



Curriculum Information Record for a Master's Programme

Department of Physics Effective from Semester A 2025/26 For Students Admitted with Catalogue Term Semester A 2025/26 and thereafter

This form is for completion by the *Programme Leader*. The information provided on this form is the official record of the Programme. It will be used for City University of Hong Kong's database, various City University of Hong Kong publications (including websites) and documentation for students and others as required.

In specifying the curriculum for a Programme, "catalogue term" is used to determine the set of curriculum requirements that a student is following. By mapping the student record and the version of curriculum rules applicable, the graduation requirements of individual students will be evaluated accordingly.

Prepared / Last Updated by

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City University of Hong Kong

Curriculum Information Record for a Taught Postgraduate Programme

School/Department of Physics

Effective from Semester A 2025/26

For Students Admitted to the Programme with Catalogue Term

Semester A 2025/26 and thereafter

Part I Programme Overview

Programme Title (in English) : Master of Science in Physics with Data Modelling and Quantum Technologies
(in Chinese) : 理學碩士(物理學數據建模與量子技術)

Award Title[#] (in English) : Master of Science in Physics with Data Modelling and Quantum Technologies
(in Chinese) : 理學碩士(物理學數據建模與量子技術)

Please make reference to the “Guidelines on Award Titles” approved by the Senate when proposing new award titles or changes to existing award titles (Senate/86/A5R).

1. Normal and Maximum Period of Study

	Years (full-time)	Years (part-time/combined mode)
Normal period of study	1	2
Maximum period of study	2.5	5

2. Number of Credit Units Required for the Award: 30

3. Programme Aims

The programme aims to provide an opportunity for university graduates in physical science or engineering disciplines to obtain post-graduate level training in applied physics with highly marketable professional skills specialized in the sub-fields of data modelling and quantum technologies. It also provides an opportunity for scientists and engineers in industry to upgrade their knowledge or skills through pursuing graduate level studies of various topics of applied physics. The graduates of this programme will gain knowledge of physical principles and how these principles can be applied to practical problems in specific related professions. The training and knowledge provided are suitable for employment in data modelling and quantum technologies in Hong Kong, China and other South Eastern countries. It is also expected that this programme will serve as a bridge providing a good base for students to pursue Ph.D. studies in related fields (Physics, Materials Science, Computer Science, Electrical Engineering, Mechanical Engineering).

4. Programme Intended Learning Outcomes (PILOs)

(Please state what the student is expected to be able to do on completion of the programme according to a given standard of performance.)

Upon successful completion of this Programme, students should:

No.	PILOs	Discovery-enriched curriculum related learning outcomes (please tick where appropriate)		
		A1	A2	A3
1.	Have acquired an extensive and in-depth physical knowledge of and analytical skills in various fields in physics, quantum technology and data modelling.		✓	
2.	Have developed the ability to apply the knowledge of physics, quantum technology and data modelling to generate creative and ethical solutions in the working environment.		✓	
3.	Be able to communicate effectively with physics, quantum technology and data modelling related professions.		✓	
4.	Be able to apply textbook theories to physics, quantum technology and data modelling problems.	✓	✓	
5.	Be able to design and conduct experiments, as well as to critically analyze and interpret data.	✓		✓
6.	Be able to identify, formulate, solve engineering or scientific problems and generate new ideas in the relevant subfields of physics, quantum technology and data modelling.	✓		✓
7.	Have developed necessary skills to present research findings in a logical manner to the scientific community.	✓	✓	✓
8.	Recognize the need for, and an ability to engage in life-long learning.	✓		

A1: Attitude

Develop an attitude of discovery/innovation/creativity, as demonstrated by students possessing a strong sense of curiosity, asking questions actively, challenging assumptions or engaging in inquiry together with teachers.

A2: Ability

Develop the ability/skill needed to discover/innovate/create, as demonstrated by students possessing critical thinking skills to assess ideas, acquiring research skills, synthesizing knowledge across disciplines or applying academic knowledge to real-life problems.

A3: Accomplishments

Demonstrate accomplishments of discovery/innovation/creativity through producing/constructing creative works/new artefacts, effective solutions to real-life problems or new processes.

Part II Programme Requirement

1. Core Courses (12 credit units)

Course Code	Course Title	Level	Credit Units	Remarks (e.g. College Accreditation, or Exemption Requirements, etc.)
PHY5503	Introduction to Quantum Technology	P5	3	Core course on quantum technology
PHY5504	Data Acquisition and Processing Skills for Physicists I	P5	3	Core course on data modelling
PHY6604	Machine Learning in Physics	P6	3	<ul style="list-style-type: none"> Core course on data modelling and machine learning Student should learn Python programming before taking the course. One way to achieve this is to take <i>PHY5504 Data Acquisition and Processing Skills for Physicists I.</i>
PHY6505	Modern Topics in Physics	P6	3	Core course on general physics

2. Electives (18 credit units)

Course Code	Course Title	Level	Credit Units	Remarks (e.g. College Accreditation, or Exemption Requirements, etc.)
PHY5501	Modern Characterization Techniques for Materials Physics	P5	3	<ul style="list-style-type: none"> Semiconductor characterization techniques a key component to semiconductor device technologies
PHY5502	Frontiers in Physics	P5	3	All areas
PHY5505	Data Acquisition and Processing Skills for Physicists II	P5	3	<ul style="list-style-type: none"> Key course on data modelling Students taking this course should have taken <i>PHY5504 Data Acquisition and Processing Skills for Physicists I</i>
PHY5506	Data Analysis and Modelling in Physics	P5	3	

PHY5507	Physical Methods in Financial Data Modelling	P5	3	
PHY6180	Modern Scattering Methods in Materials Science	P6	3	All areas
PHY6251	Advanced Quantum Mechanics	P6	3	<ul style="list-style-type: none"> • General graduate level physics • Students taking this course should have acquired some basic knowledge of quantum physics, e.g., have taken the course <i>PHY3251 Quantum Physics</i> or equivalent courses.
PHY6252	Statistical Mechanics	P6	3	General graduate level physics
PHY6253	Introduction to Biophysics	P6	3	Biomedical physics
PHY6255	Introduction to Quantum Optics	P6	3	<ul style="list-style-type: none"> • General graduate level physics • Students taking this course should have acquired some basic knowledge of quantum physics, e.g., have taken the courses <i>PHY3205 Electrodynamics</i> or equivalent and <i>PHY3251 Quantum Physics</i> or equivalent courses.
PHY6501	Advanced Instrumentation and Measurement Methods for Experimental Physics	P6	3	
PHY6502	Advanced Computational Methods for Simulation and Modelling	P6	3	
PHY6503	Mathematical Methods for Scientists and Engineers	P6	3	
PHY6504	Physics at Nanoscale	P6	3	Key course on semiconductor physics and nanomaterials
PHY6506	Advanced Electrodynamics	P6	3	General graduate level physics
PHY6521	Advanced Solid State Physics	P6	3	General graduate level physics
PHY6526	Energy Materials: Physics and Applications	P6	3	Energy materials physics
PHY6528	Advanced Research in Physics	P6	9	

PHY6603	Introduction to Quantum Information	P6	3	<ul style="list-style-type: none"> • General graduate level physics • Students taking this course should have acquired some basic knowledge of quantum physics, e.g., have taken the courses <i>PHY3205 Electrodynamics</i> or equivalent and <i>PHY3251 Quantum Physics</i> or equivalent courses.
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Part III Accreditation by Professional / Statutory Bodies

N/A

Part IV Additional Information

N/A

Part V Curriculum Map

(The curriculum map shows the mapping between courses and the PILOs. It should cover all courses designed specifically for the programme.)

Course			PILOs								DEC		
Code	Title	Credit	P1	P2	P3	P4	P5	P6	P7	P8	A1	A2	A3
Core Courses													
PHY5503	Introduction to Quantum Technology	3	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓
PHY5504	Data Acquisition and Processing Skills for Physicists I	3	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
PHY6604	Machine Learning in Physics	3	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
PHY6505	Modern Topics in Physics	3	✓	✓	✓	✓			✓		✓	✓	✓
Electives													
PHY5505	Data Acquisition and Processing Skills for Physicists II	3	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
PHY5506	Data Analysis and Modelling in Physics	3	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
PHY5507	Physical Methods in Financial Data Modelling	3	✓	✓	✓	✓	✓			✓	✓	✓	✓
PHY5501	Modern Characterization Techniques for Materials Physics	3	✓	✓	✓	✓			✓	✓	✓	✓	✓
PHY5502	Frontiers in Physics	3	✓	✓	✓	✓	✓	✓			✓	✓	✓
PHY6180	Modern Scattering Methods in Materials Science	3	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
PHY6251	Advanced Quantum Mechanics	3	✓	✓	✓	✓				✓	✓		
PHY6252	Statistical Mechanics	3	✓	✓	✓	✓				✓	✓		
PHY6253	Introduction to Biophysics	3	✓	✓	✓	✓			✓	✓	✓	✓	✓
PHY6255	Introduction to Quantum Optics	3	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
PHY6501	Advanced Instrumentation and Measurement Methods for Experimental Physics	3	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓
PHY6502	Advanced Computational Methods for Simulation and Modelling	3	✓	✓	✓	✓			✓	✓	✓	✓	✓
PHY6503	Mathematical Methods for Scientists and Engineers	3	✓	✓	✓	✓			✓	✓	✓	✓	✓
PHY6504	Physics at Nanoscale	3	✓	✓	✓	✓				✓	✓	✓	
PHY6506	Advanced Electrodynamics	3	✓	✓	✓	✓				✓	✓	✓	
PHY6521	Advanced Solid State Physics	3	✓	✓	✓	✓				✓	✓	✓	
PHY6526	Energy Materials: Physics and Applications	3	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓
PHY6528	Advanced Research in Physics	9	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
PHY6603	Introduction to Quantum Information	3	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

- A1: *Attitude*
Develop an attitude of discovery/innovation/creativity, as demonstrated by students possessing a strong sense of curiosity, asking questions actively, challenging assumptions or engaging in inquiry together with teachers.
- A2: *Ability*
Develop the ability/skill needed to discover/innovate/create, as demonstrated by students possessing critical thinking skills to assess ideas, acquiring research skills, synthesizing knowledge across disciplines or applying academic knowledge to real-life problems.
- A3: *Accomplishments*
Demonstrate accomplishments of discovery/innovation/creativity through producing /constructing creative works/new artefacts, effective solutions to real-life problems or new processes.

Part VI Research Elements in Programme Design

(A description on how research elements are embedded in the proposed programme design for ALL students as guided by the 2016-19 Academic Development Proposal (ADP) should be included. Research elements need to be incorporated into core or compulsory course(s) in order that all students can be benefited from the learning experience.)

Description on how research elements are embedded in the programme design:

The *Introduction to Quantum Technology* course describes recent research developments including quantum computing, quantum communication, quantum sensing, and quantum simulation taught by active researchers who will give examples from their research. The *Data Analysis and Modelling in Physics* course teaches students how physical processes are described by data, and how data analysis is used to understand physical processes, both of which are the theme of this MSc program. These data techniques are widely used in physics research. The *Machine Learning in Physics* course will include programming assignments. To finish these assignments students will have to experiment with all the machine-learning techniques they learned in the course. Through such experiments the students will practice their research skills. The *Data Acquisition and Processing Skills for Physicists* course incorporates hands on experience with short research projects of acquiring and analysing real data.

Core/Compulsory Courses

Course Code	Course Title	Level	Credit Units	Information on research elements in the course design*
PHY5503	Introduction to Quantum Technology	P5	3	Integrates cutting-edge research on quantum computing, quantum communication, and quantum materials, drawing on recent advancements and case studies that reflect the latest developments in the field.
PHY5504	Data Acquisition and Processing Skills for Physicists I	P5	3	Designed around the latest research methodologies in data science as applied to physics. Features hands-on projects that engage students with advanced data analysis techniques and machine learning tools currently used in cutting-edge physics research, fostering skills that are directly applicable to modern experimental and theoretical physics investigations.

PHY6604	Machine Learning in Physics	P6	3	Provides the necessary knowledge in machine learning, one of the central methods for data modelling. Also provides examples of how machine learning is applied in physics.
PHY6505	Modern Topics in Physics	P6	3	Various current research topics in Physics will be introduced to the students.

**indicative of planned teaching and learning activities / assessment tasks incorporating research elements*