

COURSE DESCRIPTION – GRADES 9-12

Subject Area:	Mathematics
Course Number:	1202370
Course Title:	AICE Further Mathematics
Credit:	1.0

Will meet graduation requirements for Mathematics

- A. Major Concepts/Content.** The intent of this course is that students will obtain a thorough understanding of analytical geometry, pre-calculus and calculus concepts and their applications.

This content should include, but not be limited to, the following:

- sequences and series: convergence, divergence, sigma notation, factorials, combinations, binomial theorem
- the modulus function: meaning and use in solving equations
- rational functions and graphs: partial fraction decomposition, asymptotes, transformations, and other graphing techniques
- trigonometrical functions: inverse trig functions, addition and subtraction identities, solving trig equations
- complex numbers: meaning, operations, Argand diagrams, polar form, complex conjugates
- vectors: vector equation of a line and plane, skew lines, angles between lines and planes, perpendicular distance from a line to a point
- differentiation and integration: implicit differentiation, parametric equation, integration by substitution, trig substitutions, Maclaurin series
- forces and equilibrium: force vectors, equilibrium, friction
- rectilinear motion: displacement/time graphs, velocity/time graphs, area under a graph, acceleration, motion models
- motion of a projectile: horizontal and vertical equations of motion, trajectory
- Newton's laws of motion: applications of $F = ma$, negligible mass
- momentum and impulse: conservation of linear momentum
- energy, power, and work: potential energy and kinetic energy, Hooke's law, conservation of energy, relation between power, force, and velocity

This course shall integrate the Goal 3 Student Performance Standards of the Florida System of School Improvement and Accountability as appropriate to the content and processes of the subject matter.

Course student performance standards must be adopted by the district, and they must reflect appropriate Sunshine State Standards benchmarks.

- A. Special Note.** The Advanced International Certificate of Education (AICE) is an international pre-university curriculum and examination system administered by the
- B.** Local Examinations Syndicate at the University of Cambridge. The AICE courses include embedded assessments and an internationally scored end-of-course assessment.
- C. Course Requirements.** These requirements include, but are not limited to, the benchmarks from the Sunshine State Standards that are most relevant to this course. Benchmarks correlated with a specific course requirement may also be addressed by other course requirements as appropriate:

After successfully completing this course, the student will demonstrate understanding in:

- 1. Quadratics.**

MA.D.2.4.2 use systems of equations and inequalities to solve real-world problems graphically, algebraically, and with matrices.

2. Functions.

MA.A.3.4.2 select and justify alternative strategies, such as using properties of numbers, inverse, identity, distributive, associative, and transitive, that allow operational shortcuts for computational procedures in real-world or mathematical problems.

MA.C.3.4.2 using a rectangular coordinate system (graph), apply and algebraically verify properties of two- and three-dimensional figures, including distance, midpoint, slope, parallelism, and perpendicularity.

3. Coordinate geometry.

MA.B.1.4.1. use concrete and graphic models to derive formulas for finding perimeter, area, surface area, circumference, and volume of two- and three- dimensional shapes, including rectangular solids, cylinders, cones, and pyramids.

MA.B.1.4.2 use concrete and graphic models to derive formulas for finding rate, distance, time, angle measures, and arc length.

MA.B.1.4.3 relate the concepts of measurement to similarity and proportionality in real-world situations.

MA.C.2.4.2 analyze and apply geometric relationships involving planar cross-sections (the intersection of a plane and a three-dimensional figure).

MA.C.3.4.2 using a rectangular coordinate system (graph), apply and algebraically verify properties of two- and three-dimensional figures, including distance, midpoint, slope, parallelism, and perpendicularity.

MA.D.2.4.2 use systems of equations and inequalities to solve real-world problems graphically, algebraically, and with matrices.

4. Circular measure.

MA.C.3.4.1 represent and apply geometric properties and relationships to solve real-world and mathematical problems including ratio, proportion, and properties of right triangle trigonometry.

MA.C.3.4.2 using a rectangular coordinate system (graph), apply and algebraically verify properties of two- and three-dimensional figures, including distance, midpoint, slope, parallelism, and perpendicularity.

5. Trigonometry.

MA.B.1.4.2 use concrete and graphic models to derive formulas for finding rate, distance, time, angle measures, and arc length.

MA.C.2.4.1 understand geometric concepts such as perpendicularity, parallelism, tangency, congruency, similarity, reflections, symmetry, and transformations including flips, slides, turns, enlargements, rotations, and fractals.

MA.C.2.4.2 analyze and apply geometric relationships involving planar cross-sections (the intersection of a plane and a three-dimensional figure).

MA.C.3.4.1 represent and apply geometric properties and relationships to solve real-world and mathematical problems including ratio, proportion, and properties of right triangle trigonometry.

- MA.C.3.4.2 using a rectangular coordinate system (graph), apply and algebraically verify properties of two- and three-dimensional figures, including distance, midpoint, slope, parallelism, and perpendicularity.
- MA.D.2.4.2 use systems of equations and inequalities to solve real-world problems graphically, algebraically, and with matrices.

6. Vectors.

- MA.B.1.4.2 use concrete and graphic models to derive formulas for finding rate, distance, time, angle measures, and arc length.
- MA.B.2.4.2 solve real-world problems involving rated measures (miles per hour, feet per second).
- MA.C.2.4.1 understand geometric concepts such as perpendicularity, parallelism, tangency, congruency, similarity, reflections, symmetry, and transformations including flips, slides, turns, enlargements, rotations, and fractals.
- MA.C.2.4.2 analyze and apply geometric relationships involving planar cross-sections (the intersection of a plane and a three-dimensional figure).

7. Series.

- MA.A.2.4.1 understand and use the basic concepts of limits and infinity.
- MA.D.1.4.1 describe, analyze, and generalize relationships, patterns, and functions using words, symbols, variables, tables, and graphs.
- MA.D.2.4.1 represent real-world problem situations using finite graphs, matrices, sequences, series, and recursive relations.

8. Differentiation.

- MA.A.2.4.1 understand and use the basic concepts of limits and infinity.
- MA.B.2.4.1 select and use direct (measured) and indirect (not measured) methods of measurement of appropriate.
- MA.B.2.4.2 solve real-world problems involving rated measures (miles per hour, feet per second).
- MA.D.2.4.2 use systems of equations and inequalities to solve real-world problems graphically, algebraically, and with matrices.

9. Integration.

- MA.A.2.4.1 understand and use the basic concepts of limits and infinity.
- MA.B.2.4.1 select and use direct (measured) and indirect (not measured) methods of measurement of appropriate.
- MA.B.2.4.2 solve real-world problems involving rated measures (miles per hour, feet per second).
- MA.C.2.4.1 understand geometric concepts such as perpendicularity, parallelism, tangency, congruency, similarity, reflections, symmetry, and transformations including flips, slides, turns, enlargements, rotations, and fractals.
- MA.C.2.4.2 analyze and apply geometric relationships involving planar cross-sections (the intersection of a plane and a three-dimensional figure).

MA.D.2.4.2 use systems of equations and inequalities to solve real-world problems graphically, algebraically, and with matrices.

10. Algebra.

- MA.A.1.4.3 understand concrete and symbolic representations of real and complex numbers in real-world situations.
- MA.A.1.4.4 understand that numbers can be represented in a variety of equivalent forms, including integers, fractions, decimals, percents, scientific notation, exponents, radicals, absolute value, and logarithms.
- MA.A.3.4.1 understand and explain the effects of addition, subtraction, multiplication, and division on real numbers, including square roots, exponents, and appropriate inverse relationships.

11. Logarithmic and exponential functions.

- MA.A.3.4.1 understand and explain the effects of addition, subtraction, multiplication, and division on real numbers, including square roots, exponents, and appropriate inverse relationships.
- MA.D.1.4.1 describe, analyze, and generalize relationships, patterns, and functions using words, symbols, variables, tables, and graphs.
- MA.D.2.4.2 use systems of equations and inequalities to solve real-world problems graphically, algebraically, and with matrices.

12. Numerical solution of equations.

- MA.D.2.4.1 represent real-world problem situations using finite graphs, matrices, sequences, series, and recursive relations.
- MA.D.2.4.2 use systems of equations and inequalities to solve real-world problems graphically, algebraically, and with matrices.

13. Complex numbers.

- MA.A.1.4.4 understand that numbers can be represented in a variety of equivalent forms, including integers, fractions, decimals, percents, scientific notation, exponents, radicals, absolute value, and logarithms.
- MA.A.3.4.1 understand and explain the effects of addition, subtraction, multiplication, and division on real numbers, including square roots, exponents, and appropriate inverse relationships.
- MA.D.1.4.1 describe, analyze, and generalize relationships, patterns, and functions using words, symbols, variables, tables, and graphs.

14. Forces and equilibrium.

- MA.A.4.4.1 use estimation strategies in complex situations to predict results and to check the reasonableness of results.
- MA.B.1.4.2 use concrete and graphic models to derive formulas for finding rate, distance, time, angle measures, and arc length.

- MA.B.1.4.3 relate the concepts of measurement to similarity and proportionality in real-world situations.
- MA.B.2.4.2 solve real-world problems involving rated measures (miles per hour, feet per second).
- MA.B.3.4.1 solves real-world and mathematical problems involving estimates of measurements, including length, time, weight/mass, temperature, money, perimeter, area, and volume and estimates the effects of measurement errors on calculations.

15. Kinematics of motions in a straight line.

- MA.B.2.4.2 solve real-world problems involving rated measures (miles per hour, feet per second).
- MA.B.3.4.1 solves real-world and mathematical problems involving estimates of measurements, including length, time, weight/mass, temperature, money, perimeter, area, and volume and estimates the effects of measurement errors on calculations.
- MA.B.4.4.2 selects and uses appropriate instruments, technology, and techniques to measure quantities in order to achieve specified degrees of accuracy in a problem situation.
- MA.C.2.4.2 analyze and apply geometric relationships involving planar cross-sections (the intersection of a plane and a three-dimensional figure).
- MA.C.3.4.1 represent and apply geometric properties and relationships to solve real-world and mathematical problems including ratio, proportion, and properties of right triangle trigonometry.
- MA.D.2.4.2 use systems of equations and inequalities to solve real-world problems graphically, algebraically, and with matrices.

16. Newton's laws of motion.

- MA.D.1.4.1 describe, analyze, and generalize relationships, patterns, and functions using words, symbols, variables, tables, and graphs.
- MA.D.2.4.2 use systems of equations and inequalities to solve real-world problems graphically, algebraically, and with matrices.

17. Energy, work and power.

- MA.B.2.4.1 select and use direct (measured) and indirect (not measured methods of measurement of appropriate).
- MA.B.2.4.2 solve real-world problems involving rated measures (miles per hour, feet per second).
- MA.D.1.4.1 describe, analyze, and generalize relationships, patterns, and functions using words, symbols, variables, tables, and graphs.
- MA.D.2.4.2 use systems of equations and inequalities to solve real-world problems graphically, algebraically, and with matrices.