CURRICULUM INTENT OVERVIEW PLAN (KS5)

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| Intent Statement – at Brook Sixth Form College, Mathematics plays a vital role in STEM subjects in which pupils learn to be able to move fluently between representations of mathematical ideas. We believe strongly that improving the maths skills among the pupils would improve their performance and deeper understanding of the STEM subjects, allowing them to progress to university or enable them to succeed in their chosen career at the end of year 13.  How are you trying to accomplish this, with this Programme of Study (PoS)? |
| To develop passion in the subject the curriculum is designed and delivered in a collaborative learning atmosphere where the students are encouraged to have communication in the classroom and they feel that it’s okay to ask questions. Challenging mathematical concepts are delivered with ease, using subject specific terminology, notation, real life facts, generalisations, interactive methods and techniques.  Further the maths curriculum is designed to provide students with a range of skills and knowledge that enable them to succeed, not only in their maths education and examinations, but to also provide a solid foundation in engineering maths and for their futures. An ability to understand and interpret mathematical information presented in a variety of forms and be able to translate from one to another. |
| Aims – what do you want pupils to be able to know and do by the time they finish this Programme of Study (PoS)? |
| An A Level Mathematics course and Further Mathematics course is offered to sixth form students gives them the opportunity to study ‘pure’ topics such as Algebraic functions, calculus and trigonometry. Learners use these ideas within the 'applied' topics such as mechanics and statistics which are compulsory modules along with pure modules. Students need an enthusiasm for problem-solving, and the course suits those with the determination to keep going in the hunt for possible solutions to complex problems. Although mathematics is highly logical, it also requires imagination and perseverance to work well on your own: consistent practice is the key to develop the knowledge and intuition required to do well and to develop the discipline needed to clearly communicate the solution. The 'applied’ disciplines of mechanics and statistics require mathematical modelling to make sense of real-life problems. Students will learn how to model real-life situations in mathematical terms, how models are refined and how to identify limitations within this process. Students will be expected to use technology where appropriate; for example, the use of spreadsheets and graphical calculators to support statistical analysis. |
| **Priority 2: Ensuring that an appropriate (post pandemic) curriculum is delivered effectively, leading to excellent student outcomes and destinations** |
| Entry level test helps to identify the ability of the students and put them in correct sets. Stretch and challenge material should be available to all students in all lessons. Milestone assessments and mini assessments help the teachers to identify the gaps in their knowledge. Students are given feedback on their work and provided with personalised feedback to allow students to make the progress that is most suitable for them, encouraging them to extend their thinking further to more complex contexts where appropriate.  Analysis of ALPs data to identify trends regarding the performance of groups of students: SEND, EAL, PP, Low ability and high ability shows excellent attainment results. |

**KS5 CURRICULUM: Mathematics (Year 12 AS Maths)**

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| **Term** | **Focus and NC Reference** | **NC Reference** |
| **Autumn 1** | **Pure**  1a. Algebraic expressions: basic algebraic manipulation, indices and surds  1b. Quadratic functions: factorising, solving, graphs and discriminants  1c. Equations: quadratic/linear simultaneous  1e. Graphs: cubic, quartic and reciprocal  1f. Transformations: transforming graphs , f(x) notation  Mechanics  6a. Introduction to mathematical modelling and standard S.I units of length, time and mass  6b. Definitions of force, velocity, speed, acceleration, weight and displacement; Vector and scalar quantities  7a. Graphical representation of velocity, acceleration and displacement  7b. Motion in a straight line under constant acceleration; suvat formulae for constant acceleration; Vertical motion under gravity | 2.1, 2.2  2.3  2.4  2.7  2.9  6.1  Cross curricular link with A level Physics  7.1, 7.2  7.3, 8.3 |
| **Autumn 2** | Pure  2a. Straight-line graphs, parallel/perpendicular, length and area problems  2b. Circles: equation of a circle, geometric problems on a grid  3a. Algebraic division, factor theorem and proof  3b. The binomial expansion  4a. Trigonometric ratios and graphs  Mechanics  8a. Newton’s first law, force diagrams, equilibrium, introduction to i, j system of vectors  8b. Newton’s second law, ‘F = ma’, connected particles (no resolving forces or use of F = μR); Newton’s third law: equilibrium, problems involving smooth pulleys  9a. Variable force; Calculus to determine rates of change for kinematics (differentiation)  9b. Use of integration for kinematics problems i.e. r = ∫ 𝒗 𝐝𝒕, v = ∫ 𝒂 𝐝𝒕 ( | 3.1, 2.7  3.2  2.6, 1.1  4.1  5.1, 5.3  8.1  8.2, 8.4  7.4 |
| **Spring 1** | Pure  4b. Trigonometric identities and equations  5a. Definitions, magnitude/direction, addition and scalar multiplication  5b. Position vectors, distance between two points, geometric problems  6a. Definition, differentiating polynomials, second derivatives  6b. Gradients, tangents, normals, maxima and minima  Statistics  1a. Introduction to sampling terminology; Advantages and disadvantages of sampling  1b. Understand and use sampling techniques; Compare sampling techniques in context  2a. Calculation and interpretation of measures of location; Calculation and interpretation of measures of variation; Understand and use coding  2b. Interpret diagrams for single-variable data; Interpret scatter diagrams and regression lines; Recognise and interpret outliers; Draw simple conclusions from statistical problems | 5.5, 5.7  10.1, 10.2, 10.3  10.4, 10.5  7.1, 7.2  7.3  1.1  1.1  2.3, 2.4  2.1, 2.2, 2.4 |
| **Spring 2** | Pure  7a. Definition as opposite of differentiation, indefinite integrals of x n  7b. Definite integrals and areas under curves  UNIT 8: Exponentials and logarithms Exponential functions and natural logarithms  Statistics  UNIT 3: Probability Mutually exclusive events; Independent events  UNIT 4: Statistical Distributions Use discrete distributions to model real-world situations; Identify the discrete uniform distribution; Calculate probabilities using the binomial distribution (calculator use expected)  5a. Language of hypothesis testing; Significance levels  5b. Carry out hypothesis tests involving the binomial distribution | 8.1, 8.2  8.3  6.1 – 6.7  3.1  4.1  5.1  5.2 |
| **Summer 1** | Revision  Recall and consolidation of the topics covered. Preparation for AS final exam |  |
| **Summer 2** | Pure  UNIT 1: Proof Examples including proof by deduction and proof by contradiction  UNIT 2: Algebraic and partial fractions  4a. Arithmetic and geometric progressions (proofs of ‘sum formulae’  4b. Sigma notation  4c. Recurrence and iterations  5a. Expanding (a + bx) n for rational n; knowledge of range of validity  5b. Expansion of functions by first using partial fractions  Mechanics  UNIT 4: Moments Forces’ turning effects  5a. Resolving forces  5b. Friction forces (including coefficient of friction µ) | 1.1  2.6, 2.10  4.4, 4.5, 4.6  4.3  4.2, 4.6  4.1  4.1  9.1  8.4  8.6 |

**KS5 CURRICULUM: Mathematics (Year 13 – A level Maths)**

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| **Term** | **Focus** | **NC Reference** |
| **Autumn 1** | Pure  3a. Modulus function  3b. Composite and carte  3c. Transformations  3d. Modelling with functions  6a. Radians (exact values), arcs and sectors  6b. Small angles)  6c. Secant, cosecant and cotangent (definitions, identities and graphs) & inverse trigonometrical functions & inverse trigonometrical functions  6d. Compound\* and double (and half) angle formulae \*geometric proofs expected  6f. Proving trigonometric identities  Mechanics  UNIT 6: Applications of kinematics Projectiles  7a. Equilibrium and statics (including ladder problems)  7b. Dynamics of a particle | 2.7  2.8  2.9  2.11  5.1, 5.3  5.2  5.4, 5.5  5.6a  5.8  7.5  8.4, 8.5, 9.1  8.2, 8.4, 8.5, 8.6 |
| **Autumn 2** | Pure  6e. R cos (x ± α) or R sin (x ± α)  6g. Solving problems in context (e.g. mechanics)  7a. Definition and converting between parametric and Cartesian forms  7b. Curve sketching and modelling  8a. Differentiating sin x and cos x from first principles  8b. Differentiating exponentials and logarithms  8c. Differentiating products, quotients, implicit and parametric functions.  8d. Second derivatives (rates of change of gradient, inflections)  9a. Location of roots  9b. Solving by iterative methods (knowledge of ‘staircase and cobweb’ diagrams)  Mechanics  8a. Constant acceleration (equations of motion in 2D; the i, j system)  8b. Variable acceleration (use of calculus and finding vectors 𝒓̇ and 𝒓̈ at a given time)  Statistics  1a. Change of variable  1b. Correlation coefficients; Statistical hypothesis testing for correlation coefficients  Revision  Recall and consolidation of the topics covered | 5.6b  5.9  3.3  3.3, 3.4  7.1c  7.2  7.2, 7.4, 7.5  7.1b  9.1  9.2  7.3  7.4  2.2  5.1 |
| **Spring 1** | Pure  9c. Newton-Raphson method  10a. Integrating x n (including when n = –1), exponentials and trigonometric functions  10b. Using the reverse of differentiation and using trigonometric identities to manipulate integrals  11a. Integration by substitution  11b. Integration by parts  11c. Use of partial fractions  11d. Areas under graphs or between two curves, including understanding the area is the limit of a sum (using sigma notation  11e. The trapezium rule  UNIT 12: Vectors (3D) Use of vectors in three dimensions; knowledge of column vectors and i, j and k unit vectors  Statistics  2a. Using set notation for probability; Conditional probability  2b. Questioning assumptions in probability  3a. Understand and use the Normal distribution  3b. Use the Normal distribution as an approximation to the binomial distribution; Selecting the appropriate distribution  3c. Statistical hypothesis testing for the mean of the Normal distribution | 9.2  8.2  8.2  8.5  8.5  8.6  8.3, 8.4  9.3  10.1  3.1, 3.2  3.3  4.2  4.2, 4.3  5.3 |
| **Spring 2** | Revision  Recall and consolidation of the topics covered. Preparation for AS final exam |  |
| **Summer 1** | Revision  Recall and consolidation of the topics covered. Preparation for A level final exam |  |
| **Summer 2** |  |  |

We will enrich our students by:

* To encourage student’s passion and engagement through the introduction of subject specific cultural capital. E.g. UCL PEARL environmental energy project. Undergraduate presentation regarding Maths and Robotics.
* Offering further opportunities for students to study mathematics. Establishing cross-curricular links especially through the learning of numerical skills and application in other areas through curriculum planning and dedicated numeracy week.
* Using external resources to enhance and support independent learning and revision using AMSP resources
* The experience of practical implementation of mathematics in everyday life for financial and numerical confidence and security;
* Opportunities to promote STEM and further/higher education learning and careers; Giving pupils the opportunity to mentor/be mentors by their peers

Our curriculum will enable students to:

* Learn within a coherent and exciting framework which does not limit students’ ambitions;
* Develop new skills through a variety of interesting contexts to foster enjoyment
* Develop a rich, deep and secure subject knowledge;
* Understand what they are doing well and how they need to improve;
* Explore the breadth and depth of the national curriculum;
* Build on their understanding of the importance of British values, including democracy, the rule of law, individual liberty and tolerance and respect.