

Teaching Plan: Semester IV Minor Mathematics (Basic Algebra)

Total Credits: 4 (45 Theory Hours + 15 Tutorial Hours) **Evaluation:** Internal Assessment, Tutorial Examination, and End-Semester University Examination

Week / Dates	Module & Topics Covered	TH / TU Hours	Pedagogical Approach & Resources	Assessment & Student KPIs
Week 1-2 (<i>Mid to Late Apr</i>)	Complex Numbers: Polar representation, De Moivre's theorem and its applications.	6 TH 2 TU	Traditional board work; introduce the historical context of mathematics (weaving in Indian Knowledge Systems regarding early concepts of roots and zero).	Formative Q&A. Verify students' ABC ID / Digilocker status for the semester.
Week 3-4 (<i>Early May</i>)	Complex Numbers (Contd.): Roots of complex numbers, exponential, logarithmic, and trigonometric functions of complex variables.	6 TH 2 TU	ICT-enabled demonstrations of complex planes.	Short quiz on De Moivre's applications to track initial student progression.
Week 5-7 (<i>Mid to Late May</i>)	Theory of Equations: Polynomials, relation between roots and coefficients, symmetric functions of roots.	9 TH 3 TU	Flipped classroom discussions.	Assignment 1 (Problem-solving on symmetric functions).
Week 8-9 (<i>Early Jun</i>)	Theory of Equations (Contd.): Transformation of equations, Descartes' rule of signs, Cardan's method for cubic equations.	6 TH 2 TU	Step-by-step algorithmic breakdown of Cardan's method.	Peer evaluation in tutorial groups.
Week 10-12 (<i>Mid to Late Jun</i>)	Linear Algebra / Matrices: Matrices, rank of a matrix, row and column equivalence,	9 TH 3 TU	Software applications (e.g., matrix operations via Python or C if aligned with their SEC papers).	Internal Assessment / Class Test (Data used for NIRF academic progression

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	systems of linear equations.			metrics).
Week 13-14 (<i>Early Jul</i>)	Linear Algebra (Contd.): Eigenvalues, eigenvectors, Cayley-Hamilton theorem and its use in finding inverses.	6 TH 2 TU	Visualizing eigenvectors using smart classroom tools.	Assignment 2 (Matrix operations & Cayley-Hamilton).
Week 15 (<i>Mid Jul</i>)	Revision & Doubt Clearing: Comprehensive review, previous year question (PYQ) discussions.	3 TH 1 TU	Open forum and mock tutorial exams.	Final Tutorial Examination submission.

TIME PLAN SEM - 6

Topic ODE-I	No. of Classes	Remarks
Formation, order & degree of differential equations, first order & first degree equations	4	Basics
Homogeneous & exact equations, integrating factors, linear & Bernoulli equations	6	Application oriented
First order higher degree equations solvable for x, y, p; Clairaut's forms	6	Singular solutions, tac-locus, nodal locus, cuspidal locus
Higher order linear & nonlinear equations, Wronskian, complementary functions, particular integrals	10	Constant coefficients, method of undetermined coefficients
Method of variation of parameters, simultaneous linear differential equations	5	Problem solving
Higher order equations with variable coefficients reducible to constant coefficients (Euler's eqn.), exactness condition, integrating factors	5	Advanced applications

Topic Group Theory I	No. of Classes	Remarks
Definition & examples of groups (permutation, dihedral, quaternion), elementary properties	6	Foundation
Commutative & non-commutative groups, subgroups, necessary & sufficient conditions	6	Subgroup theory
Normalizer, centralizer, center, product of subgroups	4	Important concepts
Order of an element, order of a group, cyclic groups, classification of subgroups of cyclic groups	4	Core properties
Permutations: cycle notation, even/odd permutations, alternating group	2	Permutation theory
Cosets, Lagrange's theorem, consequences including Fermat's little theorem	2	Applications

Topic Mechanics I	No. of Classes	Remarks
Kinematics: rectilinear and curvilinear motion, velocity & acceleration	4	Basics
Dynamics: Newton's laws, motion under variable forces	5	Problem solving
Work, energy, power, potential & kinetic energy	4	Core concepts
Impulse and momentum, collision of particles	3	Applications
Motion of system of particles, center of mass, motion relative to CM	4	Advanced problems