# PRINCIPAL SUBJECT AREA

## MATHEMATICS

### 400 LEVEL COURSES

All of the following courses shall be compulsory for students following Special Degree Course in Mathematics.

**MT 401 Galois Theory (3 credit)**
(Prerequisites: MT 301, MT 305)
Field extensions, Ruler and Compass Constructions, Three classical Problems, Galois groups of field extensions, Automorphisms of a field, Theorem of the Primitive Element, Splitting Fields, Automorphisms of a field extension over a fixed field, Galois Groups, Separable and Inseparable Extensions, Normal Extensions and Galois Extensions, Subgroups of the Galois group and intermediate fields of the extension, Fundamental Theorem of Galois Theory, Solubility of polynomials, Galois group of a polynomial, Radical Extensions, Solubility by radicals, Proof that a polynomial is irreducible if and only if its Galois group acts transitively on its roots, Proof of the Fundamental Theorem of Algebra.

Recommended Texts:
1. M. Artin (1994), *Algebra*, Prentice-Hall
2. I. Kaplansky (1972), *Rings and Fields*, University of Chicago Press
3. I.N. Stewart (1973), *Galois Theory*, Chapman and Hall

**MT 402 Measure Theory (3 credit)**
(Prerequisite: MT 302)
Lebesgue Measure on the real line, $\sigma$ -algebras, Measurable functions, Measure spaces, Lebesgue integral, Fatou's Lemma, Monotone Convergence Theorem, Dominated Convergence Theorems, $L^p$ spaces, Modes of Convergence, Product measures, Fubini's Theorem.

Recommended Texts:
1. G. De Barra (1974), *Introduction to Measure Theory*, Van Nostrand Reinhold Company
2. H.L. Royden (1988), *Real Analysis*, Macmillan

**MT 403 Topology II (3 credits)**
(Prerequisite: MT 306)
Box Topology and Tychonoff Topology, Inadequacy of sequences, Nets and Filters ;
Tychonoff spaces and Normal spaces, Uryshon's Lemma and Tietze's Extension theorem ;
Paracompactness and BNS- Metrization Theorem ; $G_\delta$ - Sets and Baire Spaces ;
Totally disconnected spaces, The Cantor set , Homotopy relations, Fundamental group; Triangulating spaces, Infinite Complexes , Euler Characteristics and Surgery, Knots and covering spaces

Recommended Texts:
1. J. R. Munkres (1975), *Topology: A First Course*, Prentice-Hall
2. R. Brown (1968), *Elements of Morden Topology*, McGraw-Hill

**MT 404 Complex Analysis II (3 credits)**
(Prerequisites: MT 306, MT 307)
Homotopy of paths and Cauchy's theorem, Winding numbers and Cauchy's integral formulae, Power series and uniform convergence, Miscellaneous contour integrals, Maximum modulus principle, Schwarz's lemma, Liouville's theorem, Fundamental theorem of algebra, Morera's theorem, Argument principle, Rouche's theorem, Open mapping theorem, Reflection principle, Normal families, Riemann mapping theorem.

Recommended Texts:
1. L. V. Ahlfors (1979), *Complex Analysis*, McGraw-Hill
2. J. B. Conway (1980), *Functions of One Complex Variable*, Narosa Publishing House

**MT 405 Functional Analysis (3 credits)**
(Prerequisites: MT 301, MT 306, MT 402)
Normed Linear Spaces , Banach Spaces, Riesz-Fischer Theorem, Linear maps and functionals or normal linear spaces, Dual Spaces; Geometry of Banach Spaces , Hanch Banach Theorems (Separation Form, Extension Form); Uniform Boundedness Principle, Open Mapping Theorem, Banach's Isomophism Theorem, Closed Graph Theorem; Second Dual Space, Projections and direct sums in Banach Spaces , Schauder Basis, Hilbert Spaces; Banach Algebras, Topoligical Vector Spaces.

Recommended Texts:
1. E. Kreyszig (1978), *Introductory Functional Analysis With Applications*, John Wiley

**MT 406 Fluid Mechanics II (3 credits)`**
(Prerequisite: MT 310)
***Perfect Fluid Theory***
*Two-dimensional flow*:Complex potential, Blasius Theorem, Conformal Transformation; Joukowski and Schwartz Christoffel. Discontinuous Motion, Vortex Motion.
*Three-dimensional flow*: Stokes' stream function in axi-symmetric flows, Image systems in 3-D.
***Viscous Flow***
Navier-Stokes equation of motion; its exact solutions, Steady slow motion past a fixed sphere, Reynold's Number, Prandtl's Boundary Layer.

Recommended Texts:
1. L.M. Mline-Thomson (1968), *Theoretical Hydrodynamics*, McMillan
2. D.H. Wilson (1959), *Hydrodynamics*, Edward Arnold
3. F. Chorlton (1990), *Fluid Dynamics*, Oxford University Press

**MT 407 Optimization Theory (3 credits)**
(Prerequisite: MT 311)
Advanced Linear Programming: Dantzig-Wolf decomposition algorithm, Goal programming.
Integer Programming: Cutting plane algorithms, Branch and bound algorithms.
Non-Linear Programming: Kuhn-Tucker conditions, Quadratic programming, Separable programming.

Recommended Texts:
1. D. A. Pierre (1998), *Optimization Theory with Applications*, Dover Publications Inc

**MT 408 Independent Study/Project Work (3 credits)**
Supervised independent study on a project approved by an academic staff member of the department.
Candidates are required to present their work at a seminar and submit the work in a report/dissertation form.