Proposed Curriculum
BS-Mathematics

Faculty of Sciences
Department of Mathematics

Namal Institute Mianwali

Program Introduction

BS Mathematics is a 4-year degree program accredited by Higher Education Commission (HEC). The overall purpose of this program is to serve as the foundation of advancements in the areas of mathematics and to introduce the students with the fundamentals of the core mathematics to prepare them for the emerging future of the mathematics area. However, we aim to set benchmark in producing the most efficient and proficient graduates.

Department Vision

To provide an environment where students can learn analytical and quantitative reasoning skills and promote Mathematical thinking as a significant part of human thought.

Department Mission

The department of Mathematics is committed to the following goals:

➢ To develop the ability to its students to discuss mathematical ideas effectively and to use these skills to solve practical problems.

➢ To impart the capacity to become an independent learner, critical thinker and problem-solver.

➢ To provide an ideal environment for the continued growth of faculty members with meaningful research.

HEC Compliance

It is important for the curriculum to be in compliance with Higher Education Commission (HEC) guidelines in order to gain accreditation. Following table outlines the comparison between the proposed curriculums and HEC's requirements and shows a close match between the two.

Table-1: BS-Mathematics, Overall program structure.

Course Description	Namal	HEC
University core	26	25
General	22	21-24
Foundation	33	30-33
Major + Research	42	36-46
Elective	12	12
Total credit hours	135	124-140

University Core

The key unifying theme of the university core courses will attempt to answer the key big questions:

- Who am I?
- Where have I come from?
- Where am I?
- What am I to do?

Almost every knowledge based civilization has tried to give answers to such questions, including the big three points – philosophy, science and religion. In this regard, the following set of courses/themes would help Namal shape up those individuals who will shape the future: philosophy, history of the world, classic literature/great books, Islamic civilization, Indo-Pak history and birth of Pakistan, habits of mind, physical well-being, kitchen gardening, economic perspectives, arts and aesthetics, creative writing, sociology based field work, scientific worldview, quantitative reasoning and analysis, technology, society and environment, Iqbaliat. The other primary purpose of university core courses is to build the students' attributes and IQ, EQ level. Table below covers all the proposed university core subjects with their objectives in brief.

University Core Course (Total credit hours: 26)

Course Code	Course Title	Credit Hours
ENG-110	Functional English	3
ENG-111	Technical Writing and Communication	3
ENG-112	Creative Rhetoric and Writing	3
SS-101	Introduction to Philosophy	3
SS-102	Islamic Studies / Ethics	3
SS-103	Pakistan Studies	3
SS-104	Great Books	2
CS-100	Quantitative and Computational Reasoning	3+1
SS-106	Iqbaliat	2

General Courses (Credit Hours: 22)

Course Code	Course Title	Credit Hours
GS-100	Principles of Science	3
PH-120	Physics-I (Basic Electricity and Magnetism)	3
PH-121	Physics-II (Waves and Oscillations)	3
CS-ABC	Introduction to Programming	3+1
SS-112	Introduction to Psychology	3
MA-311	Mathematical Economics	3
SS-117	Introduction to Management	3

Foundation Courses (Credit Hours: 33)

Course Code	Fundamental Course Title	Credit Hours
MA-121	Calculus I (Differential Calculus)	3
MA-122	Calculus II (Integral Calculus)	3
MA-223	Calculus III (Multivariate Calculus)	3
MA-224	Algebra-I (Group Theory)	3
MA-321	Algebra-II (Ring Theory)	3
MA-123	Linear Algebra I	3
MA-124	Introduction to Formal Mathematics	3
MA-421	Discrete Mathematics	3
MA-221	Ordinary Differential Equations	3
MA-321	Complex Variables	3
MA-211	History of Mathematics	3

Major Courses (Credit Hours: 36)

Course Code	Major Course Title	Credit Hours
MA-333	Differential Geometry	3
MA-332	Partial Differential Equations	3
MA-431	Mathematical Statistics	3
MA-334	Functional Analysis	3
MA-232	Numerical Methods	3
MA-432	Linear Algebra II	3
MA-435	Mathematical Methods	3
MA-434	Operations Research	3
MA-433	Number Theory and Applications	3
MA-231	Introduction to Real Analysis I	3
MA-331	Introduction to Real Analysis II	3
MA-222	Probability and Statistics	3

Elective Courses (Credit Hours: 12)

Elective Courses	Credit Hours
Elective 1	3
Elective 2	3
Elective 3	3
Elective 4	3

List of Elective Courses (Credit Hours: 12)

Data Science
- Data Analysis with R
- Applied Probability
- Data Mining
- Machine Learning
- Time Series Analysis
- Linear Statistical Models

Computational Mathematics

- ➢ Exact Solutions of Dynamical System
- ➢ Lie analysis and Conserved Quantities
- ➢ Numerical Linear Algebra
- ➢ Matrix Analysis
- ➢ Optimization Theory
- ➢ Graph Theory
- ➢ Cryptography
- ➢ Mathematical Modeling and Simulation

Mathematics Education

- ➢ Curriculum Development and Teaching Methodology
- ➢ Design and Methods in Mathematics Education Research
- ➢ Psychology and Pedagogy of Mathematics
- ➢ Usage of Digital Technology in Mathematics Education

Mathematical Physics

- ➢ Quantum Mechanics
- ➢ Electrodynamics
- ➢ Special Relativity
- ➢ Astro Physics
- ➢ Fluid Mechanics
- ➢ Classical Theory of Fields

Financial Mathematics

- ➢ Business Mathematics
- ➢ Computational Methods in Finance
- ➢ The Foundations of Interest Rate and Credit Risk Theory
- ➢ Quantitative Methods for Finance and Risk Analysis
- ➢ Stochastic Processes

Project (Credit Hours: 6)

Projects	Credit Hours
Project 1	3
Project 2	3

Scheme of Studies Semester-wise Breakdown

Semester-1

Course	Credit Hours
Calculus I (Differential Calculus)	3
Probability and Statistics	3
Functional English	3
Islamic Studies / Ethics	3
Quantitative and Computational Reasoning	3+1
Principles of Science	3
Total	**19**

Semester-2

Course	Credit Hours
Calculus II (Integral Calculus)	3
Linear Algebra I	3
Iqbaliyat	2
Technical Writing and Communication	3
Introduction to Programming	3+1
Physics I (Electricity & Magnetism)	3
Total	**18**

Semester-3

Course	Credit Hours
Calculus III (Multivariate Calculus)	3
Introduction to Formal Mathematics	3
Ordinary Differential Equations	3
Pakistan Studies	3
(Physics II) Waves and Oscillations	3
Great Books	2
Total	**17**

Semester-4

Course	Credit Hours
Introduction to Real Analysis 1	3
Algebra-I (Group Theory)	3
Discrete Mathematics	3
Numerical Methods	3
Introduction to Philosophy	3
Introduction to Management	3
Total	**18**

Semester-5

Course	Credit Hours
Introduction to Real analysis II	3
Linear Algebra II	3
Algebra II (Ring Theory)	3
Elective 1	3
Mathematical Economics	3
Creative Rhetoric and Writing	3
Total	**18**

Semester-6

Course	Credit Hours
Complex Variables	3
History of Mathematics	3
Functional Analysis	3
Elective 2	3
Introduction to Psychology	3
Total	**15**

Semester-7

Course Name	Credit Hours
Mathematical Statistics	3
Differential Geometry	3
Partial Differential Equations	3
Elective 3	3
Project 1	3
Total	**15**

Semester-8

Course Name	Credit Hours
Number Theory and Applications	3
Operations Research	3
Mathematical Methods	3
Elective 4	3
Project 2	3
Total	**15**