the computing facilities support the computing component of your program.
- Benchmark with similar departments in reputable institutions to identify short comings in computing infrastructure and facilities if any

It is good to share that the computers installed in Computer Lab of Mathematics Department are equipped with latest hardwares and Directorate of Information Technology helps out to fulfill the software requirements. However the students of PhD Mathematics Program demand for separate PhD Research Lab in comparison to the others universities. They students claim that a good infrastructure will boast their research ability as well as it will encourage the others to be a part of LCWU PhD Mathematics Students fraternity.

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:

- Provide the department's strategy for course offerings.
- Explain how often required courses are offered.
- Explain how often elective courses are offered.
- Explain how required courses outside the department are managed to be offered in sufficient number and frequency.

At present the Department of Mathematics has designed 31 courses in the areas of Pure Mathematics and Computational Mathematics/Applied Mathematics. It also includes the core courses. The courses are offered according to the area of specialization of the PhD students. The PhD students of same session may read different courses according to their areas of specialization. Area of specialization for PhD research is offered keeping in view of the student interest and availability of the faculty. At present the Department of Mathematics is offering sufficient areas of specialization for PhD so the courses outside the Department are not needed.

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

- Describe how you achieve effective student/faculty interaction in courses taught by more than one person such as two faculty members, a faculty member and a teaching assistant or a lecturer.

In PhD a course is taught by one faculty member. There is no concept of teaching assistant for PhD teaching.

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:

- Describe how students are informed about program requirements.
- Describe the advising system and indicate how its effectiveness is measured.
- Describe the student counseling system and how students get professional counseling when needed.
- Indicate if students have access to professional counseling; when necessary.
- Describe opportunities available for students to interact with practitioners and to have membership in technical and professional societies.

- The Admission of PhD Mathematics Program is advertised in daily newspapers twice a year(Autumn and Spring). All the requirements for PhD admission are conveyed through the advertisement. After clearing test the candidates are briefed about the next steps through PhD Coordinators and HOD. The orientation sessions are also arranged at the first day of the university.
- The advising system is provided by HOD, PhD Coordinator, senior PhD faculty and concerned PhD supervisor. It is measured through supervisory reports and overall conduct. The overall performance is monitored through different yard sticks such as six monthly report, QEC proformas for PhD scholars etc.
- Counseling and professional counseling is made available through different centers (trauma control center, job placement and career counseling center) established by LCWU. Moreover, the meeting of PhD students with PhD coordinators and HOD are arranged on regular basis.
- As discussed earlier, the administration has established counseling centers for students' facilitation.
- The department encourages the participation of students in conference and it is the part of their six monthly evaluations.

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:

- Describe the program admission criteria at the institutional level, faculty or department if applicable.
- Describe policy regarding program/credit transfer.
- Indicate how frequently the admission criteria are evaluated and if the evaluation results are used to improve the process.

The Department of Mathematics works under the guidelines of ASRB and University PhD Program Coordinate Committee. The PhD admission is based on previous academic performance, entry test and interview.

University transfer is not advisable in PhD studies so no credit transfer rules.

The admission criteria are evaluated six monthly before advertising the PhD Admission.

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:

- Describe how students are registered in the program.

- Describe how student's academic progress is monitored and how their program of study is verified to adhere to the degree requirements.

- Indicate how frequently the process of registration and monitoring are evaluated and if the evaluation results are used to improve the process.

The students are registered after qualifying admission test and interview. The academic progress of students is monitored through the Progress Reports (Six monthly). The program of study is verified through University ASRB and QEC evaluation. The synopsis and PhD thesis is processed through ASRB. All the documents are shared with HEC for enrollment in PhD Current Directory.

Almost after every six month through the meeting of University PhD Program Coordinate Committee before PhD 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:

- Describe the process used to ensure that highly qualified faculty is recruited to the program.
- Indicate methods used to retain excellent faculty members.
- Indicate how evaluation and promotion processes are in line with institution mission statement.
- Indicate how frequently this process in evaluated and if the evaluation results are used to improve the process.

The faculty is hired through selection board. The members are eminent educationalist and administrators. The minimum qualification for appointment of Lecturer is M.Phil.

The excellent faculty members are retained through the timely upgrading through selection board, research paper incentives, best teacher award.

The process is improved on the basis of faculty feedback and performance.

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:

- Describe the process and procedures used to ensure that teaching and delivery of course material is effective and focus on students learning.
- Indicate how frequently this process is evaluated and if the evaluation results are used to improve the process.

Yes, each faculty has a strong monitoring system consisting of Dean, QEC Team, Head of the Department and Director Academic. The students' performance is evaluated through Quizzes, Assignments, Seminars, Conference Participation and Term Papers. The students' feedback is received through proformas and direct interaction for setting the new strategy.

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.

- Describe the procedures used to ensure that graduated meet the program requirements.

- Describe when this procedure is evaluated and whether the results of this evaluation are used to improve the process

The performance of students' is evaluated through Departmental DPCC, QEC and ASRB under the HEC guidelines.

CRITERION 6: FACULTY

Standard 6.1: There must be enough full time faculty 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:

- Complete the following table indicating program areas and number of faculty in each area.
- Each faculty member should complete a resume.

- Information recorded in Table 4.6 and faculty member's resumes will be sufficient to validate standard 6-1.

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
Area 1. Graph Theory	As per requirement	03	03
Area 2. Computer Aided Geometric Design	As per requirement	03	03
Area 3. Image Processing	As per requirement	01	01
Area 4. Signal Processing	As per requirement	01	01
Area 5. General Relativity and Quantum Theory	As per requirement	02	02
Total 5	As per requirement	10	10

Table 4.6: Faculty Distribution by Program Areas

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:

- Describe the criteria for faculty to be deemed current in the discipline and based on these criteria and information in the faculty member's resumes, what percentage of them is current. The criteria should be developed by the department.

- Describe the means for ensuring that full time faculty members have sufficient time for scholarly and professional development.

- Describe existing faculty development programs at the departmental and university level. Demonstrate their effectiveness in achieving faculty development.

- Indicate how frequently faculty programs are evaluated and if the evaluation results are used for improvement.

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

- Describe programs and processes in place for faculty motivation.
- Obtain faculty input using Faculty Survey on programs for faculty motivation and job satisfaction.
- Indicate how effective these programs are.

1) Staff Development Courses   2) Promotion through HEC criteria

3) Travel and Research Grant   4) Justice in the award of research projects

5) Incentive and appraisal for exceptional work   6) Incentive on publication

7) Best teacher award   8) Best employee award

CRITERION 7: INSTITUTIONAL FACILITIES

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

- Describe infrastructure and facilities that support new trends in learning.
- Indicate how adequate the facilities are.

The university provides the Wifi facilities and faculty can easily get themselves engage in e-learning. The facilities for collaborative e-learning are adequate.

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:

- Describe the adequacy of the library's technical collection.
- Describe the support rendered by the library.

The university provides the facility of HEC Digital Library. The Post Graduate Library has collaboration learning room and training facilities for technology based learning.

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

- Describe the adequacy of the classrooms.
- Describe the adequacy of faculty offices

The class rooms are not sufficient. The smart class rooms should be promoted to meet the teaching and lecturing international standards. A place to setup separate PhD Research Room in the PG Block may kindly be provided to motivate and attract students.

There is no separate faculty office. One HOD room and one staff room. The Department has only four lecture rooms serving as the class rooms of BS, MS and PhD. One staff room is shared by all staff members.

CRITERION8: 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:

- Describe how your program meets this standard. If it does not explain the main causes and plans to rectify the situation.
- Describe the level of adequacy of secretarial support, technical staff and office equipment.

✓ The program meets the standards (admission criteria, degree awarding criteria, faculty competence) of HEC and it is verified through HEC Review Team Visit. However the infrastructure needs to be improved.
✓ Faculty shares the HOD resources.

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

- Provide the number of graduate students, research assistants and Ph. D students for the last three years.
- Provide the **faculty: graduate student ratio** for the last three years.

✓ The number of PhD students enrolled in last three years is three.
✓ The faculty: graduate student ratio of last three years is 10:3.

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

- Describe the resources available for the library.

- Describe the resources available for laboratories.

- Describe the resources available for computing facilities.

The Department has no separate library and funds. The above mentioned resources are provided as per university policy.