St. Mary's College
Pure Mathematics Unit 2 Course Outline (2024-2025)

Term 1

PROPOSED TIME	TOPIC	SECTIONS
WEEKS 1-2	**Differentiation II**	Quick recap of Differentiation I. Chain Rule. Differentiation of log and exponential functions. Differentiation of Parametric equations, Implicit differentiation and Inverse Trig Functions (Second derivatives, combination of functions, tangents and normals included) Partial Derivatives (1^{st} & 2^{nd})
WEEK 3-4	**Integration**	Rational Functions, Partial Fractions. Trig Functions, Log and Exponential Functions Integration by Recognition. Integration by Substitution. Integration by Parts. Inverse Trig Functions. Reduction Formulae. Trapezium Rule.
WEEK 5-6	**Complex Numbers**	Complex Number Algebra – Addition, Subtraction, Division, Square Root. Nature of Roots - Quadratic Equations. Conjugate Pairs. Modulus and Argument of a Complex Number. The Argand Diagram. Locus and the Argand Diagram. De Moivre's Theorem. Polar and Exponential form of a Complex Number
WEEK 7-8	**Sequences**	Distinguish between Sequence & Series. Recurrence Relations. Limit of a Sequence. Convergence & Divergence. Periodic and Oscillating sequences. Mathematical Induction.
WEEK 9-11	**Series**	Series Notation and Partial Sums. Convergent and Divergent Series. AP's and GP's Mathematical Induction Method of Differences. Maclaurin and Taylor Series.

Term 2

WEEKS 1-3	**Binomial Theorem** **Roots of Equations**	Use of the ${}^{n}_{r}C$ notation and factorials. The Binomial Theorem and its application. Intermediate Value Theorem Interval Bisection Linear Interpolation Newton-Raphson Method (include failed cases) Iteration.
WEEKS 4-6	**Counting and Probability**	Distinguish between Permutation and Combination. Permutations with and without repetition – linear/circular, with/without restrictions, identical objects. Combinations with and without repetition Possibility Space Diagrams, Venn Diagram (no more that 3 Sets), Tree Diagrams Probability Rules and elementary applications
WEEKS 7-9	**Matrices & System of Linear Equations**	m x n Matrices $(1 \leq m, n \leq 3)$ - include matrix tyes/definitions and algebraic laws. Matrix Algebra – Addition, Subtraction, Multiplication Singular and Non-Singular Matrix Determinant, Cofactors and Inverse Matrix (2x2, 3x3) Multiplicative Inverse. Express linear equations as a matrix system of equations. Augmented Matrix. Solve system of linear equations by Row-Reduction to Echelon form. Consistency of system of equations. Cramer's Rule.
WEEKS 10-11	**Differential Equations & Modeling**	Solve First Order and Second Differential equations. Use a given substitution to reduce to a suitable form.