

**SYLLABUS FOR THE ENTRANCE TEST IN MATHEMATICS,
JOINT DEGREES, AND COMPUTER SCIENCE**

Issued January 2018.

- **Polynomials:** The quadratic formula. Completing the square. Discriminant. Factorisation. Factor Theorem.
- **Algebra:** Simple simultaneous equations in one or two variables. Solution of simple inequalities. Binomial Theorem with positive whole exponent. Combinations and binomial probabilities.
- **Differentiation:** Derivative of x^a , including for fractional exponents. Derivative of e^{kx} . Derivative of a sum of functions. Tangents and normals to graphs. Turning points. Second order derivatives. Maxima and minima. Increasing and decreasing functions. Differentiation from first principles.
- **Integration:** Indefinite integration as the reverse of differentiation. Definite integrals and the signed areas they represent. Integration of x^a (where $a \neq -1$) and sums thereof.

- **Graphs:** The graphs of quadratics and cubics. Graphs of

$$\sin x, \quad \cos x, \quad \tan x, \quad \sqrt{x}, \quad a^x, \quad \log_a x.$$

Solving equations and inequalities with graphs.

- **Logarithms and powers:** Laws of logarithms and exponentials. Solution of the equation $a^x = b$.
- **Transformations:** The relations between the graphs

$$y = f(ax), \quad y = af(x), \quad y = f(x - a), \quad y = f(x) + a$$

and the graph of $y = f(x)$.

- **Geometry:** Co-ordinate geometry and vectors in the plane. The equations of straight lines and circles. Basic properties of circles. Lengths of arcs of circles.
- **Trigonometry:** Solution of simple trigonometric equations. The identities

$$\tan x = \frac{\sin x}{\cos x}, \quad \sin^2 x + \cos^2 x = 1, \quad \sin(90^\circ - x) = \cos x.$$

Periodicity of sine, cosine and tangent. Sine and cosine rules for triangles.

- **Sequences and series:** Sequences defined iteratively and by formulae. Arithmetic and geometric progressions*. Their sums*. Convergence condition for infinite geometric progressions*.

* Part of full A-level Mathematics syllabus.