DEPARTMENT OF

PHYSICS

Faculty of Science

物理系

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Physics

PHYSICS is a study of the basic regularities behind the various complex phenomena in the physical world; and its scope ranges from the tiniest, like quarks in a proton, to the largest, like the universe. Built upon a tradition of excellence in teaching and research, the 4-year physics curriculum is strengthened in various aspects. The programme will continue to enable students to have a good grasp of fundamentals of Physics and a basket of analytic, experimental, numerical, research, communication and other generic skills, and to appreciate and understand the important applications of physics in modern society.

BSc PROGRAMME IN PHYSICS

Aimed at training our students to have a good grasp of fundamental knowledge and general methods, the programme arms students with abilities to appreciate and understand the basic laws of nature, as well as their important applications in the modern society. It also focuses on building on students’ analytic, laboratory and various soft skills by offering courses in the form of lectures, laboratories, small-group discussions, problem solving sessions, colloquia, seminars and projects. Learning is further enhanced by a number of highly successful undergraduate exchange and research opportunities and internship programmes.

From 2015 onwards, JUPAS applicants could become a physics student at CUHK through one of the following two paths:
- Science – Broad-based Admission Scheme under the Faculty of Science (JUPAS Code: JS 4601)
- Enrichment Stream in Theoretical Physics (JUPAS Code: JS 4690)

The Physics Department hosts public lectures regularly as part of its outreach programme. Here, Prof. Kenneth Young was giving a lecture to an audience consisting mostly of secondary school students and teachers.

HIGHLIGHTS OF PHYSICS MAJOR PROGRAMME:

A solid foundation plus a wide range of electives
- A carefully selected set of core required courses provides systematic and rigorous training on all fundamental areas of physics, experimental, analytical, research and communication skills
- Students may select courses from a wide range of electives to fit to their interest, career and study plan

Enhanced research component
- Required short project(s), final-year project and seminar courses enhance research experience among undergraduates
- Students may participate in active research programmes of teaching staff

Flexible credit system
- Students may choose a minor by completing prescribed courses offered by other programmes
- Such major-minor combination proved to be beneficial for students of physics who wish to acquire multi-disciplinary skills and to enhance their career prospects

Experiential learning opportunities
- Exchange programmes: Overseas Programme for Undergraduate Students (OPUS) and Summer Undergraduate Research Exchange (SURE) programme
- Internship programmes: Summer Teacher Apprenticeship (STAR) programme with local secondary schools, internship programmes in the Hong Kong Observatory and the Hong Kong Space Museum
- Mentoring programme to guide interested students to study topics of their choices
- Exchange opportunities are further enhanced by University exchange programmes
The majority of CUHK Physics BSc and MPhil graduates who continued to pursue higher degrees abroad have been admitted into graduate schools of distinguished universities, including:

- University of California at Berkeley
- University of Illinois at Urbana Champaign
- Northwestern University
- University of California at San Diego
- University of Chicago
- John Hopkins University
- Princeton University
- University of Twente
- University of California at Santa Barbara
- University of Maryland
- University of Colorado
- Georgia Institute of Technology
- University of Michigan
- University of Cambridge
- University of Pittsburgh
- University of Toronto
- Brown University
- Caltech

where they have been awarded financial supports in the form of teaching assistantships, fellowships and scholarships. Many of our alumni now hold senior posts in renowned academic and research institutes in the United States, China, Taiwan, and Hong Kong, and many more occupy prominent positions in various sectors in the society.

Scholarships
- University and College scholarships, Physics Admission Scholarships, Undergraduate Research Experience Grant, CN Yang Scholarships, Professor and Mrs. Yau Wa Chan Scholarship, CUHK Physics Alumni Scholarships, Undergraduate Research Assistantship, the Physics Prize, Professor Dennis Yam Kuen Lo Physics Award, and supports for OPUS and SURE students.

Postgraduate Programmes
- CUHK Physics Department offers MPhil and PhD programmes that currently enrolled over 110 students and a taught MSc programme
- Undergraduate may take postgraduate level courses as electives

Professor Chen Ning Yang and some of our teachers were congratulating the awardees of CN Yang Scholarship and Physics Prize.

CUHK Physics Alumni Association visited the elders in Tin Shui Wai. Undergraduate students also involved in this activity.

CAREER OF PHYSICS GRADUATES

Office of Student Affairs’ surveys in recent years indicate that 44% of Physics graduates continue to pursue higher degrees in Physics or related subjects. Among those who are in employment after graduation, the following chart gives the career distribution.

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Phon: (852) 3943 6154
Email: physics@cuhk.edu.hk
Website: http://www.phy.cuhk.edu.hk
STUDY SCHEME (4-YEAR BSc PROGRAMME IN PHYSICS) FOR STUDENTS ADMITTED IN 2017

COURSES

Students are required to complete a minimum of 71 or 72* units of courses as follows:

Faculty Package (All Streams):

- University Physics I - Introduction to Mechanics, Fluids and Waves
- University Mathematics (offered by Department of Mathematics)
- one 3-unit course in Chemistry, Statistics or Life Sciences from Science Faculty Package

Elective Courses [Note 1]:

- Basic Computational Physics * or equivalent
- Introduction to Astronomy and Astrophysics
- Methods in Theoretical Physics I / II *
- Introduction to Computer Simulation of Physical Systems *
- Practical Electronics *
- Topics in Contemporary Physics
- Basic Instrumentation *
- Short Theoretical Project I / II / III
- Classical Mechanics II *
- Quantum Mechanics II *
- Statistical Mechanics *
- Electromagnetic Theory II *
- Computational Physics *
- Physics in Meteorology
- Astrophysics
- Topics in Nanoscience and Technology
- Optical Physics
- Relativity
- Nuclear and Particle Physics
- Special Topics I / II / III/IV
- Senior Project II
- Other Physics Learning Experience
- Short Experimental Project I / III / IV
- Seminar II
and all Postgraduate Courses offered by Department of Physics

Required Courses:

All Streams

Introductory Calculus-Based Physics Series and Analytic Skills
- University Physics II - Introduction to Optics and Modern Physics
- University Physics III - Introduction to Heat and Electromagnetism
- Quantitative Methods for Basic Physics

Laboratory Skills
- Physics Laboratory I / II / III

Student-Centred Learning
- Student Centred Learning I / II

Upper-level Core Courses
- Classical Mechanics I
- Quantum Mechanics I
- Applied Quantum Mechanics
- Thermodynamics and Statistical Physics
- Electromagnetic Theory I

Capstone (Subject Matter)
- Solid State Physics

Research Component, Presentation, Project Learning, and Capstone (Various Skills)
- Seminar I
- Short Experimental Project I
- Senior Project I

Other Supporting Courses
- Advanced Calculus I for Physical Science and Engineering (offered by Department of Mathematics)
- Principles of Modern Chemistry or General Chemistry (offered by Department of Chemistry)

Enrichment Stream in Theoretical Physics
- Methods in Theoretical Physics I
- Basic Computational Physics
- Senior Project II
- Seminar II

Enquiries: physics@cuhk.edu.hk

Explanatory Note:
1. Elective courses marked* are especially useful to preparations towards postgraduate studies in physics and related fields.
+ For Enrichment Stream in Theoretical Physics
RESEARCH ACTIVITIES

All members of our teaching staff are engaged in rigorous research programmes. Together, they supervise over 110 research students in our MPhil and PhD programmes. In recent years, our staff published over 200 papers each year in international refereed journals, including high-impact journals such as Nature, Nature Physics, Nature Communications, Nature Nanotechnology, Physical Review Letters, Journal of the American Chemical Society, and Advanced Materials. International and national collaborations in research are common, and our faculty members have established research collaborations with scientists in many institutions worldwide, including several institutes of Chinese Academy of Sciences, some key universities in China, and a number of universities and research laboratories in US, UK, Canada, Europe and Israel.

Research projects of the Department cover a wide range of topics. Recent experimental projects, with emphasis on astrophysics, particle physics, condensed matter physics, solar energy, nanostructures and surfaces, optics and soft matters, include: materials for energy applications such as solar cells and solar fuels, fabrication and characterization of biomorphic materials, ceramic-metal composites, thin film growth and magnetic oxides; synthesis and property of semiconductor and metal nanostructures, plasmonic properties of metal nanostructures; optical properties of semiconductors, nonlinear optical properties of organic materials; turbulence, bacterial motion, colloids, glass formation, liquid-solid impact; undercooled metal liquids and nanostructured metal composites; surface sciences and nanostructures on surfaces; ultracold atoms and molecules; and strong correlation in solids under high pressure. Members of the Department are actively participating in three large international experiments in fundamental physics: the ATLAS experiment at the Large Hadron Collider, CERN, searching for physics beyond the Standard Model of elementary particle physics, the Advanced LIGO observatory studying gravitational-wave physics and astrophysics, and the Daya Bay Reactor Neutrino Experiment measuring neutrino oscillations and properties.

Theoretical research areas fall broadly into astrophysics, condensed matter physics, optics, and statistical physics. Recent research topics include: particle physics, cosmology, complex systems, computational physics, computational many-body physics, computational biophysics, computational materials physics, dissipative quantum systems, gravitational waves, pulsations of compact stellar objects, high-temperature superconductors, interacting electron-phonon systems, quantitative finance, quantum optics, quantum physics and quantum information, quantum spin systems, sonoluminescence, strongly correlated systems, topological matters, plasmonics, turbulence, and cold atoms and cold molecules. Some projects involve collaborations between theorists and experimentalists.

The above projects are actively undertaken by the staff members and graduate students. Moreover, they provide ample and valuable research experience for our undergraduates to work under the guidance of the staff members in student research projects, which frequently lead to scientific publications.

Research projects of the Department have attracted external support from the Research Grants Council of the Hong Kong SAR Government, the Croucher Foundation, Innovation and Technology Fund, as well as supports from the local industries. Over the past 5 years, members of the Department were awarded research funds of over $30 million to conduct basic and applied research. This continual success in securing research funding allows the Department to set up state-of-the-art research laboratories and to provide a stimulating research environment for teachers and students alike.
### Distinguished Professor-at-Large
- Yang, C. N. (楊振寧) PhD (Chicago) [Nobel Laureate in Physics]

### Emeritus Professor
- Young, K. (楊振聲) PhD (Caltech) [Theoretical Physics]

### Professor
- Ching, E. C. S. (程鴻基) PhD (Chicago)
  - [Non-equilibrium Systems, Turbulence, Complex Networks, Biophysics]
- Chu, M. C. (朱明中) PhD (Caltech)
  - [Astroparticle Physics, Cosmology, Neutrinology, Particle Physics]
- Hui, P. M. (許伯議) PhD (Ohio State)
  - [Complex Systems and Complex Networks, Condensed Matter Physics]
- Leung, P. T. (黎浩輝) PhD (CUHK) [Theoretical Physics]
  - [Nonlinear Science, Neutrinology, Surface Science, Nanoparticles, Renewable Energy]

### Associate Professor
- Gu, Z. (顧正洪) PhD (Tsinghua) [Condensed Matter Physics]
- Law, C. K. (羅志強) PhD (Rochester) [Quantum Optics]
  - [Theoretical and Mathematical Physics, Quantitative Finance]
- Ong, D. H. C. (王冠傑) PhD (Northwestern) [Materials Science]
- Wang, D. J. (王大復) PhD (Connecticut) [Atomic, Molecular and Optical Physics]
  - [Nonlinear Optics, Organic Optoelectronics]
- Xu, L. (徐力) PhD (Chicago) [Soft Condensed Matter, Fluid Mechanics, Complex Fluids]

### Assistant Professor
- Flores-Castillo, L. R. PhD (Pittsburgh) [High Energy Physics]
- Goh, S. K. (吳哲明) PhD (Cambridge) [Condensed Matter Physics, High Pressure Techniques]
- Li, B. B. (李華彬) PhD (Northwestern) [Astrophysics]
- Li, T. G. F. (黎冠輝) PhD (U Amsterdam) [Gravitational-wave Physics]

### Visiting Professor
- Lau, L. W. M. (劉偉明) PhD (UBC) [Materials Science]
- Wang, Y. (王一) PhD (UIUC) [Computational Biophysics]
- Wu, Y. L. (吳麗輝) PhD (Notre Dame) [Biophysics and Quantitative Biology]
- Zhu, J. Y. (朱健宜) PhD (Utah) [Computational Material Physics]

### Senior Lecturer
- Cheng, K. M. (鄭啟明) PhD (HK) [Quantum Mechanics]
- Tong, S. S. (湯兆榮) PhD (CUHK) [Physics Education]
- Leung, A. H. T. (黎浩輝) PhD (Cambridge) [Biophysics]
- Leung, P. K. (梁顯遠) PhD (UIUC) [Astrophysics]

### Lecturer
- Chen, F. C. (陳方正) PhD (Brandeis) [Theoretical Physics]
- Suen, W. M. (孫建武) PhD (Caltech) [Theoretical Physics, General Relativity]
- Wu, C. (吳奇) PhD (SUNY) [Macromolecular and Colloid Chemistry and Physics]
  - [Quantum Optics, Laser Physics, Photonic Crystals]
- Zhu, S. Y. (朱醉醒) PhD (Shanghai Jiao Tong)

### Adjunct Professor
- Hart, S. K. (霍��) PhD (SUNY) [Optical Properties of Semiconductors]
- Lai, H. M. (賴美梅) PhD (Dartmouth) [Plasma Physics]
- Lin, H. Q. (林海青) PhD (UC San Diego) [Computational Physics, Condensed Matter Physics]
- Loong, C. K. (盧冠陽) PhD (Iowa State) [Condensed Matter Physics]
  - [Superlattice, Superconductors]
- Young, C. C. (楊宜中) PhD (MIT) [High Energy Physics]
  - [High Energy Density Physics]

### Adjunct Associate Professor
- Lee, W. K. (李家基) PhD (Cincinnati) [Condensed Matter Physics, Optics]
- Li, P. W. (李洞華) PhD (U Texas) [Meteorology]

### Adjunct Assistant Professor
- Yip, S. T. (葉達達) MPhil (CUHK) [Health Physics]