

UM-DAE Centre for Excellence in Basic Sciences

Outline of course structure for the M.Sc. (Integrated) Mathematics stream

SEMESTER –I

Mathematics I  
Mechanics  
Chemical Structures & Bonding  
General Biology  
Computer Basics  
Communication Skills  
Physics Laboratory  
Chemistry Laboratory  
Biology Laboratory  
Computer Laboratory

SEMESTER –II

Mathematics II  
Electricity & Magnetism  
Thermodynamics & Properties of Matter  
Molecular Biology  
Electronics & Instrumentation  
History of Science  
Physics Laboratory  
Chemistry Laboratory  
Biology Laboratory  
Electronics Laboratory

SEMESTER –III

Analysis I  
Algebra I  
Statistical Techniques and Applications  
Mathematical Methods for Physics  
Chemical Kinetics & Reaction Dynamics  
World Literature  
Computational Mathematics Laboratory  
Environmental Science Laboratory

#### SEMESTER –IV

Analysis II  
Algebra II  
General Topology  
Mathematical Physics  
Environmental Science  
History of Indian Mathematics & Science  
Computational Mathematics Laboratory  
Environmental Science Laboratory

#### SEMESTER –V

Analysis III  
Algebra III  
Differential Equations & Dynamics  
Numerical Methods  
Philosophy & Sociology  
Computational Mathematics  
Laboratory  
Project

#### SEMESTER –VI

Analysis IV  
Algebraic Number Theory  
Differential Geometry  
Optimization  
Energy  
Computational Mathematics  
Laboratory  
Project

#### SEMESTER –VII

Analysis V  
Algebra IV  
Algebraic Topology  
Discrete Mathematics  
Astronomy & Astrophysics  
Computational Mathematics  
Laboratory  
Project

## SEMESTER –VIII

Probability & Applications  
Partial Differential Equations  
Elective I  
Elective II  
Computational Mathematics Laboratory  
Project

## SEMESTER –IX

Lie Groups & Applications  
Finite Fields & Coding Theory  
Elective III  
Elective IV  
Computational Mathematics  
Laboratory  
Project

## SEMESTER –X- Project

Analysis I: Metric spaces & basic topics as found, for example, in Rudin  
Analysis II: Several variables leading to inverse & implicit function theorems.  
Analysis III: Complex analysis.  
Analysis IV: Measure Theory, ordinary differential equations.  
Analysis V: Functional analysis, Fourier analysis.

Algebra I: Groups, rings, fields.  
Algebra II: More on groups, rings, fields & linear algebra leading to spectral theorem.  
Algebra III: Galois theory & representation theory.  
Algebra IV: Commutative algebra & applications.

Mathematical Physics: Classical mechanics/principle of variation.

### Electives:

Financial Mathematics  
Industrial Mathematics  
Econometrics  
Stochastic Analysis  
Perturbation Theory  
Wavelet Analysis & Applications  
Algebraic Geometry & Applications  
Differential Geometry & Applications  
Mathematical Applications to Engineering  
Representation Theory & Applications

Fractals & Applications  
Mathematics & Nano Technology  
Quantum Computing  
Fluid Mechanics  
Homological Algebra & Applications  
Algebraic Topology & Applications  
Combinatorial Design Theory  
Advanced Topics in Topology & Geometry  
Advanced Numerical Techniques