THE UNIVERSITY OF HONG KONG
DEPARTMENT OF MATHEMATICS

Advice on Course Selection 2020-21 (4-year curriculum)

Contents

1 Introduction

One of the key features of the Bachelor of Science programme is the great flexibility of the curriculum. Students are free to choose their major and to plan their own class schedule. Meanwhile, it is very likely that you will have questions about what courses you should enroll in for your first two years so as to better prepare your future courses. In view of this, we are going to provide you in this article with some advice on course selection, aiming at those who are interested in choosing one of the following programmes:

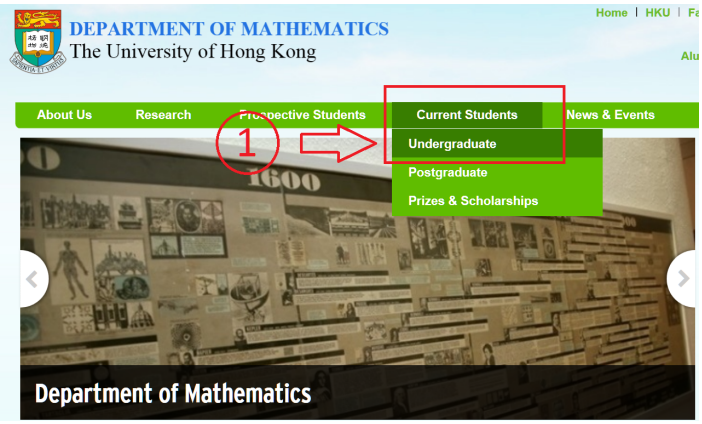
- Major in Mathematics
- Major in Mathematics (Intensive)
- Minor in Mathematics
- Minor in Computational and Financial Mathematics
- Minor in Operations Research and Mathematical Programming

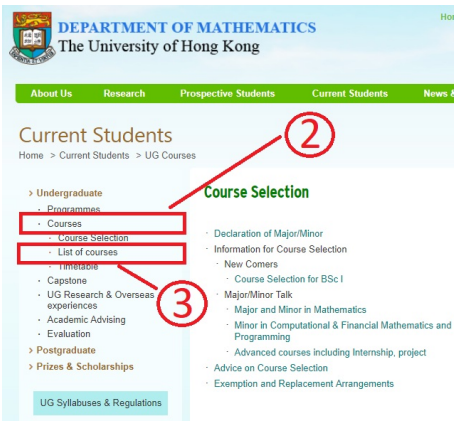
For further discussion and for endorsement of your course approval form, please contact our *Course Selection Advisers* (see **Appendix 3.1**).

1.1 List of courses offered (in 2020-21)

To find out the courses offered by our department, you can

1. go to `http://www.math.hku.hk/`
2. click **Current Students** $\Longrightarrow$ **Undergraduate** $\Longrightarrow$ **Courses** $\Longrightarrow$ **List of Courses**





Here we also include the list of courses offered by our department in 2019-20 for your reference:

Course Code	Course Name	Semester Offered
MATH1009	Basic Mathematics for Business and Economics	both
MATH1011	University Mathematics I	both
MATH1013	University Mathematics II	both
MATH1821	Mathematical Methods for Actuarial Science I	1st
MATH1851	Calculus and Ordinary Differential Equations	both
MATH1853	Linear Algebra, Probability and Statistics	both
MATH2012	Fundamental Concepts of Mathematics	both
MATH2014	Multivariable Calculus and Linear Algebra	both
MATH2101	Linear Algebra I	both
MATH2102	Linear Algebra II	2nd
MATH2211	Multivariable Calculus	both
MATH2241	Introduction to Mathematical Analysis	both
MATH2822	Mathematical Methods for Actuarial Science II	2nd
MATH3002	Mathematics Seminar	2nd
MATH3301	Algebra I	1st
MATH3304	Introduction to Number Theory	2nd
MATH3401	Analysis I	1st
MATH3403	Functions of a Complex Variable	2nd
MATH3405	Differential Equations	2nd
MATH3408	Computational Methods and Differential Equations with Applications	2nd
MATH3600	Discrete Mathematics	1st
MATH3601	Numerical Analysis	1st
MATH3603	Probability Theory	1st
MATH3901	Operations Research I	1st
MATH3904	Introduction to Optimization	1st
MATH3906	Financial Calculus	2nd
MATH3911	Game Theory and Strategy	2nd
MATH3999	Directed Studies in Mathematics	1st/2nd
MATH4302	Algebra II	2nd
MATH4402	Analysis II	2nd
MATH4404	Functional Analysis	2nd
MATH4406	Introduction to Partial Differential Equations	1st
MATH4501	Geometry	1st
MATH4511	Introduction to Differentiable Manifolds	2nd
MATH4602	Scientific Computing	2nd
MATH4910	Senior Mathematics Seminar	2nd
MATH4966	Mathematics Internship	1st/2nd/summer
MATH4999	Mathematics Project	year long
MATH7101	Intermediate Complex Analysis	1st
MATH7202	Complex Manifolds	2nd
MATH7502	Topics in Applied Discrete Mathematics	2nd
MATH7503	Topics in Mathematical Programming and Optimization	2nd
MATH7505	Real Analysis	2nd
APAI1001	Artificial Intelligence: Foundation, Philosophy and Ethics	1st
CCST9017	Hidden Order in Daily Life: A Mathematical Perspective	1st
CCST9037	Mathematics: A Cultural Heritage	1st
CCST9048	Simplifying Complexity	1st

1.2 Programme requirements

In this section we list the requirements of our major/minor programmes for your reference. In fact, all these information can be found in

`http://webapp.science.hku.hk/sr4/servlet/enquiry`

1.2.1 Major in Mathematics

Introductory level courses (48 credits)	
Science Foundation Courses	(12 credits)
SCNC1111	Scientific Method and Reasoning
SCNC1112	Fundamentals of Modern Science
Disciplinary Core Courses	(36 credits)
MATH1013	University Mathematics II
MATH2012	Fundamental Concepts of Mathematics
MATH2101	Linear Algebra I
MATH2102	Linear Algebra II
MATH2211	Multivariable Calculus
MATH2241	Introduction to Mathematical Analysis
Advanced level courses (42 credits)	
Disciplinary Core Course	(6 credits)
MATH3401	Analysis I
Disciplinary Electives	(36 credits)
At least 36 credits advanced level Mathematics courses (MATH3XXX or MATH4XXX or MATH7XXX level), of which at least 12 credits are selected from List A and at least 12 credits should be from MATH4XXX or MATH7XXX level, subject to pre-requisite requirements.	
List A	
MATH3301	Algebra I
MATH3403	Functions of a Complex Variable
MATH3601	Numerical Analysis
MATH3603	Probability Theory
MATH3904	Introduction to Optimization
For List B, please refer to *Enquiry for Major/Minor/Programme Requirements: Major in Mathematics*	
Capstone requirement (6 credits)	
At least 6 credits selected from the following courses:	
MATH3999	Directed Studies in Mathematics
MATH4910	Senior Mathematics Seminar
MATH4911	Mathematics Capstone Project
MATH4966	Mathematics Internship
MATH4999	Mathematics Project (12 credits)

Table 1.2.1 Programme requirements: **Major in Mathematics**

Please also refer to the notes and remarks listed in *Enquiry for Major/Minor/Programme Requirements: Major in Mathematics*

1.2.2 Major in Mathematics (Intensive)

Introductory level courses (48 credits)	
Science Foundation Courses	(12 credits)
SCNC1111	Scientific Method and Reasoning
SCNC1112	Fundamentals of Modern Science
Disciplinary Core Courses	(36 credits)
MATH1013	University Mathematics II
MATH2012	Fundamental Concepts of Mathematics
MATH2101	Linear Algebra I
MATH2102	Linear Algebra II
MATH2211	Multivariable Calculus
MATH2241	Introduction to Mathematical Analysis
Advanced level courses (84 credits)	
Disciplinary Core Course	(60 credits)
MATH3002	Mathematics Seminar
MATH3301	Algebra I
MATH3401	Analysis I
MATH3403	Functions of a Complex Variable
MATH3405	Differential Equations
MATH3600	Discrete Mathematics
MATH3603	Probability Theory
MATH3904	Introduction to Optimization
MATH4404	Functional Analysis
MATH4406	Introduction to Partial Differential Equations
Disciplinary Electives	(24 credits)
Select Stream (A) or Stream (B):	
(A) Pure Mathematics (at least 24 credits with 12 credits from MATH7XXX level, subject to pre-requisite requirement);	
(B) Applied Mathematics (at least 24 credits with 12 credits from MATH4XXX or MATH7XXX level, subject to pre-requisite requirement)	
For the list of courses in Stream (A) or Stream (B), please refer to *Enquiry for Major/Minor/Programme Requirements: Major in Mathematics (Intensive)*	
Capstone requirement (12 credits)	
At least 12 credits selected from the following courses:	
MATH3999	Directed Studies in Mathematics
MATH4910	Senior Mathematics Seminar
MATH4911	Mathematics Capstone Project
MATH4966	Mathematics Internship
MATH4999	Mathematics Project (12 credits)

Table 1.2.2 Programme requirements: **Major in Mathematics (Intensive)**

Please also refer to the notes and remarks listed in *Enquiry for Major/Minor/Programme Requirements: Major in Mathematics (Intensive)*

1.2.3 Minor in Mathematics

Introductory level courses (18 credits)	
Disciplinary Core Course	(6 credits)
MATH1013	University Mathematics II
Disciplinary Electives	(12 credits)
Select either List A or List B:	
List A	
MATH2101	Linear Algebra I
MATH2211	Multivariable Calculus
List B	
MATH2012	Fundamental Concepts of Mathematics
MATH2014	Multivariable Calculus and Linear Algebra
Advanced level courses (18 credits)	
Disciplinary Electives	(18 credits)
At least 18 credits of advanced level Mathematics courses (MATH3XXX or MATH4XXX or MATH7XXX level), subject to pre-requisite requirements.	

Table 1.2.3 Programme requirements: **Minor in Mathematics**

Please also refer to the notes and remarks listed in *Enquiry for Major/Minor/Programme Requirements: Minor in Mathematics*

1.2.4 Minor in Computational and Financial Mathematics

Introductory level courses (18 credits)	
Disciplinary Core Course	(6 credits)
MATH1013	University Mathematics II
Disciplinary Electives	(12 credits)
Select either List A or List B:	
List A	
MATH2101	Linear Algebra I
MATH2211	Multivariable Calculus
List B	
MATH2012	Fundamental Concepts of Mathematics
MATH2014	Multivariable Calculus and Linear Algebra
Advanced level courses (24 credits)	
Disciplinary Core Courses	(12 credits)
MATH3601	Numerical Analysis
MATH3906	Financial Calculus
Disciplinary Electives	(12 credits)
At least 12 credits selected from the following courses:	
MATH3408	Computational Methods and Differential Equations with Applications
MATH3603	Probability Theory
MATH3904	Introduction to Optimization
MATH3911	Game Theory and Strategy
MATH4602	Scientific Computing
MATH4907	Numerical Methods for Financial Calculus
MATH7217	Topics in Financial Mathematics
MATH7224	Topics in Advanced Probability Theory

Table 1.2.4 Programme requirements: **Minor in Computational and Financial Mathematics**

Please also refer to the notes and remarks listed in *Enquiry for Major/Minor/Programme Requirements: Minor in Computational and Financial Mathematics*

1.2.5 Minor in Operations Research and Mathematical Programming

Introductory level courses (18 credits)	
Disciplinary Core Course	(6 credits)
MATH1013	University Mathematics II
Disciplinary Electives	(12 credits)
Select either List A or List B:	
List A	
MATH2101	Linear Algebra I
MATH2211	Multivariable Calculus
List B	
MATH2012	Fundamental Concepts of Mathematics
MATH2014	Multivariable Calculus and Linear Algebra
Advanced level courses (24 credits)	
Disciplinary Core Courses	(12 credits)
MATH3901	Operations Research I
MATH3904	Introduction to Optimization
Disciplinary Electives	(12 credits)
At least 12 credits selected from the following courses:	
MATH3405	Differential Equations
MATH3600	Discrete Mathematics
MATH3905	Queueing Theory and Simulation
MATH3906	Financial Calculus
MATH3911	Game Theory and Strategy
MATH3943	Network Models in Operations Research
MATH4902	Operations Research II
MATH4907	Numerical Methods for Financial Calculus
MATH7502	Topics in Applied Discrete Mathematics
MATH7503	Topics in Mathematical Programming and Optimization

Table 1.2.5 Programme requirements: **Minor in Operations Research and Mathematical Programming**

Please also refer to the notes and remarks listed in *Enquiry for Major/Minor/Programme Requirements: Minor in Operations Research and Mathematical Programming*

Remark (for students taking double majors, major-minor or double minors with overlapping course requirements):

See *Exemption and Replacement Arrangement*.

2 Course Selection Advice

You may have several things to consider while selecting your courses. For instance, you may want to finish the compulsory courses as early as possible so as to enable yourself to enroll in more mathematics courses that you are interested in; or you may want to distribute the compulsory courses evenly so as to allow sufficient time to digest the materials and to strike a balance between the core subjects and your other interests.

Here we would like to provide you with some study plans, focussing on your first and second years. Note that these are just suggestions – we do not intend to fix the menu for you and you can always design one that fits you better. Again, you are strongly advised to consult our *Course Selection Advisers* (see Appendix 3.1) before making up your study plans.

2.1 For students intending to major in mathematics

Plan A – with the prerequisites of MATH1013 at the beginning of Year 1 Sem 1 (for example, students with M1 or M2 in HKDSE, or other equivalent qualifications (**Appendix 3.2**)):

Year 1	Sem 1	MATH1013 University Mathematics II
	Sem 2	MATH2012 Fundamental Concepts of Mathematics MATH2211 Multivariable Calculus
Year 2	Sem 1	MATH2101 Linear Algebra I
	Sem 2	MATH2102 Linear Algebra II MATH2241 Introduction to Mathematical Analysis

Plan A : For students intending to **major in mathematics**
(with the prerequisites of MATH1013 at the beginning of Year 1 Sem 1)

Remark: Following this plan, you will complete all the introductory level disciplinary courses as required by the major programme by the end of your second year.

Plan B – without the prerequisites of MATH1013 at the beginning of Year 1 Sem 1:

Year 1	Sem 1		MATH1011 University Mathematics I **OR**
		†	MATH1009 Basic Mathematics for Business and Economics
	Sem 2		MATH1013 University Mathematics II
Year 2	Sem 1		MATH2012 Fundamental Concepts of Mathematics MATH2211 Multivariable Calculus
	Sem 2		MATH2101 Linear Algebra I MATH2241 Introduction to Mathematical Analysis

Plan B : For students intending to **major in mathematics**
(without the prerequisites of MATH1013 at the beginning of Year 1 Sem 1)

† MATH1009 Basic Mathematics for Business and Economics is **NOT** for students from the Faculty of Science or Engineering. It is **NOT** for students who have passed MATH1011 or MATH1013, or have already enrolled in these courses.

Plan C – this is an example of a study plan for more aggressive students (assuming the prerequisites of MATH1013 at the beginning of Year 1 Sem 1 are satisfied):

Year 1	Sem 1		MATH1013 University Mathematics II
		†	MATH2012 Fundamental Concepts of Mathematics
	Sem 2		MATH2101 Linear Algebra I MATH2211 Multivariable Calculus
Year 2	Sem 1		MATH2241 Introduction to Mathematical Analysis MATH3401 Analysis I
	Sem 2		MATH2102 Linear Algebra II MATH3XXX

Plan C : For more aggressive students intending to **major in mathematics**

† Note that you need to seek approval from one of our *Course Selection Advisers* (see **Appendix 3.1**) for taking MATH2012 concurrently with MATH1013.

Remark: Following this plan, you are able to enroll to some of our advanced level courses in your second year.

Remark: Students who want to choose the **intensive major** should consider packing as many disciplinary core introductory level courses as possible into your first year.

Remark: For all the above plans you can fill up the remaining credits with common cores, SCNC and CAES courses as well as some other electives that you are interested in.

2.2 For students intending to minor in mathematics/minor in computational and financial mathematics/minor in operations research and mathematical programming

- Students doing a major in decision analytics, major in risk management, major in economics/finance or major in quantitative finance are **highly recommended** to attempt one of our minor programmes.

Plan D

Year 1	Sem 1	
	Sem 2	MATH1013 University Mathematics II
Year 2	Sem 1	Any one course from List X (X = A or B)
	Sem 2	The other course from List X
	List A	MATH2101 Linear Algebra I MATH2211 Multivariable Calculus
	List B	MATH2012 Fundamental Concepts of Mathematics MATH2014 Multivariable Calculus and Linear Algebra

Plan D : For students intending to do one of our **minor programmes**

Remark: Year 1 Sem 1 is left blank for mathematics courses to reserve room for the major and faculty requirements. However, students without the prerequisites of MATH1013 are suggested to put MATH1009 or MATH1011 in this semester.

If you are more aggressive and would like to explore more about mathematics, then you can try the following:

Plan E

Year 1	Sem 1	MATH1013 University Mathematics II
	Sem 2	MATH2012 Fundamental Concepts of Mathematics MATH2101 Linear Algebra I
Year 2	Sem 1	MATH2211 Multivariable Calculus MATH2241 Introduction to Mathematical Analysis
	Sem 2	Advanced Level Disciplinary Core Courses or Electives

Plan E : For more aggressive students intending to do one of our **minor programmes**

Remark: In this plan students will take courses from List A to fulfill the introductory level Disciplinary Electives requirement (for any of our minor programmes).

3 Appendix

3.1 Course Selection Advisers (Department of Mathematics)

Mathematics	Computational & Financial Mathematics *(Minor)*	Dr Zhiwen ZHANG	Rm 421, Run Run Shaw Bldg	zhangzw@maths.hku.hk	2859 2251
	Mathematics (*Intensive Major, Major & Minor*)	Dr Yat Ming CHAN	Rm 312, Run Run Shaw Bldg	ymchan@maths.hku.hk	2241 5198
		Dr Tak Wing CHING	Rm 316, Run Run Shaw Bldg	lmtching@maths.hku.hk	2859 2451
		Dr Ka Ho LAW	Rm 314, Run Run Shaw Bldg	lawkaho@hku.hk	2857 8591
		Dr Chi Wing WONG	Rm 313, Run Run Shaw Bldg	cwwongab@hku.hk	2857 8574
		Dr Haiyu ZHANG	Rm 311, Run Run Shaw Bldg	hyzhang@maths.hku.hk	2241 5216
	Operations Research & Mathematical Programming *(Minor)*	Dr Zheng QU	Rm 419, Run Run Shaw Bldg	zhengqu@maths.hku.hk	2859 2578

3.2 Table of Equivalence between HKDSE and Other Qualifications

HKDSE	**Grade**	**Equivalent Qualification to HKDSE**				
		IB	**GCE**	**SATII**	**AP**	**Gao Kao (高考)**
Biology	3 or above	Biology (SL/HL)	Biology (AL)	Biology	Biology	Equivalent to fulfillment of all HKDSE requirements
Chemistry	3 or above	Chemistry (SL/HL)	Chemistry (AL)	Chemistry	Chemistry	
Physics	3 or above	Physics (SL/HL)	Physics (AL)	Physics	Physics B or C	
Mathematics	2 or above	Mathematics (SL)/Mathematical Studies (SL)	Mathematics (AL)	Mathematics Level 1 or 2		
Mathematics + (M1 or M2)	2 or above	Mathematics (HL)/Mathematical Studies (HL)	Pure Mathematics (AL) Further Mathematics (AL)		Calculus AB or BC	