

DEPARTMENT OF MATHEMATICS

Mathematics is the backbone of many scientific and engineering fields. It provides a strong theoretical knowledge and techniques essential to understand the fundamentals of areas such as physics, engineering, space science, biotechnology and computer science. With a firm grasp of mathematics, one will have the widest possible base to launch explorations of the related disciplines.

The MPhil and PhD programs offered by the Mathematics Department focus on preparing academicians and researchers with command on modern mathematical tools and knowledge. The students are expected to benefit not only from a full spectrum of Mathematics courses but also from the courses offered by other departments of the university.



BS Mathematics with Data Science

(ii) In case of foreign qualification, equivalence from IBCC will be required

(iii) CUST Admission Test/HEC Approved Test

■ Admission Requirements

- (i) Higher Secondary School Certificate or Equivalent with Mathematics securing at least 50% marks in aggregate

■ Degree Requirements

Each candidate for the BS Mathematics with Data Science degree is required to successfully earn 139 credit hours (Cr. Hrs.) as per the following detail:

Area	Cr. Hrs.
a) General Education	34
b) Major Courses	72
c) Allied Courses	12
d) Elective Courses	12
e) Internship	03
f) Capstone Project	06
g) Community Service	00
Total	139

■ General Education Courses (34 Cr. Hrs)

Course Title	Code	Cr. Hrs.
Functional English	MDG1113	3
Expository Writing	MDG1123	3
Islamic Studies/ Ethics	MDG1012	2
Ideology and Constitution of Pakistan	MDG1022	2
Personal Grooming	MDG2212	2
Applied Physics	MDG1312	2
Applied Physics Lab	MDG1311	1
Fehm-ul-Quran I	MDG1021	1
Fehm-ul-Quran II	MDG1031	1
Pakistan Studies	MDG1032	2
Elements of Set Theory and Mathematical Logic	MDG2593	3

Discrete Mathematics	MDG2573	3
Application of Information & Communication Technologies	MDG1612	2
Application of Information & Communication Technologies Lab	MDG1611	1
Entrepreneurship	MDG2712	2
Civics and Professional Ethics	MDG2812	2
Sociology	MDG1412	2

■ Major Courses (72 Cr. Hrs)

Course Title	Code	Cr. Hrs.
Calculus-I	MD1013	3
Calculus-II	MD1023	3
Calculus-III	MD2033	3
Real and Complex Analysis	MD3043	3
Topological and Metric Spaces	MD3053	3
Functional Analysis	MD4063	3
Differential Geometry	MD4073	3
Linear Algebra	MD2123	3
Introduction to Number Theory	MD3103	3
Abstract Algebra	MD3133	3
Ordinary Differential Equations	MD3313	3
Partial Differential Equations	MD4323	3
Probability and Statistics-I	MD2413	3
Probability and Statistics-II	MD2423	3
Object Oriented Programming Lab	MD1521	1
Object Oriented Programming	MD1523	3
Software for Mathematics	MD3503	3
Data Structure Lab	MD2531	1
Data Structure	MD2533	3

Numerical Analysis	MD3543	3
Introduction to Data Science	MD2713	3
Data Analysis and Visualization	MD3723	3
Database Systems Lab	MD3741	1
Database Systems	MD3743	3
Data Mining	MD3753	3
Data Warehousing and Business Intelligence	MD4733	3

■ Allied Courses (12 Cr. Hrs)

Course Title	Code	Cr. Hrs.
Introduction to Programming	CSMD1513	3
Introduction to Programming Lab	CSMD1511	1
Introduction to Artificial Intelligence	AIMD3843	3
Accounting	ACMD4853	3
Economics	ECMD3862	2

■ Elective Courses (12 Cr. Hrs)

Course Title	Code	Cr. Hrs.
Fundamentals of Big Data Analytics	MD4763	3
Machine Learning	MD4823	3
Time Series Analysis and Forecasting	MD4443	3
Cryptography	MD4813	3
Optimization Theory	MD4363	3
Stochastic Processes and Application	MD4453	3

■ Capstone Project (06 Cr. Hrs)

The project worth 6 Cr. Hrs. and shall be completed in two parts as given below:

Course Title	Code	Cr. Hrs.
Design Project Part I	MD4912	2
Design Project Part II	MD4924	4

■ Internship

It is mandatory for every student to participate in a 6-8 weeks summer internship program following their 6th semester or after the completion of 90 Cr. Hrs.

Course Title	Code	Cr. Hrs.
Internship	MD4103	3

■ Community Work (VIS4000)

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

■ CGPA Requirement

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

■ Program Duration

This is a four years degree program comprising of 8 semesters. There will be a Fall and a Spring semester in each year. The summer semester will be utilized for community work or deficiency courses. The maximum duration to complete BS Mathematics degree is 07 years.



SCHEME OF STUDIES

BS Mathematics Program

□ Semester-I (15 Cr. Hrs.)

Course Code	Course Title	Cr. Hrs.
CSMD1513	Introduction to Programming	3
CSMD1511	Introduction to Programming Lab	1
MDG1612	Application of Information and Communication Technologies	2
MDG1611	Application of Information and Communication Technologies Lab	1
MD1013	Calculus-I	3
MDG1022	Ideology and Constitution of Pakistan	2
MDG1113	Functional English	3

□ Semester-II (18 Cr. Hrs.)

Course Code	Course Title	Cr. Hrs.
CSMD1523	Object Oriented Programming	3
CSMD1521	Object Oriented Programming Lab	1
MDG1412	Sociology	2
MDG1123	Expository Writing	3
MD1023	Calculus-II	3
MDG1012	Islamic Studies/ Ethics	2
MDG1312	Applied Physics	2
MDG1311	Applied Physics Lab	1
MDG1021	Fehm-ul-Quran-I	1

□ Semester-III (18 Cr. Hrs.)

Course Code	Course Title	Cr. Hrs.
MD2533	Data Structures	3
MD2531	Data Structures Lab	1
MD2033	Calculus-III	3
MDG2593	Elements of Sets Theory and Mathematical Logic	3

MDG2212	Personal Grooming	2
MDG2712	Entrepreneurship	2
MD2413	Probability and Statistics-I	3
MDG1031	Fehm-ul-Quran-II	1

□ Semester-IV (16 Cr. Hrs.)

Course Code	Course Title	Cr. Hrs.
MDG2812	Civics and Professional Ethics	2
MD2123	Linear Algebra	3
MDG1032	Pakistan Studies	2
MD2713	Introduction to Data Science	3
MDG2573	Discrete Mathematics	3
MD2423	Probability and Statistics-II	3

□ Semester-V (18 Cr. Hrs.)

Course Code	Course Title	Cr. Hrs.
MD3053	Topological and Metric Spaces	3
MD3743	Database System	3
MD3741	Database System Lab	1
MD3503	Software for Mathematics	3
MD3133	Abstract Algebra	3
ECMD3862	Economics	2
AIMD3843	Introduction to Artificial Intelligence	3

□ Semester-VI (18 Cr. Hrs.)

Course Code	Course Title	Cr. Hrs.
MD3043	Real and Complex Analysis	3
MD3313	Ordinary Differential Equations	3
MD3753	Data Mining	3
MD3723	Data Analysis and Visualizations	3
MD3543	Numerical Analysis	3
MD3103	Introduction to Number Theory	3

□ Semester-VII (17 Cr. Hrs.)

Course Code	Course Title	Cr. Hrs.
MD4XX3	Elective-I	3
MD4323	Partial Differential Equations	3
MD4073	Differential Geometry	3
MD4XX3	Elective-II	3
MD4XX3	Elective-III	3
MD4912	Design Project-I	2

□ Semester-VIII (16 Cr. Hrs.)

Course Code	Course Title	Cr. Hrs.
MD4063	Functional Analysis	3
ACMD4853	Accounting	3
MD4733	Data Warehousing and Business Intelligence	3
MD4XX3	Elective-IV	3
MD4924	Design Project-II	4



MPhil Mathematics

■ Admission Requirements

- (i) A minimum of 16 years of education leading to BS/MSc degree in Mathematics or equivalent
- (ii) Minimum 2.00/4.00 CGPA or 50% marks
- (iii) Admission Test/HEC Approved Test

■ General Education (02 Cr. Hrs.)

Course Title	Code	Cr. Hrs.
Fehm-ul-Quran I	MTG7021	1
Fehm-ul-Quran II	MTG7031	1

There are no core courses and the students are required to register courses offered by the department from the list appended below:-

■ Elective Courses

Course Title	Code	Cr. Hrs.
Advanced Partial Differential Equations	MT7013	3
Advanced Wave Mechanics	MT7023	3
Integral Equations	MT7033	3
Celestial Mechanics	MT7043	3
Advanced Mathematical Analysis	MT7123	3
Topics in Complex Analysis	MT7133	3
Advanced Functional Analysis	MT7143	3
Fixed Point Theory	MT7153	3
Advanced Numerical Techniques	MT7213	3
Finite Element Methods	MT7233	3
Finite Difference Methods	MT7243	3
Advanced Group Theory	MT7303	3
Computational Algebra	MT7313	3
Non Commutative Algebra	MT7323	3

■ Degree Requirements

A student admitted in this program will have to complete the degree requirements by following any one of the options given below:

- (i) 24 Cr. Hrs. course work with 2 Cr. Hrs. Fehm-ul-Quran and 6 Cr. Hrs. Thesis
- (ii) 30 Cr. Hrs. course work (10 courses) with 2 Cr. Hrs. Fehm-ul-Quran

Algebraic Cryptography	MT7343	3
Advanced Fluid Dynamics	MT7513	3
Non-Newtonian Fluid Mechanics	MT7533	3
Computational Fluid Dynamics	MT7543	3
Optimization Techniques	MT7613	3
Linear System Theory	MT7623	3
Nonlinear Control Systems	MT7633	3
Applied Cryptography	MT7643	3
Stochastic Processes	MT7653	3
Financial Mathematics	MT7xxx	3
Operational Research	MT7723	3
General Relativity	MT7813	3
Special topics in Mathematics	MT7xx3	3
Perturbation Methods	MT7063	3
Heat and Mass Transfer	MT7553	3
Electromagnetic Wave Theory	MT7043	3
Banach Algebra	MT7173	3
Approximation Theory	MT7163	3
Topological Vector Spaces	MT7183	3

■ Research Thesis

Course Title	Code	Cr. Hrs.
Research Thesis Part-I	MT7913	3
Research Thesis Part-II	MT7923	3

■ CGPA Requirement

A student is required to earn a minimum 3.00/4.00 CGPA on the completion of his/her degree requirements.

■ Program Duration

This is normally a two years program comprising of 4 semesters. There will be a Fall and Spring semester in each year. The maximum duration to complete MPhil in Mathematics is 4 years.



PhD Mathematics

Through the PhD program in Mathematics, we emphasize on bringing the creative abilities of the researchers to the level where they can produce novel ideas to solve an existing problem. To choose a research area, a scholar will have a sufficiently good number of options available in the Department. The interest of scholars in the collaborative work of mathematical nature with other departments of the university will also be encouraged.

■ Admission Requirements

- (i) MPhil/MS degree in a relevant discipline
- (ii) Minimum CGPA 3.0/4.0 (Semester System) or 60% marks (Annual System)
- (iii) Admission Test/HEC Test
- (iv) Interview

■ Degree Requirements

A PhD candidate shall be awarded degree on successful completion of the following requirements:

- (i) 18 Cr. Hrs. course work with minimum CGPA 3.00/4.00
- (ii) 2 Cr. Hrs. Fehm-ul-Quran
- (iii) Comprehensive Examination
- (iv) 30 Cr. Hrs. Research Work
- (v) Synopsis Defense
- (vi) Dissertation Foreign Reviews
- (vii) Publication of research paper(s) in HEC approved journal.
- (viii) Dissertation Final Defense

Note: PhD scholars are required to comply with the following timeline:

Activity	Preferred Time	Maximum
Course Work	2 Semesters	3 Semesters
Comprehensive Exam	3 Semesters	6 Semesters
Synopsis Qualification	4 Semesters	6 Semesters
Thesis Submission	6 Semesters	10 Semesters



