Degree Programmes in

Department of
Physics and Materials Science

Department of

Physics and Materials Science

物理及材料科學系

City University of Hong Kong
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Website: www.ap.cityu.edu.hk
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The Department of Physics and Materials Science

The world of science and technology in the new millennium is facing scientific challenges in the areas of Information Technology, Biotechnology, Nanotechnology, Energy and Environmental Science. In all these endeavors, materials issues are ubiquitous and the understanding of the underpinning physics is essential. In 1993, the City University of Hong Kong, recognizing the importance of these frontier challenges as well as the need for a synergism between education and research encompassing both physics and materials, formed the Department of Physics and Materials Science—the first of its kind in Hong Kong.

Over a ten-year period the Department has grown to a current size of 27 teaching staff. In addition, there are approximately 70 research students and 110 research and technical staff. The Department now offers two undergraduate programmes, BSc (Hons) in Applied Physics and BEng (Hons) in Materials Engineering, with a total of about 290 fulltime students. Moreover, the Department offers a taught Master of Science (MSc) degree in Materials Engineering and Nanotechnology, with a total of about 40 students, as well as post-graduate degree programmes for Master of Philosophy (MPhil) and Doctor of Philosophy (PhD). The Department’s objectives are threefold: 1) to educate students via both undergraduate and postgraduate programmes to meet the demands for skilled professionals in Hong Kong and the Pan Pearl River Delta Region, 2) to conduct innovative, especially applied, research and development leading to advances in science and technology, and 3) to offer professional services for the professional community in Hong Kong and the Pan Pearl Delta Region.

In the past five years, our research support totalled about $150 million from external grants (including matching funds) in addition to $75 million from internal sources. Our academic staff have published approximately 1300 technical papers in internationally refereed journals and delivered approximately 500 invited talks and conference presentations during the same period. With well-equipped laboratories, sound curriculum programmes and advanced multi-media education facilities, the devoted staff of the Department of Physics and Materials Science welcome the new challenges and are ready to bring state-of-the-art education to all students entering our programmes.

Prof Robert K Y Li
Acting Head
September 2011
Scanning AUGER/XPS for surface analysis

Student life in CityU
What is Applied Physics?

Applied physics adapts and utilizes physics principles for a multitude of scientific and technological applications. The scope of study therefore overlaps with other scientific and engineering disciplines (e.g., materials science, environmental science, biomedical science and engineering, electronics, mechanical and manufacturing engineering). In fact, much of modern technology and its advances owes its existence to applied physics.

Graduates with a degree in applied physics possess a unique qualification. Not only do they have a fundamental understanding of physics principles, they are also trained in applying these principles to various fields with particular emphasis on problem-solving research and development. Because of this background, graduates generally need less time to integrate themselves into future jobs, and adapt well to technological changes.

Elective courses in the BSc in Applied Physics programme are concentrated in four streams: (1) Environmental Physics, (2) Photonics, (3) Materials Technology, and (4) Biomedical Physics and Engineering. Environmental Physics Stream prepares students with knowledge in Radiation Physics, Energy and Environment, Noise Pollution, and Earth Systems. Photonics Stream prepares students with the basic knowledge of optics, photonic materials, optical spectroscopy, lasers and opto-electronics. Materials Technology Stream prepares students with knowledge in materials testing and characterization, microelectronic materials, thin film technology and nanocrystalline coatings. Biomedical Physics and Engineering Stream prepares students with knowledge in medical physics, radiation biophysics and biomedical materials. Students are free to choose any combination of courses in the above four streams.

Final-year students are required to work independently on a project in a selected area. These projects are designed to help students integrate their knowledge to solve challenging problems. Projects may be carried out in conjunction with industries or government agencies, and facilitate job seeking.
甚麼是應用物理學？

應用物理學是研究如何將物理學原理應用於科技領域的一門學科。該學科的研究範圍與其他科學及工程學科（如：材料科學、環境科學、生物醫學科學及工程、電子、機械與製造工程）有相同重疊之處。事實上，許多現代科技及其發展都是建基於應用物理學。

應用物理學的畢業生具有與別不同的學歷條件。他們不但對物理學原理有著透徹的瞭解，而且精研物理學原理在不同領域的應用，尤其是在採用物理學原理來解決問題及研發方面，更是訓練有素。這種知識背景有助畢業生迅速熟悉及投入日後工作，而這顯然切合社會需求及時代脈搏。

應用物理學士課程有四個專業：(一)環境物理學、(二)光子學、(三)材料科技及(四)生物醫學物理及工程。環境物理課程為學生提供輻射物理、能量及環境、噪音污染及地球系統的知識；應用光學課程提供基礎光學、光子學材料、光譜分析、激光及光電學的知識；材料科技課程提供材料分析、電子材料、薄膜技術及納米材料科技的知識；生物醫學物理及工程課程提供醫學物理，放射生物物理及生物醫學材料的知識。學生可以自由選擇任何以上選修課程。

學生在最後一年必須獨立進行一個研究項目，作為畢業論文。研究項目旨在協助學生把所學知識融會貫通來解決難題，而部分項目與工業界或政府機構合作進行，有助就業。
# Minimum Entrance Requirements

**For HKDSE Students (Normal Duration: 4 years)**

<table>
<thead>
<tr>
<th>General Entrance Requirements</th>
<th>Core Subjects</th>
<th>Elective Subject</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimum Level Required</td>
<td>English Language</td>
<td>Chinese Language</td>
</tr>
<tr>
<td>Level 3</td>
<td>Level 3</td>
<td>Level 2</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>College Requirements</th>
<th>Core Subjects</th>
<th>Elective Subject</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimum Level Required</td>
<td>English Language</td>
<td>Chinese Language</td>
</tr>
<tr>
<td>Science</td>
<td>Level 3</td>
<td>Level 3</td>
</tr>
</tbody>
</table>

**College of Science and Engineering**

- Level 3 in one of the following for the elective subject:
  - Biology
  - Chemistry
  - Physics
  - Science (Integrated or Combined)
  - Business, Accounting and Financial Studies
  - Design and Applied Technology
  - Information and Communication Technology
  - OR
  - Level 3 in any elective subject for students who have attained level 3 in Mathematics

*Note: Unspecified electives may include “other languages” at grade E or above.*

**For HKALE Students (Normal Duration: 3 years)**

The following requirements, incorporating the University general entrance requirements, must be satisfied before an applicant is eligible for admission:

<table>
<thead>
<tr>
<th><strong>University General Entrance Requirements</strong></th>
<th>Language Requirement</th>
<th>General Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pass in AS level Use of English and Chinese Language and Culture (or equivalent)</td>
<td>Either pass in 2 AL subjects or pass in 1 AL plus 2 AS Level subjects</td>
<td></td>
</tr>
</tbody>
</table>

**Major Requirements**

- Pass in AL/ASL Physics or AL Engineering Science

**For Students with Higher Diploma or Associate Degree**

Holders of a higher diploma or an associate degree in relevant disciplines such as Applied Science, Electronic Engineering, Mechanical Engineering, or other technical qualifications, or other candidates with equivalent qualifications will also be considered for admission on a case-by-case basis.
**Major Structure**

To complete BSc (Hons) in Applied Physics and earn the award, students must obtain the following credits:

<table>
<thead>
<tr>
<th>Degree Requirement</th>
<th>Normative 4-year Degree</th>
<th>Advanced Standing I (Notes)</th>
<th>Advanced Standing II (Notes)</th>
</tr>
</thead>
<tbody>
<tr>
<td>College Requirement</td>
<td>30</td>
<td>21</td>
<td>12 Waived</td>
</tr>
<tr>
<td>General Education</td>
<td>15</td>
<td>6</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Major Requirement</th>
<th>Core Courses</th>
<th>Elective Courses</th>
<th>Free Elective</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>30</td>
<td>27</td>
<td>18</td>
<td></td>
</tr>
<tr>
<td>Degree Requirement</td>
<td>33*</td>
<td>27</td>
<td>30</td>
<td></td>
</tr>
<tr>
<td>Core Courses</td>
<td></td>
<td></td>
<td>Waived</td>
<td></td>
</tr>
<tr>
<td>Elective Courses</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Free Elective</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Notes:
1. HKALE students will be admitted through Advanced Standing I.
2. Students with higher diploma or associate degree may be admitted through Advanced Standing I or Advanced Standing II on a case-by-case basis.

* Students admitted through Advanced Standing I are required to take a specific mathematics course of 3 credits to equip them to complete courses in this major.

A set of core courses is in the following areas:

- Computer Programming
- Electricity and Magnetism
- General Physics
- Mathematics
- Measurement and Instrumentation
- Modern Physics
- Optics
- Physics Laboratory
- Solid State Physics
- Thermodynamics

「能夠夢想成真成為一個醫學物理學家，我相信過往在城大的努力是沒有白費的。」
張耀忠—92年畢業、95年碩士畢業，01年博士畢業，現職瑪嘉烈醫院腫瘤科醫學物理學家

「課程理論與實踐並重，加上教授導師們的悉心教學，課堂所學的知識，有效幫助我處理日常工作問題。」
袁志明—09年畢業（兼讀制），現職信德中旅船務管理有限公司助理總經理—澳門

「課程內多元化的科目，增加我對不同物料的原理的認識，為我現時的工作建立堅固的基礎。」
馮君良—97年畢業、03年碩士畢業，現職Pulse Components Ltd (Sourcing & Supplier Development Manager)
The elective courses are in the following areas:

**Environmental Physics Courses:**
- Earth Systems
- Energy, Technology and Environment
- Environmental Modelling
- Environmental Radiation
- Experimental Techniques for Environmental Radiation
- Nuclear Radiation and Detection
- Principles of Noise Pollution

**Photonics Courses:**
- Advanced Optics Laboratory
- Photonic Materials
- Fundamental of Laser Optics
- Optical Fabrication and Testing
- Optoelectronics Devices and Systems
- Physical Optics
- Thin Film Technology and Nanocrystalline Coatings

**Materials Technology Courses:**
- Design and Manufacturing Project
- Electroceramics
- Materials Characterization Techniques
- Materials Testing Techniques
- Microelectronic Materials and Processing
- Semiconductor Physics and Devices
- Thin Film Technology and Nanocrystalline Coatings

**Biomedical Physics and Engineering Courses:**
- Biomedical Materials
- Environmental Radiation
- Materials Characterization Techniques
- Materials Testing Techniques
- Medical Physics
- Nuclear Radiation and Detection
- Radiation Biophysics
- Radiological Physics and Dosimetry
Professional Qualifications

With the affiliation of the Institute of Physics to the UK Engineering Council, a route now exists for suitably qualified physicists to become chartered engineers.

Graduates working in a field related to mechanical engineering are qualified for the Grade 1 Affiliate Membership of the Institute of Mechanical Engineers. With further professional development, a route exists for Affiliate Members to gain a chartered engineer status.

Career Prospects

Traditionally, in Hong Kong, most physics graduates have either become teachers, pursued further studies or taken up careers in various government departments and agencies. Graduates in applied physics have the distinct advantage that they can also pursue careers in industry and business sectors. Examples are:

Industry/Business

- Environmental consultancy (e.g., noise, radiation)
- Optics-related industries (e.g., design, manufacturing and testing)
- Instrumentation (e.g., scientific instruments and applications)
- Electronic components manufacturing (e.g., printed circuit boards, liquid crystal displays)
- Semiconductor manufacturing (e.g., integrated-circuits process technology)
- Biomedical equipment and products manufacturing
Government departments and agencies

• Environmental Protection Department
• Hospital Authority
• Hong Kong Observatory

Please see pages 29–33 for our industrial links and graduate employment information.

Opportunities for Postgraduate Study and Research

Opportunities exist for qualified graduates of this programme to pursue further studies and research by enrolling in the Master of Philosophy and Doctor of Philosophy degree programmes.

A significant proportion of our graduates go on to study for an MPhil or a PhD degree. Those who graduate with first-class honours are well sought after by graduate schools in many disciplines, particularly physics, materials engineering and other engineering disciplines. Graduate schools usually provide ample financial support for their studies.
What is Materials Engineering?

The role of materials in our society is much more important than most of us realize. Our lives would be endangered by storms in the absence of concrete and steel. Our visual defects cannot be easily corrected without glass or plastic. The launching of satellites and space shuttles would not be possible without heat-resistant materials and semiconductors.

The comfort and conveniences of modern life are intimately associated with the discovery, manipulation and selection of natural and synthetic materials. Advances in materials engineering lead to better understanding and manipulation of materials, which is a prerequisite for continued technological progress.

The recent rapid advances in nanomaterials technology are opening up new opportunities for the prosperous career development for materials engineers.
Major Aim

To educate graduates with knowledge and understanding of the production, processing, characterization, and service performance of engineering materials. They will be able to make contributions alongside other engineering specialists to the design, manufacture, maintenance, testing and safety of engineering components, devices, structures and process plants. Our graduates will be professionals contributing consistently for local and regional needs in the industrial, commercial, governmental and educational sectors.

Minimum Entrance Requirements

For HKDSE Students (Normal Duration: 4 years)

<table>
<thead>
<tr>
<th>General Entrance Requirements</th>
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<tbody>
<tr>
<td>Minimum Level Required</td>
</tr>
<tr>
<td>English Language</td>
</tr>
<tr>
<td>Level 3</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>College Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimum Level Required</td>
</tr>
<tr>
<td>Engineering</td>
</tr>
</tbody>
</table>

Notes:
1. Unspecified electives may include “other languages” at grade E or above.
2. Students seeking admission to the College of Science and Engineering (Engineering) are advised to study one or more of the following HKDSE subjects: Biology, Chemistry, Physics, Mathematics (Extended Module 1 or 2), Science (Integrated or Combined), Business, Accounting and Financial Studies, Design and Applied Technology, Information and Communication Technology.
For HKALE Students (Normal Duration: 3 years)
The following requirements, incorporating the University general entrance requirements, must be satisfied before an applicant is eligible for admission:

<table>
<thead>
<tr>
<th>University General Entrance Requirements</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Language Requirement</td>
<td>Pass in AS level Use of English and Chinese Language and Culture (or equivalent)</td>
</tr>
<tr>
<td>General Requirement</td>
<td>Either pass in 2 AL subjects or pass in 1 AL plus 2 AS Level subjects</td>
</tr>
</tbody>
</table>

Major Requirements
Pass in one of the following AL subjects: Physics, Engineering Science, Applied Mathematics, Pure Mathematics, or Chemistry
or
Pass in one of the following AS Level subjects: Physics, Applied Mathematics, Pure Mathematics, or Chemistry

For Students with Higher Diploma or Associate Degree
Holders of a higher diploma or an associate degree in relevant disciplines such as Applied Science, Electronic Engineering, Mechanical Engineering, or other relevant qualifications, or candidates with equivalent qualifications will also be considered for admission on a case-by-case basis.

Major Structure
To complete BEng (Hons) in Materials Engineering and earn the award, students must obtain the following credits:

<table>
<thead>
<tr>
<th>Degree Requirement</th>
<th>Normative 4-year Degree</th>
<th>Advanced Standing I (Notes)</th>
<th>Advanced Standing II (Notes)</th>
</tr>
</thead>
<tbody>
<tr>
<td>General Education</td>
<td>30</td>
<td>21</td>
<td>12 Waived</td>
</tr>
<tr>
<td>College Requirement</td>
<td>15</td>
<td>9</td>
<td></td>
</tr>
<tr>
<td>Major Requirement</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Core Courses</td>
<td>53</td>
<td>53</td>
<td>53</td>
</tr>
<tr>
<td>Elective Courses</td>
<td>18</td>
<td>18</td>
<td>18</td>
</tr>
<tr>
<td>Free Elective</td>
<td>4</td>
<td>Nil</td>
<td>Nil</td>
</tr>
</tbody>
</table>

Notes:
1. HKALE students will be admitted through Advanced Standing I.
2. Students with higher diploma or associate degree may be admitted through Advanced Standing I or Advanced Standing II on a case-by-case basis.
A set of core courses in the following areas:

- Dissertation
- Engineering Design
- General Physics
- Materials Characterization Techniques
- Mathematics
- Properties and Processing of Materials
- Solid Mechanics

The elective courses are in the following areas:

- Building Materials
- Computer Aided Engineering
- Computer Programming
- Composite and Nanocomposite Materials
- Electroceramics
- Electronic Packaging and Materials
- Environmental Degradation
- Failure Analysis and Case Studies
- Microelectronic Materials and Processing
- Simulation and Modelling in Materials Science
- Stress Analysis
- Thin Film Technology and Nanocrystalline Coatings
- Smart and Functional Materials
- Nanostructures and Nanotechnology
- Solar Cell and Energy Materials
- Biomedical Materials and Devices

「材料工程學」
修讀些甚麼課程？

課程主要圍繞材料的各方面的特性及應用，內容包括：

- 基礎材料科學
- 金屬、陶瓷、塑膠、電子材料及先進物料的特性及加工方法
- 納米材料科技
- 材料設計、測試及選擇
- 材料微結構分析技術
- 電腦輔助設計及應力分析
- 薄膜技術
- 工程材料失效分析及真實個案考察
Accreditation for Professional Status

The BEng(Hons) degree in Materials Engineering has been accredited by the Hong Kong Institution of Engineers (HKIE) as an award satisfying the academic requirements for its Corporate Membership.

Career Prospects

One of the prevailing objectives of industry, whether high-tech or conventional, is the production of higher quality products at a more competitive cost. The wise choice of materials and processing routes is among the major factors contributing to product quality and cost reduction. In 2004, the Innovation and Technology Commission of the HKSAR government proposed Nanotechnology and Advanced Materials among the thirteen Technology Focus Areas in Hong Kong. In 2009, the Chief Executive of the HKSAR government announced that Testing and Certification has been earmarked as one of the six industries which Hong Kong already has a competitive edge and will be further strengthened. Graduates with a materials related degree have the advantage that they are highly prepared to pursue a wide range of careers in industry and business sectors.

Please see pages 29–33 for our industrial links and graduate employment information.
Opportunities for
Postgraduate Study and Research

Qualified graduates of this programme can pursue further studies and research by enrolling in the Master of Philosophy and Doctor of Philosophy degree programmes. Graduate schools usually provide ample financial support for their studies. In addition, the Department also offers a Master of Science programme in 'Materials Engineering and Nanotechnology'.

「課程所學會的廣泛知識，除能夠在生活中體驗及應用出來，還可以學以致用，在工作上建立鞏固的基礎。」
程翠儀—98年畢業，02年博士畢業，現職德昌電機集團經理(集體工程)

「課程除了給予學生廣泛的學科知識外，更為學生將來在就業上所面對的挑戰作準備。作為此課程的畢業生，我深深體會如何學以致用，把課程上的知識靈活運用在工作上。」
梁思遠—98年畢業，現職香港通用公證行有限公司(消費品檢測部-玩具)高級技術經理

「畢業後，可在不同範疇都有好好發展。」
梁振邦—00年畢業，現職寶力機械有限公司高級支援工程師

「畢業後投身壓鑄業界。在校所學到的專業材料知識對我現時的工作有極大的幫助。不但協助業界發展新材料，而且解決客戶使用材料上的問題。」
羅志文—00年畢業，04年博士畢業，現職利記集團有限公司技術支援部副經理

「在大學所得到知識、技能，令我很快掌握公司產品開發和技術支援工作，繼而在不同範疇得到發展。」
李秉堅—06年畢業，現職匯聰實業有限公司業務經理
Monthly Salary (BEng (Hons) Materials Engineering)

BEng (Hons) Materials Engineering
The programme provides an opportunity for university graduates in physical science or engineering to obtain specialized knowledge in materials engineering and nanotechnology. It serves as a conversion programme for graduates who are interested in materials. It also provides an opportunity for applied scientists and engineers in industry to pursue comprehensive studies in various aspects of materials engineering and nanotechnology.

Materials engineering is an interdisciplinary subject that covers a wide spectrum of topics ranging from the basic science of materials behaviour to the design and evaluation of materials in engineering systems. Materials engineering involves the study of the relationship between structure and properties of new materials that include ceramics, metals, semiconductors, polymers, composites, thin films and biomaterials. It is particularly concerned with the design, processing, selection, quality control and performance evaluation of engineering materials to meet the demands of specific applications. Materials engineering is an important subject providing the key and enabling technology for a wide range of industrial activities.

Nanotechnology deals with the development of novel nanostructured or nanocrystalline materials having leading dimensions of up to about 100 nanometers. Nanostructured materials have high potential in structural and device applications in which enhanced physical and mechanical properties are needed. The electrical, magnetic and mechanical properties of nanocrystalline materials can be superior to those of conventional microcrystalline counterparts. The atomic-scale structures of such materials (e.g., metals, semiconductors, ceramics, polymers and biomaterials) play an important role in determining their practical properties. The students will gain basic knowledge concerning these structures and a wide variety of material properties from the micrometer scale down to the nanometer scale. The programme covers a rapidly growing interdisciplinary field encompassing materials science, physics, chemistry and biology.
Programme Structure

The programme is offered in a 2-year part-time evening mode which extends over 4 semesters, or in a one year full-time mode. Students must earn a minimum of 30 credit units (CUs) in order to be eligible for the MSc award. The structure of the programme follows the credit unit system of the University. The programme curriculum is made up of basic core and elective courses. Each course is scheduled over a period of 13 teaching weeks (1 semester).

There are two required core courses in the first semester of study that provide fundamental knowledge in instrumental methods of analysis and nanostructured materials.

Professional Qualifications

For non-materials graduates, this can be a conversion programme for obtaining an equivalent qualification to fulfill the academic requirement for the Materials Engineering discipline of the HKIE. For student who wishes to pursue HKIE Corporate Membership, they must take an elective course in dissertation of materials discipline consisting of 6 CUs. The dissertation, which requires individual initiative and effort, is carried out under the supervision of teaching staff. For science graduates, additional 6 CUs of mathematics courses are required to fulfill the HKIE academic requirement for Corporate Membership.

Admission Requirements

Applicants must satisfy one of the following to be eligible for admission:

- A degree in a relevant physical science or engineering discipline* awarded by one of the tertiary education institutions in Hong Kong funded by the University Grants Committee; or
- A degree in similar disciplines equivalent to those described above awarded by an overseas institution recognized for this purpose by the University; or
- An equivalent qualification, or evidence of academic and professional attainments, acceptable for this purpose by the University.

* Examples of a relevant discipline are chemistry, physics, building, chemical/civil/electrical/electronic/industrial/mechanical/manufacturing engineering, materials science/engineering, etc.
Introduction

As of September 2011, the Department has approximately 70 students pursuing research leading to the MPhil and PhD degrees.

The research degrees of MPhil and PhD consist of a combination of coursework and research leading to the submission of a thesis. Depending on the entry route for the MPhil/PhD, a candidate is normally required to take a certain amount of coursework in the form of taught courses:

MPhil: 7 credits (minimum requirement)
PhD: 14 credits (normal requirement)

Coursework requirements may be determined on the basis of the specific needs of a research student.

Detailed information about existing MPhil/PhD Research Projects in the Department can be obtained from the departmental homepage (http://www.ap.cityu.edu.hk). Students interested in any of these projects should contact and discuss with their potential supervisor. Students are also welcome to contact staff members and propose other possible research topics. Priority will be given to PhD applicants. Candidates holding a good bachelor’s degree or a taught master’s degree may be considered for direct entry to PhD studies. Candidates applying for MPhil studies will be considered for admission if they have good qualifications. The Department supports both MPhil and PhD studies in the following areas:

Research focus/expertise in the department include: (1) Environmental physics: environmental radiation, radon dosimetry; (2) Laser physics and optics: optical spectroscopy, optoelectronics, medical imaging, laser remote sensing; (3) Materials science: materials physics, computational materials science, metals and alloys, plastics and composites, shape memory alloys, electrical ceramics, coatings, superalloys, light metals, phase transformations, ultrasonic detection, SMT solder joints, creep and life assessment, electron microscopy, corrosion, fatigue, stress analysis, materials design, impact and superhigh strain rate deformation, sheet metal forming, surface science.
and engineering, thin films, organic light-emitting diode, nanomaterials, biomedical materials; (4) Radiation physics: radiation biophysics, radiation-induced biointerfaces, ion-track technology; (5) Solid-state physics: magnetism, superconductivity, semiconductor physics; (6) Theoretical physics: computational physics, mesoscopic physics, electron and spin transport, statistical physics, critical phenomena.

Detailed information for applicants and application procedures can be found on the homepage of the School of Graduate Studies:

(http://www.cityu.edu.hk/sgs/)

Please note that each applicant is advised to discuss his/her proposed research topic with one of the academic staff members and submit a short research proposal. The applicant is also advised to obtain the consent of that staff member to be his/her supervisor before submitting the application.

Admission Requirements

Candidates for the MPhil degree should hold a relevant bachelor’s degree with first or second class honours (or equivalent qualification) from a recognized university, or hold a taught master’s degree (or equivalent qualification) from a recognized university.

Candidates for the PhD degree should hold a higher degree by research (or equivalent qualification) from a recognized university, or be a current MPhil student in the University who is seeking transfer to PhD candidature.

Equivalent qualifications mentioned above include relevant professional qualifications or other scholarly achievements recognized by the University.
**Mode and Period of Study**

For both MPhil and PhD degrees, the study can be taken either in the full-time or part-time mode. The periods of study are as follows:

<table>
<thead>
<tr>
<th>Programme of Study</th>
<th>Full-time</th>
<th>Part-time</th>
</tr>
</thead>
<tbody>
<tr>
<td>MPhil</td>
<td>2 years</td>
<td>4 years</td>
</tr>
<tr>
<td>PhD (students who have obtained a research master’s degree before admission)</td>
<td>3 years</td>
<td>6 years</td>
</tr>
<tr>
<td>PhD (students who have not obtained a research master’s degree before admission)</td>
<td>4 years</td>
<td>8 years</td>
</tr>
</tbody>
</table>

**Financial Support**

Postgraduate Studentship (not applicable to self-financing research students) is granted on the basis of academic merit. Eligible new full-time students will be considered for the award of the Studentship as part of their application for admission to a research degree programme. Separate applications are not required. The Studentship is normally granted on a yearly basis. Continuation and renewal of the award are subject to satisfactory study progress and performance in any academic-related duties assigned.

MPhil students will normally be granted the Studentship for a maximum of two years and PhD students a maximum of three years (irrespective of their entry qualifications), and the Studentship award period should not exceed the students’ stipulated study period. The Studentship rate (HK$13,300 for MPhil and $14,000 for PhD per month for 2011–12) is subject to revision in September of every year, and any revision to the rate will apply to both current and new students.

Postgraduate Studentship holders will be required to perform some teaching duties as part of their postgraduate training. Students with outstanding academic performance may also apply for the Research Tuition Scholarship which carries an amount equivalent to the tuition fee (not applicable to self-financing research students). The Scholarship can be held concurrently with the Research Studentship. Research students are eligible to apply for Conference Grants to support their attendance at conferences (not applicable to self-financing research students). The Conference Grant covers subsistence, and 90% of the return passage and the conference registration fee, subject to a maximum of $10,000.
Applicants who could demonstrate outstanding qualities of academic performance, research ability / potential, communication and interpersonal skills, and leadership abilities are encouraged to apply for admission through “Hong Kong PhD Fellowship Scheme”. The Fellowship provides a monthly stipend of HK$20,000 (~US$2,564) and conference and research related travel allowance of HK$10,000 (~US$1,282) per year for the awardees for a maximum period of three years.

For Fellowship awardees who are admitted to a 4-year PhD programme in 2012–13, CityU will provide a monthly studentship at the same level as the Fellowship awarded by the RGC for their fourth year of study. In addition, CityU offers the Chow Yei Ching School of Graduate Studies Entrance Scholarships.

For nominees selected by RGC for the Hong Kong PhD Fellowship, in addition to the monthly stipend of HK$20,000 offered by Scheme, each awardee of the Fellowship of CityU will also receive the “Chow Yei Ching School of Graduate Studies Entrance Scholarships” (around HK$66,100) which covers student’s full-time tuition fees and on-campus hostel accommodation expenses in their 1st year of research studies.

For details about this scheme, please refer to: http://www.sgs.cityu.edu.hk/prospective/rpg/hkphd.

For CityU nominees not selected by RGC for the Hong Kong PhD Fellowship Scheme, they will be considered for the award of “Chow Yei Ching School of Graduate Studies PhD Fellowship” offered by CityU during the entire period of candidature.
The Department of Physics and Materials Science has well-equipped laboratories with advanced instruments to serve the academic staff and students for their respective research and education objectives. In particular, a comprehensive set of Microanalytic Characterization Facilities is available in the AP Department, which are unique and essential to the Physics, Materials Engineering and Nanotechnology disciplines.

**Microanalytical Characterization Facilities**

- **Optical Microscopes**
- **Polarized Light Microscope with hot stage**
- **Image Analyzers**
- **Leica DMRM Microscope with CCD Imager**
- **Olympus SZX-12 Stereo Microscope**

- **Scanning Electron Microscopes with EDS and WDS**
  (JEOL JSM 5200, JEOL JSM 820, JEOL JSM 6335F, JEOL JSM 7001F)
- **Transmission Electron Microscopes with GIF and EDS**
  (Philips CM-20, CM-200, JEOL JEM 2100F)
- **Sample Preparation Facilities**
- **Electron Probe Micro analyzer JEOL JXA 8230**

- **X-ray Diffractometer**
  (Siemens D500, Philips X-Pert, Bruker AXS-D8 Discover)
- **EDAX micro XRF Eagle II, EDAX Micro XRF Eagle III**
- **XRF Spectrometer, “SPECTRO” Xepos**

- **FTIR Spectrometer (Perkin Elmer 1600)**
- **FTIR Microscopy System (Perkin Elmer Spotlight 400)**
- **Raman Spectrometer (Spex Rama Log 1403)**
- **Raman Microscope Spectrometer (T64000)**
- **Brillouin Spectrometer (Sanderock Tandem Interferometer)**

- **Scanning Auger and XPS (PHI Model 5802)**
- **AFM, STM (Park Scientific)**
- **HREEL (LK Technology)**
- **LEED, AES and UPS (Micron)**
- **Photoluminescence Spectrometers**
- **NanoScope “Scanning Probe microscope” (Digital Instruments)**
- **UHV, Multiprobe XP SPM (Omicron)**
- **Multimode Scanning Probe Microscope (Veeco Nanoscope V)**
With a strong research focus on thin films, coatings, nanostructured materials, and surface science, the AP Department has state-of-the-art Thin-film Processing Facilities that are listed below:

**Thin-film Processing Facilities**

- **Physical Vapor Deposition (PVD) Facilities**
  - RF and DC Source Magnetron Sputtering Systems
  - Ion Beam Deposition System
  - E-Gun Deposition System
  - Thermo Evaporation Systems
  - Laser Ablation Deposition System
  - Plasma Immersion Ion Implanters

- **Chemical Vapor Deposition (CVD) Facilities**
  - Hot-filament CVD
  - Electron Cyclotron Resonance—Microwave Plasma CVD Systems
  - RF and DC Source CVD Systems
  - Metal-organic Decomposition and Sol-Gel Deposition

**Teaching/Research Laboratories**

Moreover, AP Department conducts research and teaching in a wide range of topical areas with special-purpose laboratories and facilities that are described below.

- **Metals and Alloys Processing Laboratory**
  - Arc Furnace
  - Planetary Ball Millers
  - Laser Particle Size Analyzer (Coulter LS100)
  - Surface Area Analyzer (NOVA 1000)
  - Rolling Mill
  - AC Susceptometer
  - Vibrating Sample Magnetometer
  - Hall System (Lakeshore #7704A)
  - Area and Pore Size Analyser (Quantachrome NOVA #1200e)
  - Electrochemical Analyser System (Par Versastat3-400)

- **Polymer Processing Laboratory**
  - Processing Laboratory (Injection Molders, Brabender Extruder, Compression Molder, Pultruder)
  - Characterization Laboratory (Hopkinson Pressure Bar Systems, FTIR, SEM, TEM, Optical Microscopes and all facilities from Thermal Analysis Laboratory)
  - Constant Temperature Chamber ESU-278
  - Environmental Chamber-Neutron KPKE-8
• **Advanced Ceramics Laboratory**
  - Ceramic Processing Laboratory: Microbalance, Ball Millers, Hot Isostatic Press (ABB QIH-3), Ovens, and Furnaces
  - Electrical Ceramics Characterization Laboratory: Standard Precision Pro Ferroelectric Test System (Radiant Technology), MTI 2000 Fotonic Sensor, Piezo-D Meter, Precision Impedance Analyzer (HP4294A), pA Meter/DC Voltage Source (HP4140B), Precision LCR Meter (HP4284A), High Resistance Meter (HP4339B)
  - Ultrasonic Measurement System

• **Thermal Analysis Laboratory**
  - Differential Scanning Calorimeter (Perkin Elmer DSC 7, TA MDSC-2910, Perkin Elmer Diamond DSC)
  - Differential Thermal Analyzer/DSC (Setaram Setsys DSC16/DTA18)
  - Thermogravimetric Analyzer (TGA #Q50)
  - Dynamic Mechanical Analyzers (Du Pont 983 and TA DMA 2980)
  - Thermomechanical Analyzer (Setaram Labsys TMA)

• **Mechanical Testing Laboratory**
  - Monotonic Tensile Testers (Instron models 4206 and 5567)
  - Fatigue Testers (Instron model 8801)
  - Impact Pendulum Testers (Ceast), Drop Weight Impact Tester (Ceast)
  - Creep Instruments (Creep Testers (ESH))
  - Macro-, Micro- and Nano-Indentors
  - Zwick Tensile Tester Z030/TH2
  - Tribometer WAZOU TRM-5000
  - Micro-Hardness Tester Buehler Micronet 2103
  - Macro Hardness Tester Vickers FV-700
  - Low Force Dynamic Test System (Tytron MTS)
  - Axial / Torsional Testing System (MTS)

• **Laser Optics Laboratory**
  - 532 nm Q-switched Pulsed Laser
  - 248 nm KrF Excimer Laser
  - CO₂ Laser
  - 532nm DPSS CW Laser (Spectra Physics)
  - Ar Ion CW Lasers (Coherent)
  - CO Laser (Edinburgh)
  - KrAr Laser (Coherent)
  - Newport Thermoplastic Hologram Image Recorder System
  - Optical Spectrometer
  - Fiber Optic Wavelength Analyzer
• **Microelectronic Packaging Analysis Facility**
  – Pick and Place Machine
  – IR Reflow Furnace
  – Solder Paste Screen Printer
  – Minimat Testing Machine

• **Radiation Measurement Laboratory**
  – Alpha/Beta Spectrometers (ORTEC 5030)
  – High Purity Germanium (HPGe) Gamma Spectroscopy Systems (ORTEC GMX-25190; GMX-35210; GMX-90240)
  – Radon Counting Systems (with NaI Gamma Spectroscopy System) (NUCLEUS TS-2)
  – Radon/Radon Progeny Detectors (SCINTREX RDA-200)
  – Thermoluminescence Dating System (ELSEC 7188)
  – Low Level Alpha Counting Facility (ELSEC 7286)
  – Tritium-in Air Detector (EG&G LB1210B)

• **Computer Simulation and Modelling Facility**
  – Silicon Graphics Origin 200 Workstations
  – Sun Ultra 80 Workstations
  – PC Cluster

• **Atmospheric Science Laboratory**
  – Vertical Mie Lidar System
  – Portable Mie Lidar System
  – Differential Optical Absorption Spectroscopic Air Pollution Measurement System
  – High Volume Particle Sampling System
  – Noise Pollution Measurement System
  – Meteorological Measurement System
    a) Eddy Covariance and Energy Balance System
    b) Wind, Temperature and Humidity System
  – Computational and Simulation Facility –
    a) Sun Enterprise 3500 Computer
    b) Sun Ultra60, Ultra30 and Ultra10 Workstations
    c) Computation Fluid Dynamic Software—CFX
    d) Lidar Multiple Scattering Monte Carlo Simulation Software
    e) PC Cluster
The Industrial Attachment Scheme (IAS) is provided by the College of Science and Engineering (CSE) for undergraduate students to acquire real-life industrial experience in an actual working environment mainly in Hong Kong and the Pearl River Delta Region. During the past two decades, the manufacturing industries in the Pearl River Delta Region have enjoyed tremendous success. It is important for our students’ career development to get first-hand experience in the industrial environment before graduation. A significant portion of students from the Department have joined the IAS summer training. They spent nine to eleven weeks gaining useful skills and experience in industrial companies or institutions in Hong Kong and the Pearl River Delta Region, such as:

- Advanz Corporation Ltd
- American Tec Co Ltd
- Castco Testing Centre Ltd
- Cho Ei Ltd
- Compass Technology Co Ltd
- Dongguan Ngai Hing Hong Plastic Materials Co Ltd
- Dunwell Petro-Chemical Co Ltd
- Emerson Network Power
- Heraeus Ltd
- Homewatch Ltd
- Hong Kong Observatory
- Meyer Aluminium Ltd
- Ocean Park Hong Kong
- SAE Magnetics (H.K.) Ltd
- Shanghai Ngai Hing Plastic Materials Co Ltd
- Standard Glory Management Ltd
- Sun East Technology (Holdings) Ltd
- Tehsheng Rubber Co Ltd
- Tyco Electronics Dongguan Transpower Electric Products Co Ltd
Through the IAS, we hope to provide first-hand experience in the following areas to Applied Physics and Materials Engineering students:

- awareness of the latest technologies in mass-production of products
- learning new techniques under real working conditions
- operational knowledge of a manufacturing plant, including its structure, management approach, sources of raw materials, inventory control, marketing channels, and other logistic supports
- a real-life environment to acquire the spirit of professionalism, and to develop professional ethics

Students participating in the scheme will be exempted from part of the Design and Manufacturing Project, which is usually taken in the summer of their second year of study.

**Co-operative Education Scheme**

The Co-operative Education Scheme is a placement programme for third-year science and engineering students. It normally begins in January of each year and lasts for eight to twelve months. To participate in the Scheme, students should have completed the first semester of their third year and, preferably, have joined the Industrial Attachment Scheme earlier. If necessary, the training company will release students at least once a week to attend class at the University.

The Co-operative Education Scheme contains two components: the project component and the industrial placement component. The project component provides students with experience in undertaking a project in an industrial environment, and can normally be substituted for the Final Year Project—a graduation requirement for BEng Materials Engineering and an elective for BSc Applied Physics. The placement component, on the other hand, provides relevant and meaningful industrial experience for students through day-to-day work.

Similar to the Industrial Attachment Scheme, a company mentor and a supervisor from the University will be allocated to each student to provide him/her with technical advice and general assistance. The supervisor will visit the student on-site, monitor his/her work progress and assign a final grade for both components.
In 2011, 6 students of this Department participated in the Scheme, attached to 3 companies. This scheme has significantly increased the career prospects of our graduates.

Examples of participating companies:
- Emerson Network Power
- SAE Magnetics (HK) Limited
- Meyer Aluminium Limited
- Hong Kong Observatory

**Internship Programme for Exchange Students (IPES)**

In a move to enrich our students’ work experience and to broaden their horizon, the Co-Operative Education Centre (CEC) of the College of Science and Engineering has established mutual collaboration with overseas institutions to provide industrial training for students. It is aimed to provide students solid experience in a real work environment where they can strengthen their learning, as well as to develop students’ problem-solving and interpersonal skills so as to enhance their employability upon graduation.

The IPES is an internship programme which is operated on a model similar to the Industrial Attachment Scheme (IAS). The training can either take the form of a structured project with specific training objectives or take a non-structured form that provides students with sufficient exposure to the work place through day-to-day work. Irrespective of the format of the training, students are required to give
a final presentation upon completion of their training. Currently, the CEC has established partnerships with institutions in Australia, Canada, France, Germany, Ireland, Japan, Korea, Singapore, Thailand, the UK and the US.

In 2011, 12 of our students were scheduled for this scheme. Examples of participating companies are

- Siemens, Germany
- Chalmers University of Technology, Sweden
- Aalto University, Finland
- University of Malaya, Malaysia
- Hana Microelectronics Public Co., Ltd, Thailand
- Brunel University, U.K.
- King’s College, University of London, U.K.
- The University of Greenwich, U.K.
- University of Glasgow, U.K.
- University of York, U.K.
- UCLA, U.S.A.
- University of Saskatchewan, Canada
- Lancaster University, U.K.
- ERLAS Erlanger Lasertechnik GmbH, Germany
- Center for Advanced Life Cycle Engineering, U.S.A.
- Wolfson School of Mechanical & Mfr Eng., Loughborough University, U.K

**Design and Manufacturing Project**

With the objective to give students important training experience of product R&D and team work, this course requires students to design and manufacture a small product according to a given theme. The course spans from the beginning of Semester B into the summer, during which students attend laboratory sessions, seminars and a two-week intensive workshop training in a well-equipped training centre. The important areas covered by this course include:

- Comprehensive training on product development—market analysis, product ideas, practical implementation and prototype manufacturing
- Small-group project-based activities
- Awareness of consumer market trends
- User-oriented product design
- Emphasis on innovation
- Product manufacturability and cost issues
- Materials selection
# List of Companies Employing Our Graduates

## BSc Applied Physics

<table>
<thead>
<tr>
<th>Company</th>
<th>Nature of Business</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>PCCW</td>
<td>1 Communication / Information Services</td>
<td>HK Govt – HK Observatory Post Office</td>
</tr>
<tr>
<td>HK Standard &amp; Testing Centre</td>
<td></td>
<td>Jardine Securicor Ltd6</td>
</tr>
<tr>
<td>Asia Sat</td>
<td></td>
<td>Toshiba2</td>
</tr>
<tr>
<td>Sanyo Energy (HK) Co Ltd</td>
<td></td>
<td>Shell Electrical Manufacturing Co Ltd2</td>
</tr>
<tr>
<td>ASM Assembly Automation Ltd</td>
<td></td>
<td>Cathay Pacific Airways</td>
</tr>
<tr>
<td>Bank of China</td>
<td></td>
<td>HK Airport Service Ltd</td>
</tr>
</tbody>
</table>

## BEng Materials Engineering

<table>
<thead>
<tr>
<th>Company</th>
<th>Nature of Business</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arup</td>
<td>6 Engineering Consultant</td>
<td></td>
</tr>
<tr>
<td>Chung Nam Watch Co Ltd</td>
<td></td>
<td>Leighton Contractors (Asia) Ltd4</td>
</tr>
<tr>
<td>Fujitec (HK) Co Ltd</td>
<td></td>
<td>Johnth Electric2,3</td>
</tr>
<tr>
<td>Mansfield Manufacturing Ltd</td>
<td></td>
<td></td>
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<tr>
<td>Maunsell AECOM Group</td>
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<tr>
<td>NEC Technology of HK</td>
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<td>Philips HK Ltd</td>
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<tr>
<td>Automated Systems (HK) Ltd</td>
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<tr>
<td>Unicon Concrete Product (HK) Ltd</td>
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<tr>
<td>ASM Assembly Automation Ltd</td>
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<td>SGS HK Ltd</td>
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<tr>
<td>Bureau Veritas HK Ltd</td>
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<tr>
<td>Bureau Veritas HK Ltd</td>
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</tr>
</tbody>
</table>

## Nature of Business:

1. Communication / Information Services
2. Electrical / Electronics / Computer Engineering or Products
3. Mechanical Engineering or Products
4. Construction Materials / Contractors
5. Manufacturing
6. Engineering Consultant
7. Testing Laboratory
Academic and technical members of the Department of Physics and Materials Science are professionals who can provide consultancy services and expert opinions\(^1\) to industries, high-tech companies and government agencies. The testing facilities built by the Department have made the City University of Hong Kong one of the best centres in materials testing, characterization and authentication in the region.

\(^{1}\) A list of areas of specialism can be found in the next section.
<table>
<thead>
<tr>
<th>Members of Staff, with Areas of Specialism</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>STAFF</th>
<th>AREAS OF SPECIALISM</th>
</tr>
</thead>
</table>

**Acting Head of Department, Professor and Associate Dean (CSE)**  
*Prof Robert K Y Li*  
BA BAI MA PhD *Dublin University, Ireland*  
Email: aphead@cityu.edu.hk  
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aprkyl@cityu.edu.hk  
*Polymer engineering*  
*Composite materials*  

**Personal Secretary**  
*Ms Sare W Y Lau*  
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**Associate Head (Postgraduate Affairs) and Professor**  
*Prof K S Chan*  
BSc PhD *University of Hong Kong*  
MIEEE  
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*Semiconductor physics*  
*Photonics technology*  
*Nanoscience and nanotechnology*  
*Spintronics*  
*Superconductivity*  

**Assistant Head (Undergraduate Affairs), Associate Professor and Assistant Dean (CSE)**  
*Dr C H Shek*  
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*Phase transformation in metallic materials*  
*Nanostructured materials*  
*Bulk metallic glasses*  

**Chair Professor of Materials Engineering**  
*Prof Paul K Chu*  
BSc *The Ohio State University, USA*  
MSc PhD *Cornell University, USA*  
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Email: paul.chu@cityu.edu.hk  
*Plasma science, implantation, processing and engineering*  
*Semiconductor materials and processing*  
*Biomedical materials and nanobiology*  
*Advanced materials, functional thin films, and nanomaterials*  

**Chair Professors of Materials Science**  
*Prof Joseph K L Lai*  
BA MA *Oxford University, UK*  
PhD *City University, UK*  
FIMMM CEng FInstP CPhys FIMechE FHKIE  
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*Properties of steels and aluminium*  
*Failure analysis of engineering components*  
*Temperature measurement*  
*Expert witness on accident investigations*  
*Litigations and arbitrations involving metals*  

*Prof C S Lee*  
BSc(Eng) PhD *University of Hong Kong*  
Email: apcslee@cityu.edu.hk  
*Organic electronics*  
*Nanoscaled materials*  
*Solar cells and photodetectors*  

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**STAFF**

**Prof S T Lee**

BSc *Chinese University of Hong Kong*
MSc *University of Rochester, USA*
PhD *University of British Columbia, Canada*
Member, Chinese Academy of Sciences
Fellow, TWAS, the Academy of Sciences for the Developing World
Email: apannale@cityu.edu.hk

**AREAS OF SPECIALISM**

- Nanoscience and nanotechnology
- Nanobiosensors
- Nanooptoelectronics
- Organic light-emitting diode (OLED) display technology
- Nanodiamond
- cBN and superhard coatings
- Surface science and modification

**Chair Professor of Physics**

**Prof Michel A Van Hove**

BSc *Federal Institute of Technology (ETH), Zurich, Switzerland*
PhD *University of Cambridge, Cambridge, Great Britain*
FAPS FAVS
Email: vanhove@cityu.edu.hk

**Professors**

**Prof Igor Bello**

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Email: apibello@cityu.edu.hk

**Prof Andrey L Rogach**

Diploma *Belarusian State University, Minsk, Belarus*
PhD *Belarusian State University, Minsk, Belarus*
Dr habil *Ludwig-Maximilians University, Munich, Germany*
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**Prof S C Tjong**

BSc *National Taiwan University, Taiwan*
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CEng CSci *FIMMM FHKIE*
Email: aptjong@cityu.edu.hk

**Prof Lawrence C M Wu**

BSc(Eng) PhD *University of Bristol, UK*
PgDMS *University of West of England, UK*
FHKIE
Email: lawrence.wu@cityu.edu.hk

**Areas of Specialism**

- Surface science
- Photovoltaic and light emitting devices
- Nanomaterials and nanodevices
- Diamond and related materials
- Thin films, electron and ion beams
- Surface analysis and vacuum technology
- Nanoscience and nanotechnology
- Advanced functional materials
- Optical spectroscopy
- Engineering failure analysis
- Lead-free interconnections
<table>
<thead>
<tr>
<th>STAFF</th>
<th>AREAS OF SPECIALISM</th>
</tr>
</thead>
</table>
| **Prof Peter K N Yu**  
BSc PhD *University of Hong Kong*  
CSci CPhys MInstP CRadP MSRP FHKIE  
Email: peter.yu@cityu.edu.hk | Radiation biophysics  
Medical physics  
Biointerfaces |
| **Prof R Q Zhang**  
BSc MSc PhD *Shandong University, China*  
Email: aprqz@cityu.edu.hk | Surface, interface and microstructures of functional materials  
Vapor-solid interactions  
Computational materials science  
Nanoscience |
| **Associate Professors** | |
| **Dr H F Cheung**  
BSc University of Hong Kong  
PhD *University of Illinois at Urbana-Champaign, USA*  
Email: apcheung@cityu.edu.hk | Solid state physics  
Silicon nanowires  
Computational materials science |
| **Dr S T Chu**  
BSc *Wilfrid Laurier University, Canada*  
MSc PhD *University of Waterloo, Canada* | Integrated photonics  
Sensors and sensing systems  
Numerical methods |
| **Dr C Y Chung**  
BSc(Eng) PhD *University of Hong Kong*  
MHKIE(Materials & Biomedical)  
Email: appchung@cityu.edu.hk | Metallic materials  
Shape memory alloy  
Powder metallurgy  
Battery materials |
| **Dr Z K Xu**  
BSc *Shanghai University of Science and Technology, China*  
MSc California State Polytechnic University at Pomona, USA  
PhD *University of Illinois at Urbana-Champaign, USA*  
Email: apzkx@cityu.edu.hk | Electron microscopy  
Materials characterization  
Processing of advanced materials  
Electroceramics |
| **Dr W J Zhang**  
BSc MSc PhD *Lanzhou University, China*  
Email: apwjzh@cityu.edu.hk | Surface and interface analysis  
Thin films  
Diamond and superhard materials  
Nanomaterials |
| **Dr J Antonio Zapien**  
BSc *UNAM, Mexico*  
PhD *The Pennsylvania State University, USA*  
Email: apjazs@cityu.edu.hk | Nanomaterials and nanotechnonology  
Nano-photonics and nano-optoelectronics  
Optical properties of materials  
Nucleation and growth of thin films |
Assistant Professors

Dr X F Chen
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MSc National University of Singapore
DPhil University of Oxford, UK
Email: xianfeng.chen@cityu.edu.hk
Nanomaterials, biomedical materials, medical engineering

Dr Johnny C Y Ho
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Synthesis and characterization of nano-structured materials
Assembly and heterogeneous integration of nano-materials
Nano-scale devices and processing for technological applications (electronics, energy-harvesting, photonics, sensors)

Dr Jensen T H Li
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Metamaterials for microwave, Terahertz, and optical applications
Plasmonics and nanophotonics
Acoustic metamaterials and phononic crystals
Transformation optics and acoustics

Dr Y Y Li
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MSc PhD University of California, San Diego, USA
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Functional photonic materials, including transparent conductors, transparent magnets, all-absorption photovoltaic electrode materials
Smart materials for biomedical applications

Dr Antonio Ruotolo
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Magnetism and spintronics
Superconductivity
Semiconductor oxides
Thin film technology
Nano-lithography

Dr A L Roy Vellaisamy
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MSc Loyola College, India
PhD Nagpur University, India
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Molecular electronics
Molecular self-assembly
Photonics
Nano-materials science
Bio-electronics
Renewable energy (solar and fuel cells) and flexible electronics
## STAFF

### Emeritus Professor

**Prof Czeslaw Z Rudowicz**  
Institute of Physics  
West Pomeranian University of Technology  
*Poland*

- Quantum mechanics  
- Condensed matter physics  
- Magnetism  
- Electron magnetic resonance  
- Crystal (Ligand) field theory  
- Computational physics  
- Scientific databases

### Honorary Professors

**Prof Jack C M Chang**

Microelectronics  
Surface science and nanoscience

**Prof Nathan W T Cheung**  
Professor, Department of Electrical Engineering and Computer Sciences,  
University of California, Berkeley, USA

- Advanced engineering materials including bio, nano and functionally graded materials  
- Fracture and fatigue mechanics  
- Fiber composites science and technology  
- Tribology and surface engineering  
- Failure mechanics and analysis

**Prof Y W Mai**  
Center for Advanced Materials Technology, School of Aerospace Mechanical and Mechatronic Engineering  
University of Sydney  
*Australia*

### Adjunct Professors

**Prof Yeshayahu Lifshitz**  
Materials Engineering Dept  
Technion—Israel Institute of Technology  
*Israel*

- Silicon and other semiconducting nanowires  
- Ion-beam structuring of materials  
- Diamond and diamond like carbon and related materials  
- Ion interactions with materials  
- Space environmental effects on materials  
- Electronic devices and systems

**Prof L J Wan**  
Professor of Chemistry  
Director, Institute of Chemistry  
Chinese Academy of Sciences

- Nanoscience and technology  
- Molecular assembly and device  
- Materials chemistry  
- Electrochemistry  
- Scanning probe microscopy
STAFF AREAS OF SPECIALISM

**Instructor I**
Dr Amy X Y Lu  
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MSc PhD Purdue University, USA  
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**Areas of Specialism**  
Biophysics  
Computer simulation  
Dynamic websites construction

**Laboratory Manager**
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MSc PhD University of Akron, USA  
CPhys MInstP  
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The Department performs strategic planning through its internal Executive Committee with recommendations from its external Advisory Committee. The Executive Committee consists of senior staff, programme leaders, and an elected staff member. The Advisory Committee draws its members mostly from local industries and is supplemented by external academic advisors to all degree programmes.

The Executive branch currently consists of the Head, an Associate Head, an Assistant Head, the General Office, as well as the Staffing, Laboratory and Curriculum Committees. The Assistant Head (Undergraduate Affairs) oversees undergraduate admission/recruitment, student training programmes, student mentoring, external publicity, scholarships and prizes, social activities, and the Curriculum Committee. The Associate Head (Postgraduate Affairs) has responsibility for postgraduate tutoring, health and safety, seminars, library liaison, and the Laboratory Committee. In addition, the Department relies on a number of standing or ad-hoc committees and officers to discharge its functions.
Organization Structure of AP Department

- **Head of Department**
  - Advisory Committee
  - Executive Committee
  - General Office (EO)

- **Assistant Head** (Undergraduate Affairs)
- **Associate Head** (Postgraduate Affairs)

- **Curriculum Committee**
- **Staffing Committee**
- **Laboratory Committee**

- **Legend:**
  - Solid Lines => Direct authority
  - Dashed Lines => Ex-officio linkage

- **Degree Programmes**
  - BEng (Hons) in Materials Engineering
  - BSc (Hons) in Applied Physics
  - MScMEN
  - MPhil & PhD

- **Subcommittees**
  - Postgraduate Tutoring
  - Health & Safety
  - Seminars
  - Library Liaison
  - Examinations
  - Accommodation
  - Computing & Software
  - Industrial Liaison
  - Others