Year 12 A LEVEL FURTHER MATHS Curriculum Map 2022-23

Term	Topic/Unit title	Essential knowledge and skills (what students should know, understand and be able to do by the end of the unit/topic)
Autumn 1	1. Matrices	● Learn about matrices and how to add, subtract and multiply them. ● Learn about properties of groups of matrices such as identities and inverses.
	2. Further vectors	● Use the vector equation of a line ● Find where two lines intersect ● Calculate angles between vectors ● Calculate and use vector products
	3. Applications of matrices	● Use matrices to solve simultaneous equations ● Understand the links between matrices and various transformations
	4. Complex numbers	● Learn about properties and rules with complex numbers ● Understand the links between roots of polynomials and complex conjugates ● See the link between complex numbers and transformations.
Autumn 2	5. Roots of polynomials	● Learn how to factorise polynomials including consideration of complex roots. ● Use substitutions to solve more complex equations
	6. Mathematical induction	● Use proof by induction with matrices ● Use proof by induction with number theory ● Use proof by induction with inequalities
	At this point, both teachers have finished teaching the year twelve pure maths content, and one teacher will teach the year twelve statistics content with the other looking at mechanics.	
Spring 1	Mech 1: Energy and Power 1	● Calculate the work done by a force ● Calculate kinetic energy ● Use the work energy principle ● Work with potential energy ● Calculate power

	Mech 2: Dimensional Analysis	● Use the idea of dimensions of various quantities to check the consistency of formulae, and predict formulae from given scenarios.
	Stats 1: Counting principles and probability Work	● Solve problems involving counting methods, permutations and combinations
	Stats 2: Discrete random variables	● Calculate mean and variance of a discrete random variable ● Calculate with uniform distributions ● Find expectation and variance from binomial distributions and geometric distributions
Spring 2	Mech 3: Momentum and collisions 1	● Calculate momentum and impulse ● Understand the relationship between momentum and impulse ● Use Newton's experimental law in collisions ● Solve problems involving connected particles.
	Stats 3: Poisson Distribution	● Use the Poisson distribution to model situations and make calculations accordingly.
Summer 1	Stars 5: Correlation and regression	● Calculate correlation coefficients ● Conduct hypothesis tests ● Use linear regression to find a line of best fit
	Stats 6: Chi-squared tests	● Check if two factors are independent ● Use Yate's correction ● Check if data has come from a given population
	Mech 4: Circular Motion 1	● Solve problems involving motion and angular speed in horizontal circles. ● Find acceleration and forces
Summer 2	Revision and assessment	

Year 13 A LEVEL FURTHER MATHS Curriculum Map

Term	Topic/Unit title	Essential knowledge and skills (what students should know, understand and be able to do by the end of the unit/topic)
Autumn 1	1. Series & Induction	● Use induction to prove results about sequences, series and differentiation ● Use given results to find sums of series ● Use the method of differences ● Find the limit of converging sequences
	2. Powers and roots of complex numbers	● Use de Moivre's theorem ● Find roots of complex numbers including unity ● Find the quadratic factors of polynomials ● Use the relationship between complex numbers and transformations
Autumn 2	3. Complex Numbers & Trigonometry	● Use de Moivre's theorem to derive trigonometric identities ● Find the sums of trigonometric series
	4. Lines and Planes	● Use different forms of the equation of a plane ● Find equations between lines and planes ● Calculate distances between points in 3d
	5. Simultaneous Equations and Planes	● Identify configurations of planes ● Determine the number of solutions to sets of equations
	6. Hyperbolic functions	● Define the hyperbolic functions ● Draw and understand their graphs ● Understand the inverses in terms of logarithms, and their reciprocals ● Solve equations and prove identities ● Differentiate hyperbolic functions
Spring 1	7. Further Calculus Techniques	● Differentiate inverse trig and inverse hyperbolic functions ● Find integrals that produce inverse functions ● Integrate using partial fractions

	8. Applications of Calculus		• Find MacLaurin series expansions including using results for more complex functions • Work with improper integrals • Find volumes of shapes using integration • Find the mean value of a function
	9. Polar Coordinates		• Use polar co-ordinates to represent curves • Convert between Cartesian and polar forms • Find areas enclosed by polar curves
	10. Differential Equations		• Solve first order differential equations • Solve second order differential equations
	11. Applications of differential equations 12.		• Use differential equations in modelling • Solve problems involving simple harmonic motion • Solve problems involving coupled differential equations
	Mech 5: Centres of mass 1		• Find centres of masses from particles, uniform rods and laminas. • Find centres of mass of standard 2 and 3d shapes. • Find centres of composite bodies
Spring 2	Stat 4: Non-parametric hypothesis tests		• Understand non parametric hypothesis tests and use the Wilcoxon tests.
	Stats 7: Continuous distributions		• Describe probabilities of continuous variables • Calculate expected statistics of continuous variables and functions of continuous variables • Convert between probability density functions and cumulative distribution functions • Use continuous uniform and exponential distributions
	Mech 6: Work, Energy and Power 2		• Calculate work done by a variable force • Understand and use Hooke's Law • Calculate work done when extending an elastic string • Solve problems involving elastic potential energy. • Use vectors to calculate work done, kinetic energy and power.
	Mech 7: Linear motion under variable force		• Solve problems when velocity is given as a function of displacement, acceleration is given as a function of acceleration or displacement • Use connected rates of change to solve linear motion problems

	Mech 8: Momentum and collisions 2	● Find the impulse of a variable force ● Solve impulse and momentum problems in 2d using vectors ● Calculate the result of oblique impacts
Summer 1	Stats 8: Combining random variables	● Find the mean and variance of two random variables ● Make predictions about the average or sum of a sample ● Understand distributions of linear combinations of normal variables
	Stats 9: Further Hypothesis Tests & C.I.s	● Learn more about situations where the normal distribution can be used for hypothesis testing and understand confidence intervals.
	Mech 9: Circular Motion 2	● Solve particle problems involving variable speed. ● Solve motion in a vertical circle problems.
	Mech 10: Centres of mass 2	● Use integration to find centres of mass ● Solve problems involving toppling or sliding objects.