**Curriculum**

**IB Math SL Y2**

**Course Overview**

This is a two-year course designed to prepare students with an average to above average background and ability in mathematics for the International Baccalaureate Diploma Program, a rigorous pre-university course of studies. A TI-83+ or TI-84+ is required for this course. In the second year, students will study the remaining two topics. The topics to be covered include Statistics and Probability and Calculus. Students will also complete portfolio pieces. As in the first year, the portfolio assignments will be of varying difficulty and will cover different areas of the curriculum. The purpose of the portfolio is to give students the opportunity to study a particular topic in greater detail. They also provide the students with the opportunity to communicate effectively with sound mathematical writing.

**Department Standards**

Students will be able to comprehend mathematical concepts.

Students will apply mathematical procedures accurately, efficiently, and appropriately.

Students will be able to formulate, represent, and solve mathematical problems.

Students will develop logical mathematical thought and precise mathematical communication.

**Benchmarks**:

Students will:

understand and interpret the results obtained in descriptive statistics, basic probability, and modelling data;

explore the basic concepts and techniques of differential and integral calculus and their application; and

prepare well for the IB End of Course Exam.

**Performance Indicators**

First Quarter

Students will be able to:

display data using frequency distributions, histograms, and box & whiskers plots;

compute measures of central tendency and measures of spread, for discrete data sets and grouped data;

draw a cumulative frequency graph and evaluate quartiles, percentiles and measures of spread accordingly;

describe and compare distributions using these statistics;

specify sample spaces and events for random experiments;

find the probability that an event will occur;

identify mutually exclusive and independent events and find the probability of such events;

find the derivative of a function using first principles;

understand the concept of a limit relating to the first principles approach; and be familiar with the terms slope, gradient, derivative and instantaneous rate of change.

Second Quarter

Students will be able to:

find basic trigonometric derivatives with the aid of a formula booklet;

utilize the chain rule, product and quotient rules for differentiation;

calculate second derivatives and use values to make conclusions for stationary points and points of inflection;

find equations of tangents and normals;

identify increasing and decreasing functions; and

evaluate application problems with profit, area and volume.

Third Quarter

Students will be able to:

integrate basic functions, including trigonometric composite functions;

evaluate definite integrals, find the area under a curve or between two curves;

use the concepts of displacement, velocity and acceleration with respect to integration and differentiation;

evaluate integrals and calculate the unknown constant of integration;

calculate the volume of revolution of a function about the x-axis;

generate a probability distribution for a set of events, calculate the expected value and standard deviation;

recognize a binomial distribution and calculate the mean (expected value) and standard deviation of the distribution, as well as discrete and cumulative probabilities;

recognize and analyze normal distributions; and

calculate standardized values using the z-score formula and evaluate probabilities using the normal tables or techology.

Fourth Quarter

Students will be able to:

write vector equations and transform into parametric equations;

understand and interpret velocity from a velocity vector;

interpret a and b from the equation r = a + tb;

use the form r = a + tb to solve vector equations to find points of intersection; and show that two lines are parallel, intersecting or skew.

**Assessments**

First Quarter

Homework Assignments

Quizzes

Tests

Second Quarter

Homework Assignments

Quizzes

Tests

Portfolio Tasks

First Semester Exam

Third Quarter

Homework Assignments

Quizzes

Tests

Portfolio Tasks

Fourth Quarter

IB Review Questions

IB Standard Level

**Core Topics**

First Quarter

Descriptive Statistics

Probability

Differential Calculus

Second Quarter

Applications of Differential Calculus

Derivatives of Exponential, Logarithmic, and Trigonometric functions

Third Quarter

Integration

Areas within curved boundaries

Trigonometric Integration

Volumes of Revolution

Statistical Distributions

Fourth Quarter

Lines in a Plane and in Space

IB Exam Review

**Specific Content**

First Quarter

Concepts of population, sample, random sample and frequency distribution of discrete and continuous data.

Use of both continuous and discrete data.

Presentation of data: frequency tables and diagrams, box and whisker plots.

Grouped data: mid-interval values, interval width, upper and lower interval boundaries, frequency histograms.

Mean, median, mode; quartiles, percentiles.

Range; interquartile range; variance; standard deviation.

Cumulative frequency; cumulative frequency graphs; use to find median, quartiles, percentiles.

Concepts of trial, outcome, equally likely outcomes, sample space (U) and event.

The probability of an event A as P(A)= n(A)/n(U).

The complementary events A and A' (not A); P(A) + P'(A) = 1.

Combined events, the formula: P( A U B) = P(A) + P(B) - P(A n B).

P(A n B) = 0 for mutually exclusive events.

Conditional probability; the definition

P(A|B) = P(A) = P(A|B').

Informal ideas of limit and convergence.

Definition of derivative using first principles.

Derivative of xn.

Derivative interpreted as gradient function and as rate of change.

Second Quarter

Derivative of sin x, cos x, tan x, ex and ln x.

Differentiation of a sum and a real multiple of the above functions.

The chain rule for composite functions.

The product and quotient rules.

The second derivative.

Local maximum and minimum points.

Testing for maximum or minimum using change of sign of the first derivative and using the sign of the second derivative.

Use of the first and second derivative in optimization problems.

Graphical behavior of functions: tangents and normals, behavior for large |x|, horizontal and vertical asymptotes.

The significance of the second derivative; distinction between maximum and minimum points.

Points of inflection with zero and non-zero gradients.

Third Quarter

Indefinite integration as anti-differentiation.

Indefinite integral of xn, sin x , cos x, 1/x and ex.

The composite of any of these with the linear function ax + b.

Anti-differentiation with a boundary condition to determine the constant term.

Definite integrals.

Area under curves (between the curve and the x-axis), areas between curves.

Volumes of revolution. (x-axis only).

Concept of discrete random variables and their probability distributions.

Expected value (mean), E(X) for discrete data.

Binomial distribution

Normal distribution

Fourth Quarter

Representation of a line as r = a + tb. (Parametric equations)

The angle between two lines.

Distinguishing between coincident and parallel lines.

Finding points where lines intersect.

Analysis of past questions paper 1 and paper 2.

**Resources**

TI-84plus Graphing Calculator

Resource CD for text