Mathematics

Arithmetic and algebra
Integer, rational and real numbers and their properties. Absolute value. Powers and roots. Manipulation of algebraic expressions. Polynomials (factorization and other operations). Algebraic equations and inequalities of (or reducible to) the first and second degree. Simultaneous linear equations. Equations and inequalities involving roots. Exponentials and logarithms. Exponential and logarithmic equations and inequalities.

Statistics and probability
Basic elements of combinatorics, statistics and probability.

Geometry
Segments and angles; their measurement and properties. Lines and planes. Simple geometrical loci. Simple plane figures (triangles, circles, regular polygons etc), their lengths, areas and other properties. The principal solids (spheres, cones, cylinders, prisms, parallelepipeds, pyramids etc), their volumes and surface areas.

Analytic geometry and functions
Cartesian coordinates. Concept of a function. Equations of lines and simple loci (including circles, ellipses, parabolas). Graphs and properties of elementary functions (powers, logs, exponentials etc). Working with logarithms. Equations and inequalities involving logs and exponentiation.

Trigonometry
Graphs and properties of the sine, cosine and tangent functions. The main trigonometric formulae. Trigonometric equations and inequalities. The relationship between the sides and angles of a right triangle.

Physics

Physical quantities and their units

Vector and scalar quantities, vector operations (decomposition, sum, difference, scalar product, multiplication by a scalar) and vector representation in a Cartesian plane. Dimensions and measurement units of physical quantities. The International System of Units.

Mechanics

Definition of the fundamental mechanical quantities (displacement, velocity, acceleration, mass, weight, linear momentum, force, torque, work, energy, power, angular velocity etc.). Kinematics in one and two dimensions: rectilinear, parabolic and circular motions. Types of forces: elastic force, gravitational force, constraint forces, frictional forces, etc. Newton's first, second and third law and their applications to simple systems. Work done by a force, kinetic energy, work-energy theorem, conservation of mechanical energy.

Fluid mechanics

Concept of hydrostatic pressure. Pressure in a fluid as a function of depth (Stevin's law). Archimedes' thrust and buoyancy. Steady flow of a fluid: flow rate, equation of continuity.

Thermodynamics:
Concepts of temperature, heat, specific heat, latent heat, thermal equilibrium. Heat exchanges and temperature variations. Phase changes. Thermal expansion. Ideal gases: equation of state and relevant thermodynamic processes (isothermal, adiabatic, at constant volume, at constant pressure). Thermodynamic cycles and ideal thermal engines: heat source and sink, heat absorbed/released, work done, efficiency. Refrigeration cycles. Reversibility and Carnot cycle.

Electromagnetism:
Electrostatic force between point charges (Coulomb's law), electrostatic field, electrostatic potential and potential energy. Concept of capacitance, capacitors in series and in parallel. Electric current, current density, resistance, resistivity. Ohm's law. Resistors in parallel and in series. Joule effect. Simple DC circuits.