IFoS Maths Optional Syllabus PDF

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Complete IFoS Mathematics Optional syllabus for Paper I and Paper II in a clean, exam-oriented and revision-friendly format.

Ramana Sri IAS

IAS/IFoS Maths Optional | mathsoptional.com | PYQs, Demo Videos, Test Series and Admission Support

Paper I

Linear Algebra, Calculus, Analytical Geometry, ODE, Dynamics, Statics, Hydrostatics, Vector Analysis

Paper II

Modern Algebra, Real Analysis, Complex Analysis, Linear Programming, PDE, Numerical Analysis, Mechanics & Fluid Dynamics

PYQ Practice

Prepare with topic-wise previous year questions and solution-writing practice

Admission Support

Guidance through WhatsApp, email, or call from the Ramana Sri IAS admission team

Quick Overview | IFoS Maths Optional Syllabus

IFoS Mathematics Optional has two papers: Paper I and Paper II. Both papers require concept clarity, theorem understanding, problem-solving speed, calculation accuracy and answer presentation. The subject is static, logical and scoring when prepared with PYQs and regular revision.

Subject
IFoS Mathematics Optional

Exam Stage
Indian Forest Service Mains Examination

Structure
Paper I + Paper II | 250 marks each | 500 optional marks

Preparation Path
Syllabus -> Concepts -> PYQs -> Mock Tests -> Revision

After reading the syllabus, every topic should be connected with previous year questions, solved examples, answer-writing practice and full-length test evaluation.

IFoS Maths Optional Syllabus Paper I

Linear Algebra | Calculus | Analytical Geometry | Ordinary Differential Equations | Dynamics, Statics & Hydrostatics | Vector Analysis

IFoS Maths Optional Syllabus Paper I

(1) Linear Algebra

Vector, space, linear dependence and independence, subspaces, bases, dimensions. Finite dimensional vector spaces. Matrices, Cayley-Hamilton theorem, Eigen values and Eigenvectors, matrix of linear transformation, row and column reduction, Echelon form, equivalence, congruence and similarity, reduction to canonical form, rank, orthogonal, symmetrical, skew symmetrical, unitary, Hermitian, skew-Hermitian forms their Eigen values. Orthogonal and unitary reduction of quadratic and Hermitian forms, positive definite quadratic forms.

(2) Calculus

Real numbers, limits, continuity, differentiability, mean-value theorems, Taylor's theorem with remainders, indeterminate forms, maxima and minima, asymptotes. Functions of several variables: continuity, differentiability, partial derivatives, maxima and minima, Lagrange's method of multipliers, Jacobian. Riemann's definition of definite integrals, indefinite integrals, infinite and improper integrals, beta and gamma functions. Double and triple integrals (evaluation techniques only). Areas, surface and volumes, center of gravity.

(3) Analytical Geometry

Cartesian and polar coordinates in two and three dimensions, second degree equations in two and three dimensions, reduction to canonical forms, straight lines, shortest distance between two skew lines, plane, sphere, cone, cylinder, paraboloid, ellipsoid, hyperboloid of one and two sheets and their properties.

(4) Ordinary Differential Equations

Formulation of differential equations, order and degree, equations of first order and first degree, integrating factor, equations of first order but not of first degree, Clairaut's equation, singular solution. Higher order linear equations, with constant coefficients, complementary function and particular integral, general solution, Euler-Cauchy equation. Second order linear equations with variable coefficients, determination of complete solution when one solution is known, method of variation of parameters.

IFoS Maths Optional Syllabus Paper I - Continued

(5) Dynamics, Statics and Hydrostatics

(i) Dynamics: Degree of freedom and constraints, rectilinear motion, simple harmonic motion, motion in a plane, projectiles, constrained motion, work and energy, conservation of energy, motion under impulsive forces, Kepler's laws, orbits under central forces, motion of varying mass, motion under resistance. (ii) Statics: Equilibrium of a system of particles, work and potential energy, friction, common catenary, principle of virtual work, stability of equilibrium, equilibrium of forces in three dimensions. (iii) Hydro Statics: Pressure of heavy fluids, equilibrium of fluids under given system of forces Bernoulli's equation, centre of pressure, thrust on curved surfaces, equilibrium of floating bodies, stability of equilibrium, metacentre, pressure of gases.

(6) Vector Analysis

Scalar and vector fields, triple, products, differentiation of vector function of a scalar variable, gradient, divergence and curl in Cartesian, cylindrical and spherical coordinates and their physical interpretations. Higher order derivatives, vector identities and vector equations. Application to Geometry: Curves in space, curvature and torsion. Serret-Frenet's formulae, Gauss and Stokes' theorems, Green's identities.

IFoS Maths Optional Syllabus Paper II

Modern Algebra | Real Analysis | Complex Analysis | Linear Programming | PDE | Numerical Analysis & Computer Programming | Mechanics & Fluid Dynamics

IFoS Maths Optional Syllabus Paper II

(1) Modern Algebra

Groups, subgroups, normal subgroups, homomorphism of groups quotient groups basic isomorphism theorems, Sylow's group, permutation groups, Cayley theorem. Rings and ideals, principal ideal domains, unique factorization domains and Euclidean domains. Field extensions, finite fields.

(2) Real Analysis

Real number system, ordered sets, bounds, ordered field, real number system as an ordered field with least upper bound property, Cauchy sequence, completeness, Continuity and uniform continuity of functions, properties of continuous functions on compact sets. Riemann integral, improper integrals, absolute and conditional convergence of series of real and complex terms, rearrangement of series. Uniform convergence, continuity, differentiability and integrability for sequences and series of functions. Differentiation of functions of several variables, change in the order of partial derivatives, implicit function theorem, maxima and minima. Multiple integrals.

(3) Complex Analysis

Analytic function, Cauchy-Riemann equations, Cauchy's theorem, Cauchy's integral formula, power series, Taylor's series, Laurent's Series, Singularities, Cauchy's residue theorem, contour integration. Conformal mapping, bilinear transformations.

(4) Linear Programming

Linear programming problems, basic solution, basic feasible solution and optimal solution, graphical method and Simplex method of solutions. Duality. Transportation and assignment problems. Travelling salesman problems.

IFoS Maths Optional Syllabus Paper II - Continued

(5) Partial Differential Equations

Curves and surfaces in three dimensions, formulation of partial differential equations, solutions of equations of type dx/p=dy/q=dz/r; orthogonal trajectories, Pfaffian differential equations; partial differential equations of the first order, solution by Cauchy's method of characteristics; Charpit's method of solutions, linear partial differential equations of the second order with constant coefficients, equations of vibrating string, heat equation, Laplace equation.

(6) Numerical Analysis and Computer Programming

(i) Numerical methods: Solution of algebraic and transcendental equations of one variable by bisection, Regula-Falsi and Newton-Raphson methods, solution of system of linear equations by Gaussian elimination and Gauss-Jordan (direct) methods, Gauss-Seidel(iterative) method. Newton's (Forward and backward) and Lagrange's method of interpolation. (ii) Numerical integration: Simpson's one-third rule, trapezoidal rule, Gaussian quadrature formula. (iii) Numerical solution of ordinary differential equations: Euler and Runge Kutta-methods. (iv) Computer Programming: Storage of numbers in Computers, bits, bytes and words, binary system. arithmetic and logical operations on numbers. Bitwise operations. AND, OR, XOR, NOT, and shift/rotate operators. Octal and Hexadecimal Systems. Conversion to and from decimal Systems. Representation of unsigned integers, signed integers and reals, double precision reals and long integers. Algorithms and flow charts for solving numerical analysis problems. Developing simple programs in Basic for problems involving techniques covered in the numerical analysis.

(7) Mechanics and Fluid Dynamics

(i) Mechanics: Generalized coordinates, constraints, holonomic and non-holonomic, systems. D'Alembert's principle and Lagrange' equations, Hamilton equations, moment of inertia, motion of rigid bodies in two dimensions. (ii) Fluid Dynamics: Equation of continuity, Euler's equation of motion for in viscid flow, stream-lines, path of a particle, potential flow, two-dimensional and axisymmetric motion, sources and sinks, vortex motion, flow past a cylinder and a sphere, method of images. Navier-Stokes equation for a viscous fluid.

How to continue after the syllabus?

How to continue after the syllabus?

- Divide Paper I and Paper II topics into smaller modules.
- Solve IFoS Maths Optional previous year questions topic-wise.
- Maintain a separate formula, theorem and standard method revision notebook.
- Write full-length mock tests to improve speed, accuracy and answer presentation.
- Prepare an error notebook and revise mistakes every week.

Ramana Sri IAS Guidance

For IFoS Maths Optional syllabus guidance, PYQ practice, demo videos, test series, answer evaluation and admission support, our Ramana Sri IAS admission team will guide you through WhatsApp, email, or call.

Prepared for Ramana Sri IAS. Clean syllabus reference for IFoS Maths Optional study planning.