THOMAS ALLEYNE'S HIGH SCHOOL

UTTOXETER LEARNING TRUST
INSPIRED TEACHING INSPIRING CHILDREN

Curriculum Overview for: Further Mathematics

Key Stage 5
Academic Year Group: 12

Term	Autumn 1	Autumn 2	Spring 1	Spring 2	Summer 1	Summer 2
Topic	Complex numbers 1 Matrices	Complex numbers 2 Series Algorithms Graphs and networks Algorithms on graphs 1	Algebra and functions Momentum and impulse Work, energy and power	Vectors Algorithms on graphs 2 Linear programming Critical path analysis	Proof Calculus Elastic collisions in one dimension	Trigonometry Differentiation Integration
Content	Complex numbers 1 Imaginary and complex numbers Multiplying Complex conjugate Roots of quadratic equations Solving cubic and quartic equations Matrices Multiplication Determinants Inverting 2 x 2 and 3 x 3 matrices Solving systems of equations 2D and 3D linear transformations	Complex numbers 2 Argand diagrams Modulus and argument Loci and regions in the Argand diagram Algorithms Intro to algorithms Sorting algorithms Graphs and networks Intro to graph theory Algorithms on graphs 1 Minimum spanning trees Dijkstra's algorithm	Algebra and functions Roots of polynomial equations Formation of polynomial equations Momentum and impulse Impulse-momentum principle Conservation of momentum Work, energy and power Work, kinetic energy Potential energy Power	Vectors Vector and Cartesian equations of a line and a plane Scalar product Problems involving points, lines and planes Algorithms on graphs 2 Route inspection problem Linear programming Formulation Graphical solutions Critical path analysis Critical path algorithm Gantt charts	Proof Proof by mathematical induction Calculus Volumes of revolution Elastic collisions in one dimension Direct impact of elastic spheres Newton's law of restitution	Trigonometry Equations and identities involving sec, cosec and cot Inverse trig functions and their graphs Addition formulae Equations and identities with double angle formulae Differentiation Chain, product and quotient rules Differentiating e^x, log and trig functions Integration Reverse chain rule, by parts, substitution, trig identities, standard patterns.
Rationale/ Linking	Links from – GCSE surds, Pythagoras, trigonometry, quadratics, vectors, transformations. Level 2 FM matrices Links to – complex number 2, proof	Links from – complex numbers 2, GCSE loci Links to – Algorithms on graphs 2, proof	Links from – GCSE quadratics Links to – A-Level mechanics, year 13 momentum and impulse, and work energy and power	Links from – GCSE regions and inequalities, vectors Algorithms on graphs 1, year 13 linear programming and critical path analysis	Links from – Matrices, series, A-Level integration Links to – year 13 volumes of revolution, elastic collisions in two dimensions	Links from – A-Level trigonometry, differentiation, integration Links to – year 13 complex numbers, series, methods in calculus, volumes of revolution, polar coordinates, hyperbolic functions, methods in differential equations
Assessment	Assessment Point 1 – October Assessment Point 2 – December Assessment Point 3 – February Assessment Point 4 – April Assessment Point 5 – June – End of Year Exam			**Learning Resources**	**Core Pure Mathematics Book 1** **Decision Mathematics 1** **Further Mechanics 1**	

Curriculum Overview for: Further Mathematics

Key Stage 5 Academic Year Group: 13

Term	Autumn 1	Autumn 2	Spring 1	Spring 2	Summer 1	Summer 2
Topic	Hyperbolic functions Series Algorithms on graphs	Methods in calculus Momentum and Impulse Elastic springs and strings and elastic energy	Complex numbers Differential equations	Polar coordinates Volumes of revolution Linear programming Critical path analysis Elastic collisions in two dimensions		
Content	Hyperbolic functions Definitions Inverse Identities and equations Differentiating Integrating Series Method differences Higher derivatives Maclaurin series Algorithms on graphs Planarity algorithm Floyd's algorithm Route inspection with more than 4 odd nodes Travelling salesman problem	Methods in calculus Improper integrals Mean value Differentiating and integrating inverse trigonometric functions Integrating using partial fractions Momentum and impulse Momentum as a vector Elastic springs and strings and elastic energy Hooke's law Equilibrium and dynamics problems Elastic energy	Complex numbers Exponential form Multiplying and dividing De Moivre's theorem Trigonometric identities Sums of series nth roots of a complex number Geometric problems Differential equations First-order differential equations Second-order homogeneous differential equations Second-order non-homogeneous differential equations Modelling first-order differential equations Simple harmonic motion Damped and forced harmonic motion Coupled first-order simultaneous equations	Polar coordinates Polar coordinates and equations Sketching curves Area enclosed by a polar curve Tangents to polar curves Linear programming Formulating linear programming problems The simplex method Two-stage simplex method The Big-M method Elastic collisions in two dimensions Oblique impact with a fixed surface Oblique impact of smooth spheres		
Rationale/ Linking	Links from - A-Level exponentials, trigonometry, differentiation, integration, series. Year 12 series algorithms on graphs 1	Links from – A-Level differentiation, integration, trigonometry, measures of location, vectors. Year 12 Momentum and impulse, work energy and power	Links from – A-Level Geometric series, differential equations, exponentials, quadratics. Year 12 – complex numbers.	Links from – GCSE cartesian coordinates, Pythagroas' theorem, trigonometry. A-Level differentiation, integration, trigonometry. Year 12 linear programming, elastic collisions in one dimension, vectors.		
Assessment	Assessment Point 1 – October Assessment Point 2 – December – Mock Exam Assessment Point 3 – February Assessment Point 4 – April Assessment Point 5 – June – A-Level Exams			**Learning Resources**	**Core Pure Mathematics Book 2** **Decision Mathematics 1** **Further Mechanics 1**	