

GATE Aerospace syllabus

In each of the following subjects the topics have been divided into two categories – **Core Topics** and **Special Topics**. The corresponding sections of the question paper will contain **90% of their questions on Core Topics** and the remaining **10% on Special Topics**.

Section1: Engineering Mathematics

Core Topics:

Linear Algebra: Vector algebra, Matrix algebra, systems of linear equations, rank of a matrix, eigenvalues and eigenvectors.

Calculus: Functions of single variable, limits, continuity and differentiability, mean value theorem, chain rule, partial derivatives, maxima and minima, gradient, divergence and curl, directional derivatives. Integration, Line, surface and volume integrals. Theorems of Stokes, Gauss and Green.

Differential Equations: First order linear and nonlinear differential equations, higher order linear ODEs with constant coefficients. Partial differential equations and separation of variables methods.

Special Topics: Fourier Series, Laplace Transforms, Numerical methods for linear and nonlinear algebraic equations, Numerical integration and differentiation. Complex analysis. Probability and statistics.

Section 2: Flight Mechanics

Core Topics:

Basics

Atmosphere: Properties, standard atmosphere. Classification of aircraft. Airplane (fixed wing aircraft) configuration and various parts. Pressure altitude; equivalent, calibrated, indicated air speeds; Primary flight instruments: Altimeter, ASI, VSI, Turn-bank indicator. Angle of attack, sideslip; Roll, pitch & yaw controls. Aerodynamic forces and moments.

Airplane performance: Drag polar; takeoff and landing; steady climb & descent; absolute and service ceiling; range and endurance, load factor, turning flight, V-n diagram. Winds: head, tail & cross winds.

Static stability: Stability & control derivatives; longitudinal stick fixed & free stability; horizontal tail position and size; directional stability, vertical tail position and size; lateral stability. Wing dihedral, sweep & position; hinge moments, stick forces.

Special Topics: Dynamic stability: Euler angles; Equations of motion; Decoupling of longitudinal and lateral-directional dynamics; longitudinal modes; lateral-directional modes.

Section 3: Space Dynamics

Core Topics:

Central force motion, determination of trajectory and orbital period in simple cases. Kepler's laws; escape velocity.

No Special Topics:

Section 4: Aerodynamics

Core Topics:

Basic Fluid Mechanics: Conservation laws: Mass, momentum and energy (Integral and differential form); Dimensional analysis and dynamic similarity;

Potential flow theory: sources, sinks, doublets, line vortex and their superposition. Elementary ideas of viscous flows including boundary layers.

Airfoils and wings: Airfoil nomenclature; Aerodynamic coefficients: lift, drag and moment; Kutta-Joukowski theorem; Thin airfoil theory, Kutta condition, starting vortex; Finite wing theory: Induced drag, Prandtl lifting line theory; Critical and drag divergence Mach number.

Compressible Flows: Basic concepts of compressibility, One-dimensional compressible flows, Isentropic flows, Fanno flow, Rayleigh flow; Normal and oblique shocks, Prandtl-Meyer flow; Flow through nozzles and diffusers.

Special Topics: Wind Tunnel Testing: Measurement and visualization techniques. Shock – boundary layer interaction.

Section 5: Structures

Core Topics:

Strength of Materials: Stress and strain: Three-dimensional transformations, Mohr's circle, principal stresses, Three-dimensional Hooke's law, Plane stress and strain. Failure theories: Maximum stress, Tresca von Mises. Strain energy. Castigliano's principles. Statically determinate and indeterminate trusses and beams. Elastic flexural buckling of columns.

Flight vehicle structures: Characteristics of aircraft structures and materials. Torsion, bending and shear of thin-walled sections. Loads on aircraft.

Structural Dynamics: Free and forced vibrations of undamped and damped SDOF systems. Free vibrations of undamped 2-DOF systems.

Special Topics: Vibration of beams. Theory of elasticity: Equilibrium and compatibility equations, Airy's stress function.

Section 6: Propulsion

Core Topics:

Basics: Thermodynamics, boundary layers, heat transfer, combustion and thermochemistry. **Aerothermodynamics of aircraft engines:** Thrust, efficiency, range. Brayton cycle.

Engine performance: ramjet, turbojet, turbofan, turboprop and turboshaft engines. Afterburners.

Turbomachinery: Axial compressors: Angular momentum, work and compression, characteristic performance of a single axial compressor stage, efficiency of the compressor and degree of reaction, multi-staging.

Centrifugal compressor: Stage dynamics, inducer, impeller and diffuser.

Axial turbines: Stage performance.

Rockets: Thrust equation and specific impulse, rocket performance. Multi-staging. Chemical rockets. Performance of solid and liquid propellant rockets.

Special Topics: Aerothermodynamics of non-rotating propulsion components such as intakes, combustor and nozzle. Turbine blade cooling. Compressor-turbine matching, Surge and stall.

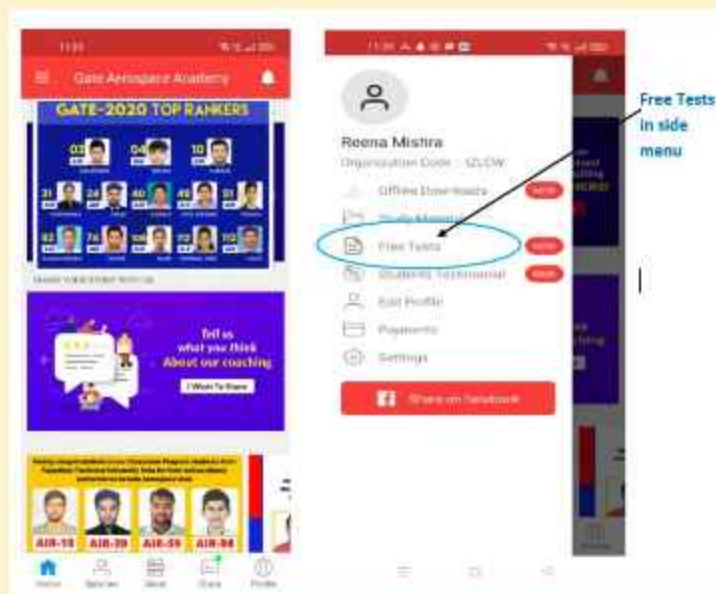
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339 AIR Vishesh	390 AIR Sru Raj	404 AIR Pradeep	486 AIR Girish	626 AIR Hardeep					

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89 AIR Srujan	89 AIR Srujan	98 AIR Srujan	118 AIR Pragati	129 AIR Rajni	134 AIR Srujan	152 AIR Vishal	173 AIR Srujan



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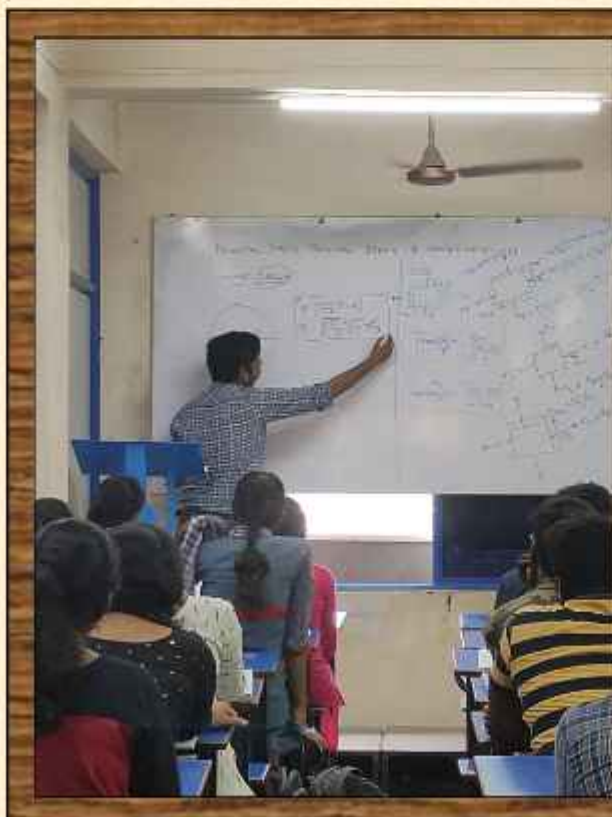
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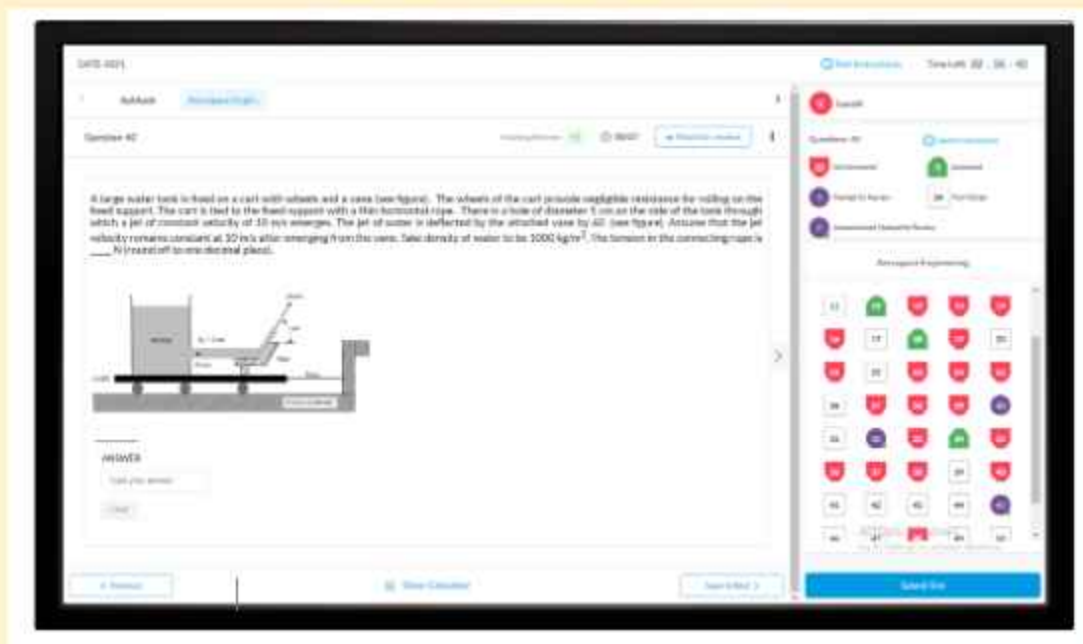




GATE Aerospace Academy Test series package

- Topic-wise Test
- Subject-wise Test
- Full syllabus Test
- GATE previous Year Test
- Total 234 Test

Interface of Test portal



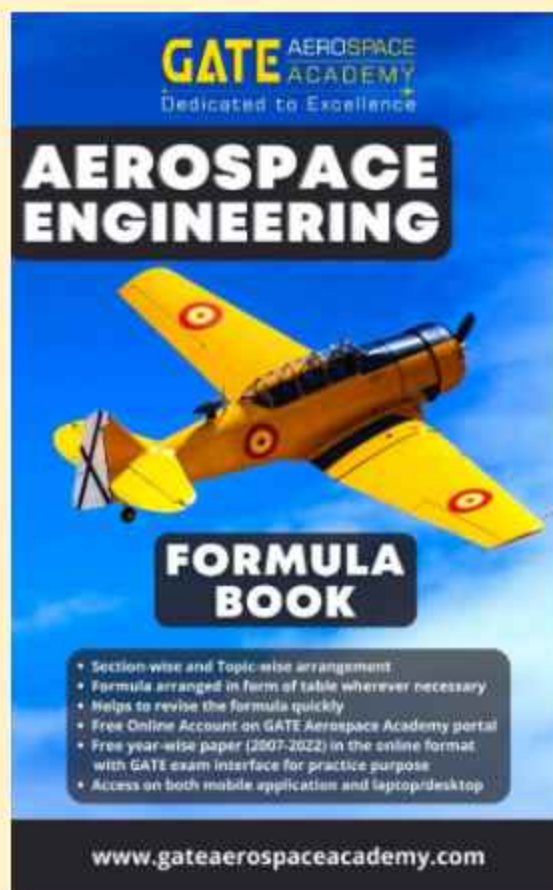
Features of Test interface/results

laptop and App access for Online Test	Average marks and average grade of complete batch	
Absolutely lag free and smooth working	Highest marks and grade	
Open or pre-scheduled Test	Section-wise marks and Total marks in form of bar/chart	
Batch Rank and Institute Rank of students	Showing different level to questions (easy, medium, hard)	
Solution of questions after Test	Accuracy and percentage in different-different level of questions	
Grade and Percentile of students	Declaration of Results on particular date and time	
Time spent on particular question	Results by Mail and SMS to students	
Comparison with topper and average marks	Information to parents (Optional)	
<u>Multiple choice question</u> (MCQ)	<u>Multiple select question</u> (MSQ)	<u>Numerical type question</u> (NAT)

Our books

1. Formula book

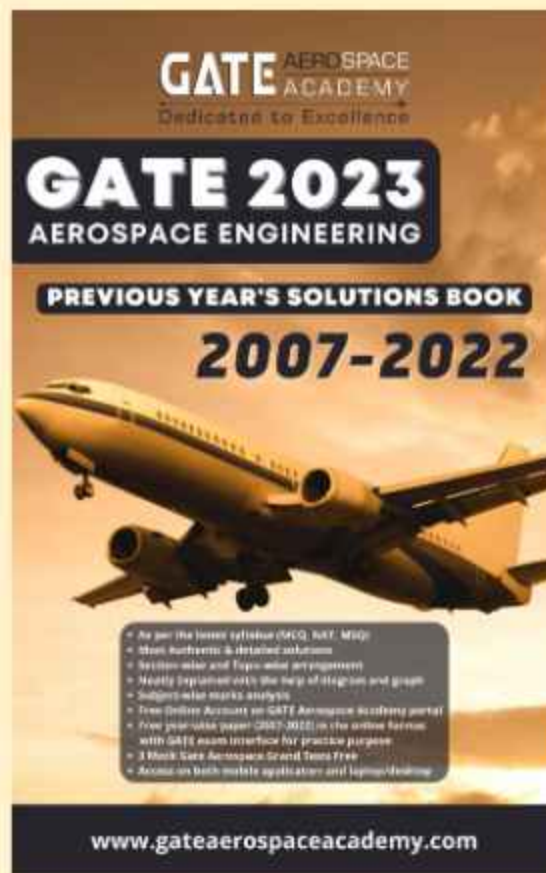
Revising the important formula is most important task specially during last month before **GATE** exam. Formula book will help the students to revise all formula quickly at such crucial stage. Book is written after going through all previous year GATE exam questions and has the collection of mostly used formula in all previous year exam, so it will be highly beneficial to all GATE Aerospace aspirants and specially for average level students and working professional to revise quickly.



2. GATE Aerospace previous year solution book

GATE previous year solution book contain most authentic solution of all previous year paper arranged in subject-wise manner. It helps the students

to study and cover all question of particular subject asked in previous year GATE exam. Further wherever necessary, subject is also arranged in topic-wise manner like propulsion in jet propulsion and rocket propulsion. It's a must have book for any GATE aerospace engineering student.



3. Problem sheet book

After studying a particular subject, practicing conceptual question is very important for students to get good position in this competitive environment. To avoid the nervousness during the exam it's become important for aspirants to have ample practice before going for GATE exam. Problem sheet book is written in two different levels going from moderate to highly conceptual questions according to latest GATE exam pattern with multiple choice questions (MCQ), multiple select questions (MSQ) and numerical type (NAT). This will help the student to test their conceptual knowledge.



4. GATE study Materials

GATE study materials is useful for students who are starting their preparations from basics. Books are written according to latest syllabus of GATE exam. Books are useful to develop basic fundamentals required for GATE like exam.





Our Books

