

# 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 basic undergraduate degree program offered by the Department of Mathematics is the four

years Bachelor of Science (BS) in Mathematics.

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

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
- (ii) In case of foreign qualification, equivalence from

## ■ Degree Requirements

Each candidate for the BS Mathematics degree is required to successfully earn 132 credit hours (Cr. Hrs.) as per the following detail:

Area	Cr. Hrs.
(a) General Education Courses	25
(b) Interdisciplinary Courses	22
(c) Core Courses	64
(d) Elective Courses	15
(e) Final Year Project (FYP)	06
(f) Community Service	00
<b>Total</b>	<b>132</b>

## ■ General Education Courses (25 Cr. Hrs)

Course Title	Code	Cr. Hrs.
Pakistan Studies	HMMT1002	2
Islamic Studies/Ethics	HMMT1012	2
English-I	HMMT1013	3
English-II	HMMT1023	3
Technical Report Writing	HMMT2033	3
Humanities-I	HMMT2xx3	3
Humanities-II	HMMT3xx3	3
Management-I	HMMT2xx3	3
Management-II	HMMT4xx3	3

## a-Humanity Courses

Course Title	Code	Cr. Hrs.
Chinese/German/French Language	HMMT2xx3	3
Introduction to Sociology	HMMT2063	3
Introduction to Psychology	HMMT3053	3
Introduction to Logic	HMMT3123	3

## b–Management Courses

Course Title	Code	Cr. Hrs.
Operations Research	MGMT2243	3
Introduction to Management	MIMT 2003	3
Professional Ethics	MGMT4013	3
Project Management	MIMT4063	3

## ■ Interdisciplinary Courses (22 Cr. Hrs)

Course Title	Code	Cr. Hrs.
Introduction to Programming	CSMT1134	4
Biology	BIMT1103	3
Statistics	MT1613	3
Software for Mathematics	MT1213	3
Accounting	ACMT4003	3
Economics	ECOE4503	3
Applied Physics	PHMT1013	3

## ■ Core Courses (64 Cr. Hrs)

Course Title	Code	Cr. Hrs.
Introduction to Number Theory	MT2433	3
Group Theory	MT2453	3
Integral Equations	MT4333	3
Calculus-I	MT1013	3
Calculus-II	MT1023	3
Calculus-III	MT2033	3
Complex Analysis	MT3123	3
Ordinary Differential Equations	MT2313	3
Linear Algebra	MT2443	3
Rings and Fields	MT3463	3
Real Analysis	MT3113	3
Elements of Set theory and Mathematical Logic	MT1413	3

Mathematical Methods	MT3343	3
Differential Geometry-I	MT2043	3
Classical Mechanics	MT3513	3
Partial Differential Equations	MT3323	3
Functional Analysis	MT3133	3
Numerical Analysis-I	MT3224	4
Topological and Metric Spaces	MT2143	3
Probability Theory	MT2623	3
Discrete Mathematics	MT2423	3

### ■ Elective Courses (15 Cr. Hrs)

Course Title	Code	Cr. Hrs.
Optimization Theory	MT4723	3
Differential Geometry-II	MT3053	3
Numerical Analysis-II	MT3233	3
Fluid Mechanics	MT4523	3
Special Relativity	MT4543	3
Introduction to Computational Fluid Dynamics	MT4533	3
Cryptography	MT4713	3

### ■ Final Year Project (06 Cr. Hrs)

After the completion of 90 Cr. Hrs., the students are required to demonstrate their problem solving skills in Mathematics by completing a project to solve a complex problem by using the tools and techniques learned in the courses. The project worth 6 Cr. Hrs. and shall be completed in two parts as given below:

Course Title	Code	Cr. Hrs.
FYP-I	MT4912	2
FYP-II	MT4924	4

### ■ Community Work (VIS4000)

Each student is required to complete 65 hours community work, usually after 4<sup>th</sup> semester which would be a prerequisite 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 (18 Cr. Hrs.)

Course Code	Course Title	Category	Cr. Hrs.
MT1013	Calculus-I	Core	3
MT1413	Elements of Set theory and Mathematical Logic	Core	3
HMMT1013	English-I (Functional English)	General Education	3
HMMT1002	Pakistan Studies	General Education	2
PHMT1013	Applied Physics	Interdisciplinary	3
CSMT1133	Introduction to Programming	Interdisciplinary	3
CSMT1131	Introduction to Programming Lab	Interdisciplinary	1

### □ Semester-II (17 Cr. Hrs)

Course Code	Course Title	Category	Cr. Hrs.
MT1023	Calculus-II	Core	3
MT1213	Software for Mathematics	Interdisciplinary	3
MT1613	Statistics	Interdisciplinary	3
HMMT1023	English-II (Communication Skills)	General Education	3
HMMT1012	Islamic Studies/Ethics	General Education	2
BIMT1103	Biology	Interdisciplinary	3

### □ Semester-III (18 Cr. Hrs)

Course Code	Course Title	Category	Cr. Hrs.
MT2433	Introduction to Number Theory	Core	3
MT2033	Calculus-III	Core	3
MT2143	Topological and Metric Spaces	Core	3
HMMT2033	Technical Report Writing	General Education	3
MT2443	Linear Algebra	Core	3
HMMT2xx3	Humanities-I (Introduction to Sociology)	General Education	3

□ Semester-IV (18 Cr. Hrs)

Course Code	Course Title	Category	Cr. Hrs.
MT2453	Group Theory	Core	3
MT2313	Ordinary Differential Equations	Core	3
MT2623	Probability Theory	Core	3
MT2423	Discrete Mathematics	Core	3
MT2043	Differential Geometry-I	Core	3
MT2xx3	Management-I (Introduction to Management)	General Education	3

□ Semester-V (16 Cr. Hrs)

Course Code	Course Title	Category	Cr. Hrs.
MT3223	Numerical Analysis-I	Core	3
MT3221	Numerical Analysis-I Lab	Core	1
MT3053	Elective-I (Differential Geometry-II)	Elective	3
MT3323	Partial Differential Equations	Core	3
MT3113	Real Analysis	Core	3
MT3463	Rings and Fields	Core	3

□ Semester-VI (18 Cr. Hrs)

Course Code	Course Title	Category	Cr. Hrs.
HMMT3xx3	Humanities-II (Introduction to Psychology)	General Education	3
MT3513	Classical Mechanics	Core	3
MT3123	Complex Analysis	Core	3
MT3133	Functional Analysis	Core	3
MT3343	Mathematical Methods	Core	3
MT3233	Elective-II (Numerical Analysis-II)	Elective	3

□ Semester-VII (14 Cr. Hrs)

Course Code	Course Title	Category	Cr. Hrs.
ACMT4003	Accounting	Interdisciplinary	3
ECOM4503	Economics	Interdisciplinary	3
MT4xx3	Elective-III	Elective	3
MT4xx3	Elective-IV	Elective	3
MT4912	FYP-I	Project	2

□ Semester-VIII (13 Cr. Hrs)

Course Code	Course Title	Category	Cr. Hrs.
MGMT4xx3	Management-II (Professional Ethics)	General Education	3
MT4333	Integral Equations	Core	3
MT4xx3	Elective-V	Elective	3
MT4924	FYP-II	Project	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

## ■ Elective Courses

Course Title	Code	Cr. Hrs.
Advanced Partial Differential Equations	MT5013	3
Advanced Wave Mechanics	MT5023	3
Integral Equations	MT5033	3
Celestial Mechanics	MT5043	3
Advanced Mathematical Analysis	MT5123	3
Topics in Complex Analysis	MT5133	3
Advanced Functional Analysis	MT5143	3
Fixed Point Theory	MT5153	3
Advanced Numerical Techniques	MT5213	3
Finite Element Methods	MT5233	3
Finite Difference Methods	MT5243	3
Advanced Group Theory	MT5303	3
Computational Algebra	MT5313	3
Non Commutative Algebra	MT5323	3
Algebraic Cryptography	MT5343	3
Advanced Fluid Dynamics	MT5513	3
Non-Newtonian Fluid Mechanics	MT5533	3
Computational Fluid Dynamics	MT5543	3
Optimization Techniques	MT5613	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 6 Cr. Hrs Thesis
- (ii) 30 Cr. Hrs. course work

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

Linear System Theory	MT5623	3
Nonlinear Control Systems	MT5633	3
Applied Cryptography	MT5643	3
Stochastic Processes	MT5653	3
Financial Mathematics	MTxxxx	3
Operational Research	MT5723	3
General Relativity	MT5813	3
Special topics in Mathematics	MT5xx3	3
Perturbation Methods	MT5063	3
Heat and Mass Transfer	MT5553	3
Electromagnetic Wave Theory	MT5043	3
Banach Algebra	MT5173	3
Approximation Theory	MT5163	3
Topological Vector Spaces	MT5183	3

### ■ Research Thesis

Course Title	Code	Cr. Hrs.
Research Thesis Part-I	MT5913	3
Research Thesis Part-II	MT5923	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 Approved 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) Comprehensive Examination (written and oral)
- (iii) 30 Cr. Hrs. Research Work
- (iv) Synopsis Defense
- (v) Dissertation Foreign Reviews
- (vi) Publication/Acceptance of at least one research paper in HEC approved journal.
- (vii) 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	5 Semesters
Synopsis Qualification	4 Semesters	6 Semesters
Thesis Submission	6 Semesters	10 Semesters

