

# Diploma Programme Course Outline

Name of the DP subject	Mathematics Analysis and Approaches	
Level	Higher  Standard 	
YEAR 2		
UNIT	TOPIC/CONCEPT	ASSESSMENT COMPONENTS
Unit 5  <b>CALCULUS</b>	<b>5.9-</b> Kinematics  <b>5.12 - HL-</b> Informal understanding of continuity and differentiability of a function at a point. - Understanding of limits(convergence and divergence). - Definition of derivative from first principles - Higher Derivatives	
	<b>5.10-</b> Indefinite integral of $x^n$ , $\sin x$ , $\cos x$ , $1/x$ , $e^x$  -The composites of any of these with the linear function $ax+b$ - Integration by inspection or substitution <b>5.13- HL-</b> The evaluation of limits using l'Hopital's or the Maclaurin series. - Repeated use of l'Hopital rule.	

	<p><b>5.11-</b> Definite integrals including analytical approach</p> <ul style="list-style-type: none"> <li>- Areas of a region enclosed by a curve <math>y = f(x)</math> and the x-axis, where <math>f(x)</math> can be positive or negative, without the use of technology.</li> <li>- Areas between curves</li> </ul> <p><b>5.14- HL-</b> Implicit differentiation</p> <ul style="list-style-type: none"> <li>--Related rates of change</li> <li>- Optimisation problems</li> </ul>	
UNIT	TOPIC/CONCEPT	ASSESSMENT COMPONENTS
<p><b>Unit 4</b></p> <p><b>Statistics and Probability</b></p> <p><b>Calculus</b></p>	<p><b>4.1-</b> Concepts of population, sample, random sample, discrete and continuous data.</p> <p><b>5.15- HL-</b> Derivatives of <math>\tan x</math>, <math>\sec x</math>, <math>\operatorname{cosec} x</math>, <math>\cot x</math>, <math>a^x</math>, <math>\log_a x</math>, <math>\arcsin x</math>, <math>\arccos x</math>, <math>\arctan x</math></p> <ul style="list-style-type: none"> <li>- Indefinite integrals of the derivatives of any of the above functions.</li> </ul>	<p>Test on Integration</p> <p>Test on limits, implicit differentiated and related rate of change</p>

	<ul style="list-style-type: none"> <li>- The composites of any of these with a linear function.</li> <li>- Use of partial fractions to rearrange the integrand</li> </ul>	
<p><b>Statistics and Probability</b></p> <p><b>Calculus</b></p>	<p><b>4.2-</b> Interpretation of outliers</p> <ul style="list-style-type: none"> <li>- Histogram</li> <li>- Cumulative Frequency graphs</li> <li>- (use to find median, quartiles, percentiles, range and interquartile range.</li> <li>- Box and whisker plots</li> <li>- Using box and whisker to compare two distributions using symmetry, median, interquartile range or range.</li> </ul> <p><b>5.16-</b> - <b>Integration by substitution</b></p> <ul style="list-style-type: none"> <li>- <b>Integration by parts</b></li> <li>- <b>Repeated integration by parts</b></li> </ul>	
<p><b>Statistics and Probability</b></p> <p><b>Calculus</b></p>	<p><b>4.3 -</b> Measures of dispersion</p> <ul style="list-style-type: none"> <li>- Standard Deviation</li> <li>- Variance</li> <li>- Effect of constant changes on the original data</li> <li>- Using TI-84 to find quartiles. Compare the values of quartiles found by hand and that by technology</li> </ul> <p><b>5.17- HL-</b> <b>Area of the region enclosed by a curve and the y-axis in a given interval</b></p> <ul style="list-style-type: none"> <li>- <b>Volumes of revolution about the x-axis and y-axis</b></li> </ul>	

<p><b>Statistics and Probability</b></p> <p><b>Calculus</b></p>	<p><b>4.4-</b> Linear correlation of bivariate data</p> <ul style="list-style-type: none"> <li>- Pearson's product-moment correlation coefficient, <math>r</math></li> <li>- Scatter diagrams, lines of best fit, by eye, passing through the mean point</li> <li>- Use of the equation of the regression line for prediction purposes</li> <li>- Interpret the meaning of the parameters, <math>a</math> and <math>b</math>, in a linear regression <math>y = ax + b</math></li> </ul> <p><b>5.18- HL-</b> First order differential equations using Euler's method</p> <ul style="list-style-type: none"> <li>- Variable separable</li> <li>- Homogenous differential equation</li> <li>- Solution of differential equations using the integrating factor.</li> </ul>	<p>Worksheet on Statistics</p>
<p><b>Statistics and Probability</b></p> <p><b>Calculus</b></p>	<p><b>4.5-</b> Concepts of trial, outcome, equally likely outcomes, relative frequency, sample space ( <math>U</math> ) and event.</p> <ul style="list-style-type: none"> <li>- The probability of an event <math>A</math> is <math>P( A ) = \frac{n(A)}{n(U)}</math></li> <li>- The complementary events <math>A</math> and <math>A'</math>( not <math>A</math> )</li> <li>- Expected number of occurrences</li> </ul> <p><b>5.19- HL-</b>Maclaurin series to obtain expressions for <math>e^x, \sin x, \cos x, \ln(1+x), (1 + x)^p</math></p> <ul style="list-style-type: none"> <li>- Use of simple substitution, products, integration and differentiation to obtain other series</li> </ul>	

	<ul style="list-style-type: none"> <li>- Maclaurin series developed from differential equations</li> <li>- Maclaurin series developed from differential equations.</li> </ul>	
UNIT	TOPIC/CONCEPT	ASSESSMENT COMPONENTS
<b>Statistics and Probability</b>	<p><b>4.6-</b> Use of Venn diagrams, tree diagrams, sample space diagrams and tables of outcomes to calculate probabilities</p> <ul style="list-style-type: none"> <li>- Combined events:</li> <li>- <math>P(A \cup B) = P(A) + P(B) - P(A \cap B)</math></li> <li>- Mutually exclusive events: <math>P(A \cap B) = 0</math></li> </ul> <p><b>4.13 – HL-</b> Use of Baye’s theorem for a maximum of three events</p>	
<b>Statistics and Probability</b>	<p><b>4.7-</b> Conditional Probability: <math>P(A/B) = \frac{P(A \cap B)}{P(B)}</math></p> <ul style="list-style-type: none"> <li>- Independent events: <math>P(A \cap B) = P(A) P(B)</math></li> <li>- Concept of discrete random variables and their probability distributions.</li> <li>- Expected value(mean), for discrete data</li> <li>- Applications</li> </ul> <p><b>4.14-</b> Variance of a discrete random variable</p> <ul style="list-style-type: none"> <li>- Continuous random variables and their probability density functions</li> <li>- Mode and median of continuous random Variables</li> </ul>	<p>Test on Statistics</p> <p>Test on Maclaurin series</p>

<b>Statistics and Probability</b>	<p><b>4.8-</b> Binomial distribution</p> <ul style="list-style-type: none"> <li>- Mean and variance of the binomial distribution</li> </ul> <p><b>4.14-</b> Mean, variance and standard deviation of both discrete and continuous random variables.</p> <ul style="list-style-type: none"> <li>-The effect of linear transformations of X</li> </ul>	
<b>Statistics and Probability</b>	<p><b>4.9-</b> Equation of the regression line of x on y.</p> <ul style="list-style-type: none"> <li>- Use of the equation for prediction purposes</li> <li>- Formal definition and use of the formulae:</li> <li>- <math>P(A/B) = \frac{P(A \cap B)}{P(B)}</math></li> <li>- <math>P(A/B) = P(A) = P(A/B')</math> for independent events</li> </ul> <p><b>4.14- HL-</b> Review of :</p> <ul style="list-style-type: none"> <li>- Variance of a discrete random variable</li> <li>- Continuous random variables and their probability density functions</li> </ul>	<p>Problem Set on Binomial Distribution</p> <p>Problem set on Baye's Theorem and Discrete Random Variables</p>
<b>Statistics and Probability</b>	<p><b>4.10-</b> Equation of the regression line of x on y.</p> <ul style="list-style-type: none"> <li>- Use of the equation for prediction purposes.</li> </ul>	
<b>UNIT</b>	<b>TOPIC/CONCEPT</b>	<b>ASSESSMENT COMPONENTS</b>

<b>Statistics and Probability</b>	<b>4.11-</b> Formal definition and use of the formulae: $P(A/B) = \frac{P(A \cap B)}{P(B)}$ $P(A/B) = P(A/B')$ for independent events.	
<b>Statistics and Probability</b>	<b>4.12-</b> Standardization of normal variables(z values) - Inverse normal calculations where mean and standard deviation are unknown	Test on Statistics and Probability

All Diploma Programme courses are designed as two-year learning experiences.