Mathematics (Senior Secondary)

1. Introduction

The Department of Mathematics at HKUGAC strives to develop students' mathematical skills, their ability to communicate mathematics, their ability to reflect and evaluate, and their ability to develop and apply mathematical and technical knowledge. We aim to foster in our students a positive attitude, an appreciation of mathematics and their significance to everyday life. The programme will incorporate elements to increase intercultural awareness and cross-subject links.

The curriculum is designed in accordance with the syllabus for Secondary 4 – 6 Mathematics, using the approaches in compliance with the New Senior Secondary Curriculum and Assessment Guides in Mathematics Education, the general guidelines set by the Curriculum Development Council and the Hong Kong Examinations and Assessment Authority in 2007.

1.2 Teaching methods

Given students' diverse learning styles, we employ various teaching and assessment strategies to ensure that all of our students have an opportunity to learn and demonstrate their understanding.

The teacher will act as a resource for the student to learn to use. This will require them to take an active part in their own learning. Thus, they are encouraged to ask questions when there is a conflict between their understanding and the feedback that they obtain.

Local and international cultures, as well as the history of mathematics, are incorporated into the syllabus wherever possible. Throughout the six years of study, students will be assigned problem solving tasks, various projects and modelling assignments that will require them to apply their mathematical knowledge to applications involving problems from the real world.

The use of e-resources and technology is incorporated into the curriculum in order to facilitate mathematical learning and assessment. Technology, whenever appropriate, is used in lessons for students to explore mathematical concepts, to be assessed and to perform mathematical experiments. Learning materials are also provided online.

We will provide various levels of study groups to ensure that all students are given the academic opportunity and challenge to reach their full potential. This is essential in developing students' abilities to express ideas clearly and to think critically, in order for them to become contributing members to society.

For the higher ability students, we provide extra training for them to take part in the International Mathematical Olympiad.

1.3 Assessment

Assessment will take various forms that will incorporate skills acquisition, class participation, oral discussion, note-taking, worksheets, assignments, projects and written tests.

2. Aims & Objectives of Mathematics Education

The aims for mathematics are to enable students to:

- develop a positive attitude toward the continued learning of mathematics
- appreciate the usefulness, power and beauty of mathematics, and recognize its relationship with other disciplines with everyday life
- gain knowledge and develop understanding of mathematical concepts
- develop mathematics skills and apply them in daily life
- develop the ability to communicate mathematics with appropriate symbols and language
- develop ability to reflect upon and evaluate the significance of their work and the work of others
- share ideas and experience and work cooperatively with others in accomplishing mathematical tasks/activities and solving mathematical problems
- develop patience and persistence when solving mathematical problems
- develop and apply information and communication technology skills in the study of mathematics
- appreciate the international dimensions of mathematics and its varied cultural and historical perspectives

At the end of the course students should be able to:

- know and understand concepts, and demonstrate skills, from the branches of mathematics
- understand and use a variety of mathematical forms and have the ability to move confidently between them
- select and use appropriate mathematical knowledge, skills and techniques when investigating problems and justify their relationship
- recognize patterns and structures and describe them as relationships or general rules when investigating problems

- draw conclusions consistent with findings
- communicate mathematical facts, ideas, methods, results and conclusions using appropriate language and symbols
- reflect on their methods and processes and be able to consider possible alternative approaches
- evaluate the significance and reliability of their findings and findings of others

3. Curriculum

3.1 Mathematics Curriculum Framework

9 Refined Generic Skills[#]		
Basic Skills:	Communication Skills, Mathematical Skills, IT Skills	
Thinking Skills:	Critical Thinking Skills, Creativity, Problem Solving Skills	
Personal and Social Skills:	Self-management Skills, Self-learning Skills, Collaboration Skills	
Level	Dimensions	Units
S4	Number and Algebra	Number Systems
		Quadratic Equations in One Unknown
		Basic Knowledge of Functions
		Quadratic Functions
		More about Polynomials
		Exponential Functions
		Logarithmic Functions
		Rational Functions
	Measure, Shape and Space	Equations of Straight Lines
		Basic Properties of Circles
		More about Basic Properties of Circles
		Basic Trigonometry
		Mensuration
	Data Handling	Nil

	Module 1	Binomial Expansion
		Exponential Functions and Logarithmic Functions
		Limits and Derivatives
		Differentiation
	Module 2	Pre-requisite Knowledge
		Mathematical Induction
		Binomial Theorem
		More about Trigonometric Functions
		Limits and the Number e
S5	Number and Algebra	More about Equations
		Inequalities in One Unknown
		More about Graphs of Functions
		Variations
	Measure, Shape and Space	Equations of Circles
		Locus
		Solving Triangles
		Applications in Trigonometry
	Data Handling	Permutation and Combination
		More about Probability
		Measures of Dispersion
		More about Dispersion
	Module 1	Applications of Differentiation
		Indefinite Integration and its Applications
		Definite Integration
		Applications of Definite Integration
		Further Probability
		Probability Distribution, Expectation and Variance
		Discrete Probability Distributions

	Module 2	Differentiation
		Applications of Differentiation
		Indefinite Integration
		Definite Integration
		Applications of Definite Integration
		Matrices and Determinants
S6	Number and Algebra	Arithmetic Sequences
		Geometric Sequences
		Linear Inequalities in Two Unknowns and Linear Programming
	Measure, Shape and Space	Nil
	Data Handling	Uses and Abuses of Statistics
	Module 1	The Normal Distribution and its Applications
		Sampling Distribution and Point Estimation
		Interval Estimation
	Module 2	Systems of Linear Equations
		Introduction to Vectors
		Scalar Products and Vector Products

3.2 Delivery Schedule

S4

Time Frames	Compulsory Part	Module 1	Module 2
September	Equations of Straight Lines, Number Systems	Nil	Nil
October	Quadratic Equations in One Unknown,		
November	Basic Knowledge of Functions Quadratic Functions		
December	More about Polynomials	Nil	Nil
January	First Term Exam		
February	Exponential Functions, Logarithmic Functions,	Binomial Expansion , Exponential Functions and Logarithmic Functions	Pre-requisite Knowledge, Mathematical Induction
March	Rational Functions, Basic Trigonometry,	Limits and Derivatives	Binomial Theorem
April	Basic Properties of Circles, More about Basic Properties of Circles	Differentiation	More about Trigonometric Functions
May	Revision of Mensuration, Law of Indices, Change of Subject, Factorization		Limits and the Number e
June	Final Exam	Final Exam	Final Exam
July	**Summer Holidays**	**Summer Holidays**	**Summer Holidays**

S5

Time Frames	Compulsory Part	Module 1	Module 2
September	More about Equations, Inequalities in One Unknown	Applications of Differentiation	Differentiation
October	More about Graphs of Functions, Variations	Indefinite Integration and its Applications	Applications of Differentiation
November	Permutation and Combination	Definite Integration	
December	More about Probability	Applications of Definite Integration	Indefinite Integration
January	Frist Term Exam	First Term Exam	First Term Exam
February	Solving Triangles, Applications in Trigonometry	Further Probability	Definite Integration
March	Measures of Dispersion, More about Dispersion	Probability Distribution, Expectation and Variances	Applications of Definite Integration
April	IGCSE	Discrete Probability Distributions	Matrices and Determinants
May	Locus, Equations of Circles		
June	Final Exam	Final Exam	Final Exam
July	**Summer Holidays**	**Summer Holidays**	**Summer Holidays**

S6

Time Frames	Compulsory Part	Module 1	Module 2
September	Arithmetic Sequences Geometric Sequences	The Normal Distribution and its Applications	Systems of Linear Equations
October	Linear Inequalities in Two Unknowns and Linear Programming Uses and Abuses of Statistics	Sampling Distribution and Point Estimation Interval Estimation	Introduction to Vectors Scalar Products and Vector Products
November - December	Assessment week		
	Revision		
January	Mock Exam		
February	Post-Exam Revision Programme		
March - April	Study Leave		
May	HKDSE		

4. Assessing students

4.1 Formative and Summative Assessment

Formative assessment is an integral part of the learning experience that is designed to measure what students know and what they are learning as they go along; the objectives addressed by specific assessment tasks are shared with students, with feedback taking place. Formative assessment is carried out in various ways, including project work, oral presentation, class discussions, homework assignments, and written tests in class or at home. Summative assessment is the judgment made by the teacher of the standard of achievement reached by each student at a particular point in time and at the end of the year.

4.2 Weighting of Component Parts

	S4 – S5	S6
Continuous Assessment[#]	40%	40%
First Term Exam	30%	-
Final Exam	30%	-
Mock Exam	-	60%
Total	100%	100%

[#] Continuous Assessment includes homework, quizzes and unit tests.

4.3 Assessment Criteria

Compulsory Part

The students are assessed on three assessment criteria:
"Numerical and Algebraic Skills" (NAS); "Spatial and Geometric Skills" (SGS);
"Data Handling Skills" (DHS)
"Application of Mathematical Concepts and Skills" (AM).

S4

Assessment Criteria	Topics involved	
	S4 Term 1	S4 Term 2
NAS	- Number Systems - Quadratic Equations in One Unknown - Basic Knowledge of Functions - Quadratic Functions - More about Polynomials	- Exponential Functions - Logarithmic Functions - Rational Functions
SGS	Equations of Straight Lines	- Basic Trigonometry - Basic Properties of Circles - More about Basic Properties of Circles - Mensuration**
DHS	Not assessed	Not assessed

** This topic is a revision of relevant content learnt in junior forms

S5

Assessment Criteria	Topics involved	
	S5 Term 1	S5 Term 2
NAS	- More about Equations - Inequalities in One Unknown - More about Graphs of Functions - Variations	Not assessed
SGS	Not assessed	- Solving Triangles - Application in Trigonometry - Locus - Equations of Circles
DHS	- Permutation and Combination - More about Probability	- Measures of Dispersion - More about Dispersion

S6

Assessment Criteria	Topics involved
	S6 Term 1
NAS	- Arithmetic Sequences - Geometric Sequences - Linear Inequalities in Two Unknowns and Linear Programming
SGS	Not assessed
DHS	Uses and Abuses of Statistics
AM	Cross-topic assessment

Extended Part – Module 1

S4 Term 2

1. Manipulation of Binomial Expansions; Exponential and Logarithmic Functions

2. Computation of Limits and Derivatives of Different Functions

S5 Term 1

1. Application of Differentiation and Indefinite Integration Techniques to Solve Real-Life Problems

2. Computation and Application of Definite Integrals to Solve Real-Life Problems

S5 Term 2

1. Solving Problems about Conditional Probability and Random Variables

2. Modelling Real-Life Scenarios by Discrete Distributions

S6 Term 1

1. Modelling Real-Life Scenarios by the Normal Distribution

2. Estimation of Parameters from Samples and Construction of Confidence Intervals

Extended Part – Module 2

S4 Term 2

1. Manipulation of Mathematical Induction

2. Manipulation of Binomial Theorem

3. Manipulation of More about Trigonometric Functions

4. Computation of Limit and the number e

S5 Term 1

1. Computation of Differentiation

2. Computation of Application of Differentiation

3. Computation of Indefinite Integration

S5 Term 2

1. Computation of Definite Integration

2. Techniques and Application of Definite Integration

3. Manipulation of Matrices and Determinants

S6 Term 1

1. Exploration of System of Linear Equations by Matrices

2. Introduction to Vectors

3. Computation of Scalar Products and Vector Products

4.4 Reference Level Descriptors and Boundaries

Levels	Boundaries of Levels	
	Compulsory Part	Module 1 or Module 2
5**	90% or above	90% or above
5*	85% to 89%	80% to 89%
5	75% to 84%	70% to 79%
4	65% to 74%	60% to 69%
3	50% to 64%	50% to 59%
2	35% to 49%	35% to 49%
1	34% or below	34% or below

The marks are rounded off to the nearest %.
The actual boundaries will vary depending on the performance of students.

4.5 Requirement of taking the extended module in S4 to S6

Based on our experiences of our graduates' past performances in the HKDSE, if students cannot achieve a satisfactory standard in the school examinations they tend to struggle to keep up in the compulsory part and the extended module in Mathematics. In order to help students focus on the compulsory part and obtain a better grade in the HKDSE, we have set the following benchmarks that students must meet if they wish to continue taking M1 or M2:

	Benchmark	
	Compulsory Part	Extended Part (M1 or M2)
S4 First Term Exam	50% or above	-
S4 Final Exam	60% or above	40% or above
S5 First Term Exam		
S5 Final Exam		

5. Parents' role and homework and assignments

5.1 Parents' role

Parents are encouraged to talk to their children about their work in class, what they are currently learning and check the aims and objectives of the unit being studied. They should also discuss the results obtained by their children and to regularly check their diaries.

Homework is a valuable aid to help students make the most of their school experience. Homework consolidates, reinforces and strengthens concepts learnt in class, encourages students to develop responsibility, time management skills, good study habits and helps teachers assess the performance of students. Teachers will assign homework at a suitable level of difficulty and related appropriately to specific objectives. A homework load of around 30 minutes will be assigned on the day of each mathematics lesson.

5.2 Homework Policy

As a measure to train students to be responsible for completing homework in a timely manner, late submission will result in zero marks given. Students who hand in homework late will be required to complete the unfinished work after school and the homework will receive their teachers' feedback as usual.