# UPSC IAS (Mains)

# MATHEMATICS

## Optional

### September Batch 2024

**LIVE** Classes & Test Series

By **Ankit Tiwari**

📅 **16th Sep' 23**        ⏱️ **12:00 PM**

STUDY IQ IAS

It is said that Optional determines the destiny of UPSC journey. It is the most important weapon to conquer this exam. To get into the final list, one must ace the optionals.

# Mathematics Optional Batch 2024

StudyIQ is here with its Mathematics Optional Course. Let's start with understanding the Merits of Mathematics Optional.

**Scoring optional:** The subject is factual and logical rather than opinion-based or subjective, hence easy to score 300+ marks.

**Breaks Monotonicity from GS preparation:** Apart from the theorems and formulas, you don't have to memorize many things in this paper.

The syllabus of Maths Optional is static in nature and not linked to current affairs, hence no regular updation is required.

# Features of the Course

600 hours of Live lectures spread over 7 months

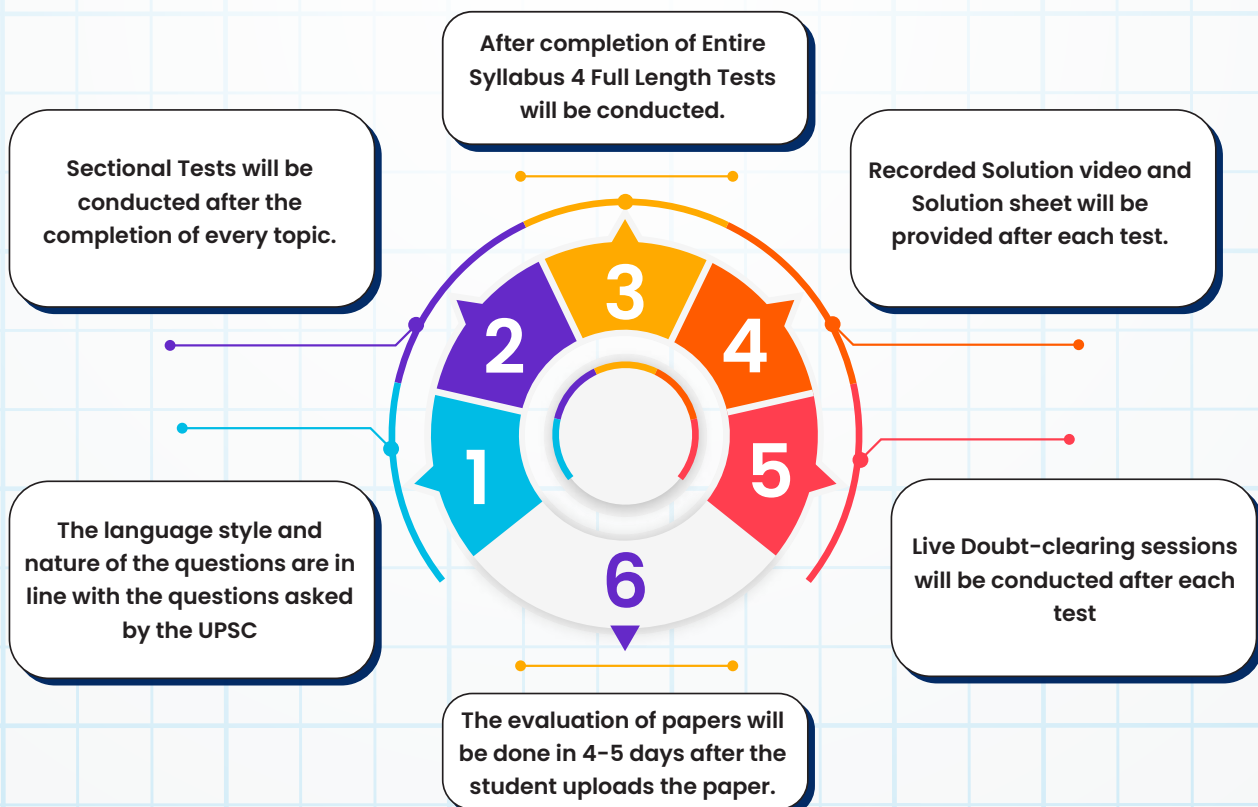Comprehensive coverage of each and every topic

Practice Questions and Solutions after each session

Formula Sheets will be provided for each and every topic

Previous Year Questions discussions from Civil Service Exam and Indian Forest Service

Regular Doubt-clearing sessions by the faculty

# Features of the Test Series

After completion of Entire Syllabus 4 Full Length Tests will be conducted.

Sectional Tests will be conducted after the completion of every topic.

Recorded Solution video and Solution sheet will be provided after each test.

3

2

4

1

5

6

The language style and nature of the questions are in line with the questions asked by the UPSC

Live Doubt-clearing sessions will be conducted after each test

The evaluation of papers will be done in 4-5 days after the student uploads the paper.

**Note: During the first few days few orientation sessions will be conducted. The students will be informed regarding the timings of such session in advance.**

# Schedule of the Classes and Tests

## Regular classes will be conducted from 12:00 pm to 3:00 pm

### 16th Sep' 23 - Orientation

| Date | Paper | Topic | Sub Topic |
|------|-------|-------|-----------|
| 18th Sep' 23 | Paper 1 | Analytic Geometry | • Introduction, Co-ordinate System<br>• Conversion of Co-ordinate system<br>• Planes 1<br>• Planes 2<br>• Planes 3<br>• Straight Lines 1<br>• Straight Lines 2<br>• Sphere 1<br>• Sphere 2<br>• Sphere 3<br>• Cone 1<br>• Cone 2<br>• Cylinder 1<br>• Cylinder 2<br>• Introduction to Conicoid<br>• Paraboloid 1<br>• Paraboloid 2<br>• Ellipsoid 1<br>• Ellipsoid 2<br>• Hyperboloid 1<br>• Hyperboloid 2 |

## Sectional Test on Analytic Geometry

| Date | Paper | Topic | Sub Topic |
|---|---|---|---|
| 23rd Oct' 23 | Paper 2 | Real Analysis | • Introduction to Real analysis<br>• Real analysis<br>• Sequences<br>• Cauchy's sequence<br>• Infinite & Alternating series<br>• Convergence<br>• Continuity & Differentiability<br>• Riemann Integral 1<br>• Riemann Integral 2<br>• Improper Integrals 1<br>• Improper Integrals 2<br>• Fundamental Theorems<br>• Integrability<br>• Revision session |

**Sectional Test on Real Analysis**

| Date | Paper | Topic | Sub Topic |
|---|---|---|---|
| 16th Nov' 23 | Paper 1 | Vector Analysis | • Introduction to Vector Calculus<br>• Scalar & Vector fields<br>• Differentiation of Vector Field of Scalar variables<br>• Gradient & Vectors<br>• Divergence & Curl<br>• Higher Order derivatives, Vector identities<br>• Vector equation<br>• Curvature & Torsion<br>• Serret & Fernet's Formulae<br>• Gauss divergence theorem, Stokes theorem<br>• Stokes theorem, Green's Identities |

**Sectional Test on Vector Analysis**

| Date | Paper | Topic | Sub Topic |
|------|-------|-------|-----------|
| 30th Nov' 23 | Paper 1 | Ordinary Differential Equation | • Introduction to Differential Equation<br>• Formulation of Differential Equation<br>• Linear Differential equation<br>• Integrating Factor<br>• Orthogonal Trajectories<br>• Higher order Differential Equations<br>• Variation of Parameters<br>• Clairaut's equation<br>• Cauchy Euler Equation<br>• Laplace Transform & Theorems<br>• Inverse Laplace transform<br>• Application of Laplace transform |

**Sectional Test on Ordinary Differential Equation**

| Date | Paper | Topic | Sub Topic |
|------|-------|-------|-----------|
| 15th Dec' 23 | Paper 2 | Partial Differential Equation | • Introduction to PDE<br>• Formation of PDE & Family of surfaces in 3D<br>• Solution of Quasi linear PDE<br>• Cauchy's method<br>• Higher order Homogenous PDE<br>• Application of PDE<br>• Vibration strings<br>• Heat equation<br>• Laplace equation<br>• Canonical form |

**Sectional Test on Partial Differential Equation**

| Date | Paper | Topic | Sub Topic |
|---|---|---|---|
| 29th Dec' 23 | Paper 1 | Dynamics & Statics | • Rectilinear motion, simple harmonic motion, motion in a plane, projectiles<br>• Constrained motion<br>• Work and energy, conservation of energy<br>• Kepler's laws, orbits under central forces.<br>• Equilibrium of a system of particles<br>• Work and potential energy, friction, Common catenary<br>• Principle of virtual work<br>• Stability of equilibrium, equilibrium of forces in three dimensions. |

## Sectional Test on Dynamics & Statics

| Date | Paper | Topic | Sub Topic |
|---|---|---|---|
| 12th Jan' 24 | Paper 2 | Algebra | • Introduction to Abstract Algebra<br>• Groups 1<br>• Groups 2<br>• Sub groups, Normal groups<br>• Cosets<br>• Lagrange's theorem<br>• Homomorphism of groups<br>• Cyclic & Quotient groups<br>• Basic Isomorphism theorem<br>• Permutation groups<br>• Cayley's theorem<br>• Rings<br>• Subrings & Ideals<br>• Ideals & Homomorphism<br>• Euclidean Ring, Polynomial ring<br>• Integral domain, Principal ideal domain<br>• Euclidean domain, Unique factorization domain<br>• Finite & Quotient fields<br>• Sylow theorem |

## Sectional Test on Algebra

| Date | Paper | Topic | Sub Topic |
|---|---|---|---|
| 22nd Jan' 24 | Paper 2 | Complex Analysis | • Introduction to Complex Numbers<br>• Limits, Continuity & Differentiability<br>• Analytic Functions<br>• Cauchy Riemann's equation, Cauchy theorem<br>• Cauchy Integral Formula<br>• Power series representation, Singularities<br>• Taylor, Laurent series<br>• Contour Integration<br>• Cauchy Residue theorem |

**Sectional Test on Complex Analysis**

| Date | Paper | Topic | Sub Topic |
|---|---|---|---|
| 7th Feb' 24 | Paper 2 | Linear Programming | • Introduction to Linear programming<br>• Graphical method & Simplex method<br>• Simplex method<br>• Duality<br>• Basic feasible solution<br>• Optimal solution<br>• Transportation & Assignment problems 1<br>• Transportation & Assignment problems 2 |

**Sectional Test on Linear Programming**

| Date | Paper | Topic | Sub Topic |
|---|---|---|---|
| 20th Feb' 24 | Paper 2 | Mechanics & Fluid Dynamics | • Introduction to Fluid<br>• Euler's & Lagrange's equation<br>• Kinematics of Fluid flow<br>• Boundary condition<br>• Stream line flow, Path of particles<br>• Sources & Sinks<br>• Method of Images<br>• Axisymmetric flow<br>• Vortex flow 1<br>• Vortex flow 2<br>• Navier's – Stokes equation<br>• Introduction to Mechanics<br>• Moment of Inertia<br>• D Alembert's principle<br>• Generalized co-ordinates<br>• Lagrange's equation<br>• Hamilton equation<br>• Motion of body in 2D |

## Sectional Test on Mechanics & Fluid Dynamics

| Date | Paper | Topic | Sub Topic |
|---|---|---|---|
| 15th Mar' 24 | Paper 2 | Numerical Analysis & Computer Programming | • Solution of Algebraic equation<br>• Bisection & Regular falsi method<br>• Newton Raphson, Gauss elimination<br>• Gauss Jordan, gauss seidel method<br>• Newton Interpolation, Lagrange's Interpolation<br>• Simpson rule, Trapezoidal rule<br>• Gaussian quadrature formula, Numerical solution of ODE<br>• Euler's & Ranga Kutta method<br>• Binary, Octal, Hexa decimal Number system<br>• Conversion & Algebra of Binary numbers<br>• Elements of Computer system & Concept of memory<br>• Truth table, Boolean algebra<br>• Representation of Integers, Algorithm & Flowcharts |

## Sectional Test on Numerical Analysis & Computer Programming

| Date | Paper | Topic | Sub Topic |
|---|---|---|---|
| 30st Mar' 24 | Paper 1 | Linear Algebra | • Introduction, Vector spaces over R & C<br>• Linear Dependence & Independence<br>• Sub Spaces & Bases<br>• Dimensions, Matrix of linear transformation<br>• Rank of Matrix<br>• Nullity<br>• Algebra of Matrices<br>• Row & Column reduction<br>• Echelon form, Rank of Matrices<br>• Types of Matrices<br>• Eigen values & Vectors<br>• Solution of System of Linear equations<br>• Characteristics Values & Vectors<br>• Caley Hamilton theorem<br>• Quadratic form |

## Sectional Test on Linear Algebra

| Date | Paper | Topic | Sub Topic |
|---|---|---|---|
| 15th Apr' 23 | Paper 1 | Calculus | • Introduction to Calculus, Functions<br>• Limits & Continuity<br>• Continuity & Differentiability<br>• Mean Values theorem & problems<br>• Taylor theorem, Indeterminate form<br>• Maxima & Minima, Asymptotes<br>• Curve tracing<br>• Function of 2 or 3 variables<br>• Partial derivatives<br>• Lagrange's method of multiplier<br>• Jacobian Functions<br>• Introduction to Integral Calculus<br>• Reimann's function<br>• Indefinite Integral<br>• Definite Integrals<br>• Infinite & Improper Integrals<br>• Double Integrals<br>• Triple Integrals<br>• Area & Surfaces<br>• Surface & Volume |

## Sectional Test on Calculus

| Test | Paper |
|---|---|
| 16th June ' 24 | Full Length Paper 1 |
| 30th June' 24 | Full Length Paper 2 |
| 14th July' 24 | Full Length Paper 1 |
| 28th July' 24 | Full Length Paper 2 |

**\* Please note that this is a tentative schedule of the batch and the dates may vary.**

Price: ~~₹24,000~~

**₹16,999**

**Enrol Now**

📞 **080-6897-3353**

✉ **contact@studyiq.com**