DEPARTMENT OF MATHEMATICS
THIRD YEAR COURSES

Brief Descriptions

SEMESTER 1 COURSES

PROJECT PREPARATION AND SKILLS F19GB1

Writing Mathematics, Typesetting with LaTeX, Citations and References, Literature Reviews, Posters, Career Management Skills, Applications and Interviews, Business Awareness and Creativity

VECTOR ANALYSIS F19MV1

Equations of lines and planes, Curves and surfaces; parametric and non-parametric equations of curves and surfaces, Differentiation of vector valued functions with respect to a scalar, Geometry of curves, Scalar and vector fields, Gradient of a scalar field, and divergence and curl of a vector field, Directional derivatives, Normal and tangent plane to a surface, Solenoidal and irrotational fields, Curvilinear line integrals, Surface integrals, The divergence theorem, Green’s theorem and Stoke’s theorem, Curvilinear Coordinate Systems, Potential Theory.

PURE MATHEMATICS B F19PB1

Binomial coefficients, distribution problems, principle of inclusion-exclusion, Stirling and Catalan numbers, partitions of integers. Prime numbers, evaluation of \( \pi(n) \), modular arithmetic. Permutation groups, group actions, Polya enumeration.

ABSTRACT ALGEBRA F19PL1

Binary operations, Axioms for a group, The subgroup test, Lagrange’s Theorem, Manipulation of permutations, Cycle and matrix notation, The symmetric and alternating groups, Homomorphisms. Kernels and images. Isomorphisms, Quotient groups, The first isomorphism theorem, Axioms for a ring, integral domains and fields, the subring and ideal tests, Prime and maximal ideals, Polynomial rings.
SEMESTER 2 COURSES

APPLIED MATHEMATICS B F19AB2
Calculus of variations, Euler–Lagrange equations, Lagrange multipliers. Lagrangian mechanics, Hamilton’s Principle, Lagrange’s equations, incompressible Euler equations, Hamilton’s equations. Fluid equations, Continuum Hypothesis; Lagrangian and Eulerian formulations, isentropic fluids and Bernoulli’s Theorem, Kelvin’s Circulation Theorem, Couette flow, Solution of Laplace’s equation and the wave equation making use of Fourier series.

COMPLEX ANALYSIS F19MC2
Metric spaces, convergence and continuity, Paths and Path integrals, the exponential, trig, hyperbolic and log functions of complex numbers, Differentiation of complex functions, Cauchy’s theorem for a convex set, Cauchy’s integral formula and Cauchy’s formula for derivatives, Liouville's theorem, Zeros and poles of complex functions, Residues, Cauchy’s residue theorem, Evaluation of real integrals, Open and closed sets, compact metric spaces

ORDINARY DIFFERENTIAL EQUATIONS F19MO2

NUMERICAL ANALYSIS B F19NB2
1– and 2–D polynomial interpolation. Gaussian elimination, LU, LLT and LDLT decomposition and their applications to the solution of linear equations, Iterative algorithms for the solution of linear systems including Jacobi, Gauss-Seidel, SOR. Convergence analysis and operation counts, Iterative algorithms for eigenvalue problems including Power, inversepower and shifted inverse power methods, Convergence analysis and operation counts.