Dear Year-1 Engineering Students,

I am Raymond Tong (Biomedical Engineering Division Head and Programme Director), hope this email finds you well. As you may know the Faculty is organising a Programme Consultation Session with Major Allocation talks on Friday (March 10, tomorrow). You are welcome to participate in the event to get more information on your major selection.

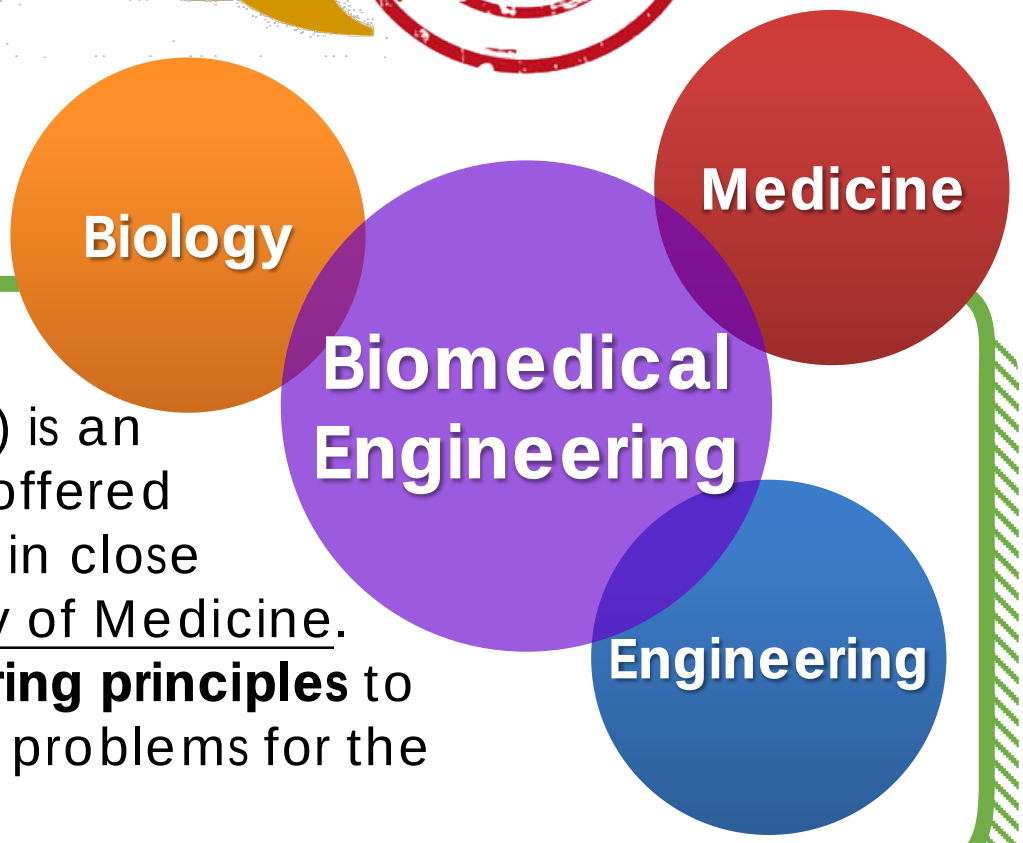
If you are interested in **BME (Biomedical Engineering)** and to know more about BME programme, career and overseas exchange, come and visit our **BME booth** from 12noon to 6pm on SHB 6/F Reading Room. BME professors and current BME students from different years will be there to provide information and answer your questions. Our **BME Programme Talk** will be conducted from 4:30 to 4:45pm by Prof Jonathan Choi at T Y Wong Hall, you are highly recommended to join!

Attached is a **BME information sheet** for you to have a quick understanding of BME, opportunities of outside exposure for BME Students and career paths of recent BME Alumni. More detailed information of the BME programme can be found in our programme brochure:
http://www.bme.cuhk.edu.hk/ubme/v2/download/CUBMEBooklet_1108_Online.pdf

BME welcome you to come and have a chat with us! Looking forward to seeing you there!

CUHK BME FAQs 懶人包

What is BME?



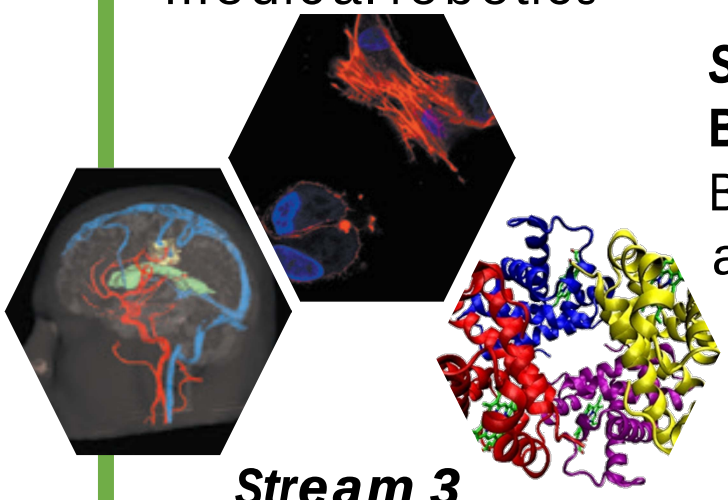
Biomedical Engineering (BME) is an **interdisciplinary programme** offered by the Faculty of Engineering in close collaboration with the Faculty of Medicine. It involves the use of **engineering principles** to solve **biological** and **medical** problems for the welfare of mankind.

What will BME undergraduates learn?

Stream 1

Medical Instrumentation & Biosensors

TeleMedicine, biofluids, neuroengineering, medical robotics



Stream 2

Biomedical Imaging, Informatics & Modeling

Bioinformatics, biomedical modeling, sound and light waves in medicine

Stream 3

Molecular, Cell & Tissue Engineering

Bionanotechnology, biomolecular engineering, musculoskeletal tissue engineering

http://www.bme.cuhk.edu.hk/

CUHK BME FAQs 懶人包

Any other BME opportunities outside the classroom?

Hospital Training

Two-week training at the Prince of Wales Hospital. Students can learn the daily operation, information flow and logistics in a hospital.

Overseas Exchange

Many BME students participate in overseas exchange programmes around the world.

NUS National University of Singapore

KIT Karlsruhe Institute of Technology

KTH Vetenskap och Konst

ILLINOIS University of Illinois at Urbana-Champaign

Stony Brook University

Work-Study Programme

One year full-time experience as an employee in BME industries

ARUP

ASM

機電工程署 EMSD

Medisen

FYP supervision from Professors of Faculty of Medicine

Collaboration with Faculties of Science and Medicine in International Research Competitions

e.g. iGEM, EMedic Global

Where do BME graduates go?

香港科學館 HONG KONG SCIENCE MUSEUM

HSBC

CATHAY PACIFIC

機電工程署 EMSD

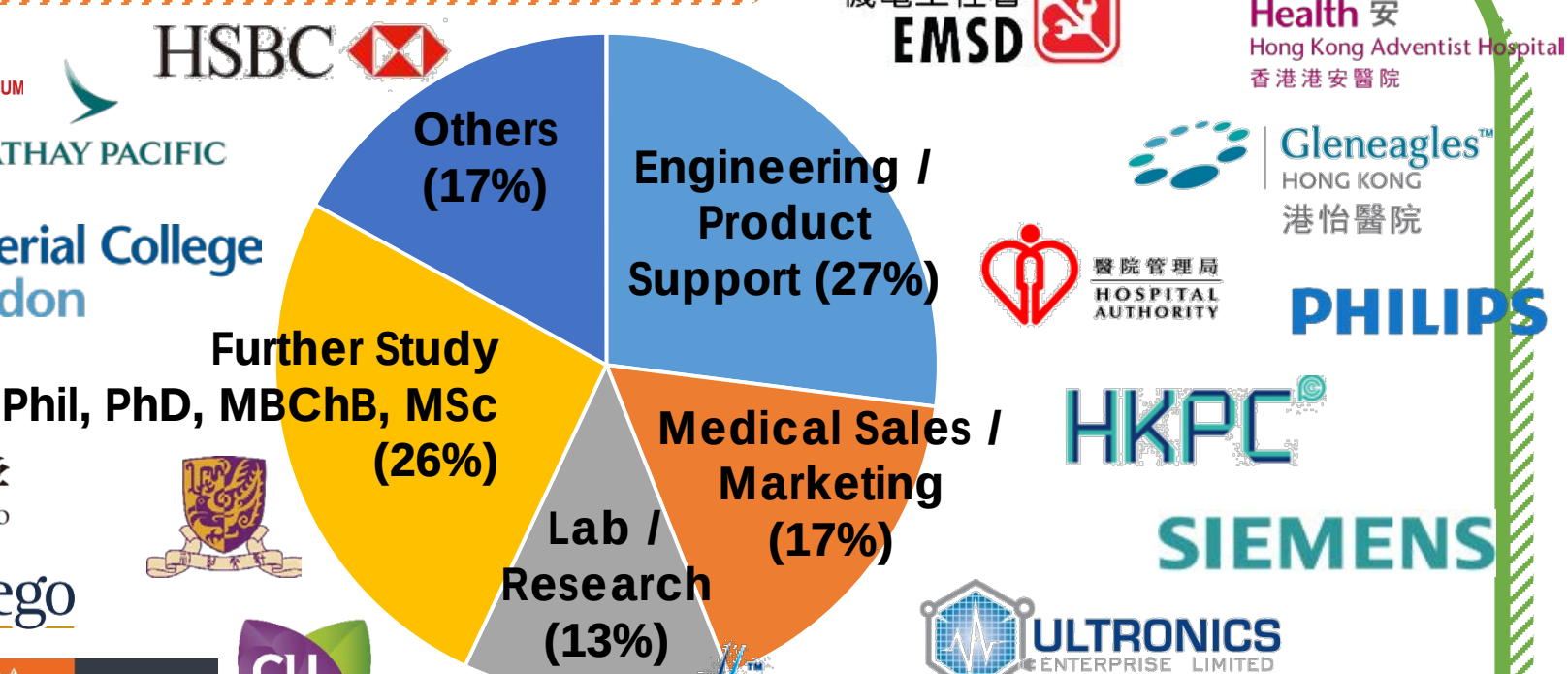
Adventist 港 Health 安 Hong Kong Adventist Hospital 香港港安醫院

Gleneagles HONG KONG 港怡醫院

Imperial College London

醫院管理局 HOSPITAL AUTHORITY

PHILIPS



HKPC

東京大学 THE UNIVERSITY OF TOKYO

SIEMENS

UC San Diego

ULTRONICS ENTERPRISE LIMITED

CU Medicine HONG KONG

ROYAL HOLLOWAY UNIVERSITY OF LONDON

ASTRI

Johnson & Johnson

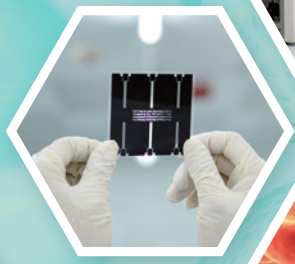
Employment survey

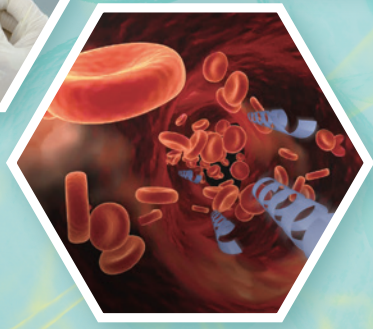
Graduating classes of '13, '14, '15 and '16

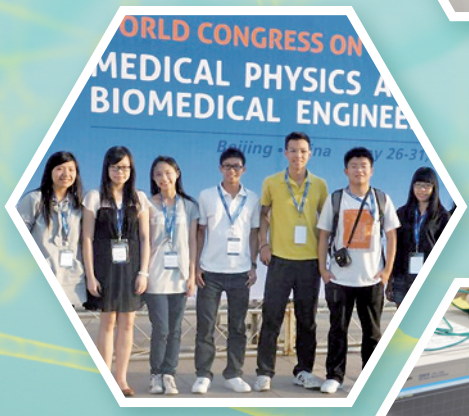
http://www.bme.cuhk.edu.hk/

The Chinese University of Hong Kong

Biomedical Engineering Programme



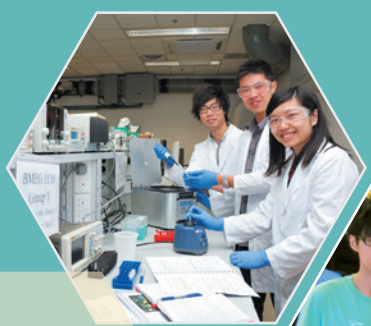


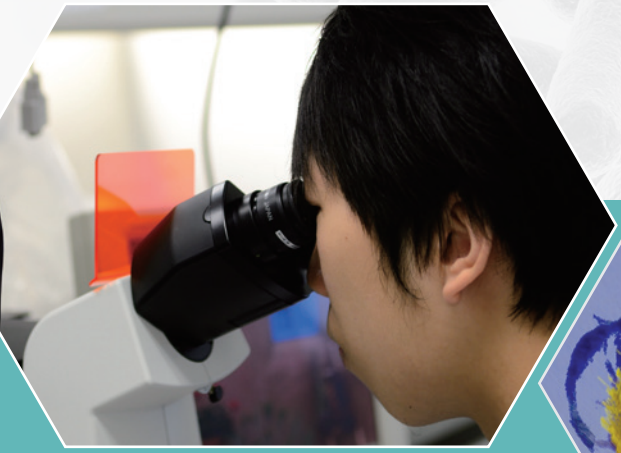


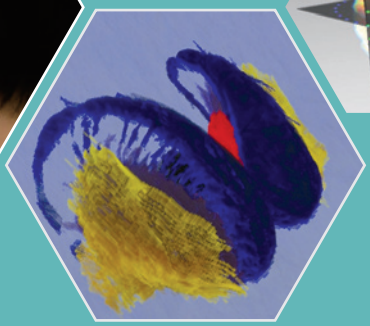
Biomedical Engineering

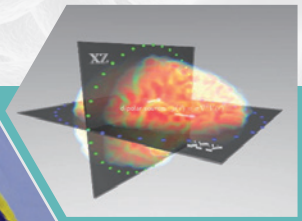
Biomedical engineering is an interdisciplinary study in which engineering and technology are applied innovatively to solve biological and medical problems for the benefit of mankind.

The Biomedical Engineering (BME) programme was launched by the Faculty of Engineering in close collaboration with the Faculty of Medicine as a co-owned interdisciplinary programme in 2009. The programme aims at educating next-generation biomedical engineers with an aspiration of serving society and advancing healthcare at the interface of engineering, science, and medicine. Academic contributions are provided by various departments across the two Faculties. Administrative supports are provided by the Department of Electronic Engineering for our undergraduate programme.









Mission

To nurture future leaders in biomedical engineering covering the broad areas of biosensors and medical devices, biological microelectromechanical systems and bionanotechnology, functional tissue engineering, informatics in biomedicine, medical imaging, as well as medical robotics and assistive technology.

Programme Outcomes

- An ability to master the required knowledge of mathematics, science, and engineering and apply them appropriately to the BME discipline in general and/or to a specialized BME area
- An ability to design and conduct experiments, collect data on humans and other biological specimens, and to analyze and interpret data to address health-related issues
- An ability to design a system, component or process to meet desired needs within realistic constraints, and to develop innovative technologies to serve the healthcare needs of society
- An ability to identify, formulate and solve engineering problems critically
- An ability to use the techniques, skills, and modern engineering tools necessary for BME practice
- An ability to use the computer/IT tools relevant to the BME discipline along with an understanding of their processes and limitations
- An ability to communicate effectively
- An ability to demonstrate leadership, to manage projects, and to function on multi-disciplinary teams
- An ability to understand professional and ethical responsibility, and the impact of engineering solutions in a global and social context, especially the importance of health, safety and environmental considerations to both workers and the general public
- A readiness to engage in lifelong learning to stay abreast of contemporary issues, and a capacity to acquire new knowledge and skills across disciplinary boundaries

BME Curriculum

Year 1	Engineering Foundation	Free Electives*, General Education & Languages
	Biology / Chemistry, Engineering Design, Engineering Mathematics, Physics, Programming	Business Administration Accounting Law Science Arts Social Science Physical Education English Technical Communications
Year 2	BME Fundamentals	
	Anatomy and Physiology, Biomechanics, Cell and Molecular Biology, Circuit and Electronics, Engineering Mathematics	
Year 3	Advanced Major Courses	
	Biomaterials, Technology, Society and Engineering Practice, Medical Instrumentation, Microprocessor, Signal and Systems, Tissue Engineering BME Electives	
Year 4	One-year Work Study Program (optional)	
Year 4 or 5	BME Specialization	
	Graduation Project BME Electives	

* Units for free electives can be used to fulfill the minor requirement.

Streams

Medical Instrumentation & Biosensors

TeleMedicine & Mobile Healthcare	Biofluids	Neuroengineering
Medical Robotics	Body Sensor Networks	BioMEMS
Bionanotehnology		

- Recommended to minor in Electronic Engineering, Mechanical & Automation Engineering, OR Physics

Biomedical Imaging, Informatics & Modeling

Bioinformatics	Database & Security	Biomedical Imaging
Biomedical Modeling	Medical Imaging Applications	
Sound and Light Waves in Medicine		

- Recommended to minor in Computer Science, OR Electronic Engineering

Molecular, Cell & Tissue Engineering

Cell Biology	Molecular Biotechnology	Genetic Engineering
Bionanotechnology	Biomolecular Engineering	BioMEMS
Musculoskeletal Tissue Engineering		

- Recommended to minor in Biology, OR Biochemistry

Curriculum

- Breadth and depth through major electives and minor options
- Coursework supplemented with practical work and hospital training
- Courses taught by faculty members from both engineering and medical faculties
- Wide selection of free electives
- Flexible credit system

BME + Business Administration Double-Degree Programme

The double degree option is designed to provide students with maximum flexibility to acquire a second degree by an additional year of study after their first degree. Biomedical engineering students can pursue a second bachelor's degree in the Faculty of Business Administration within a 5-year normative period of study if they fulfill certain requirements. For further information, please refer to the Faculty website at http://www.erg.cuhk.edu.hk.

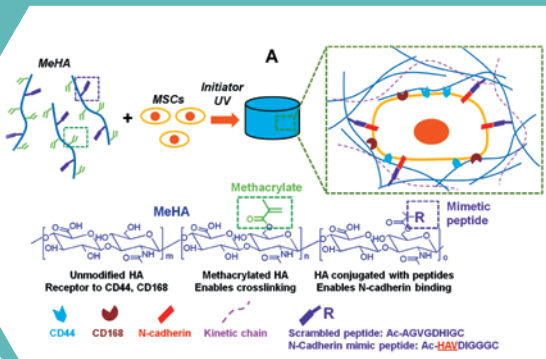
BME Minor Programme

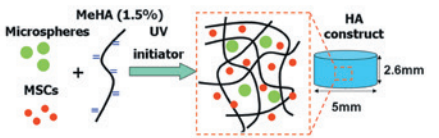
The BME minor programme is a good option for students with a science background to apply engineering tools on medical science and biology. For details, see the curriculum information in our website: http://www.bme.cuhk.edu.hk.

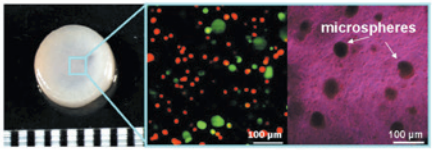
Areas of Research

In January 2015, CUHK established the Chow Yuk Ho Technology Centre for Innovative Medicine. The Centre serves as a platform for promoting academic exchange and collaboration between engineers and physicians at CUHK to engage in innovative research in biomedical engineering.

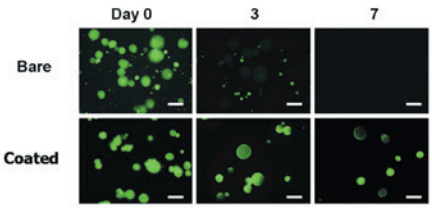
With key research areas in robotics, imaging and biosensing, the Centre aims at transferring various technologies into clinical equipment and practice for the benefit of patients.





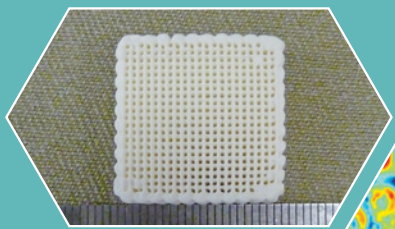


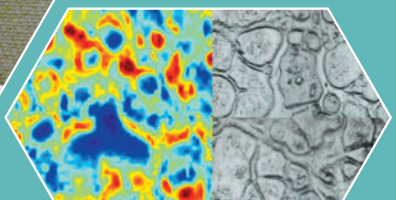
Green: alginate microspheres Red: MSCs

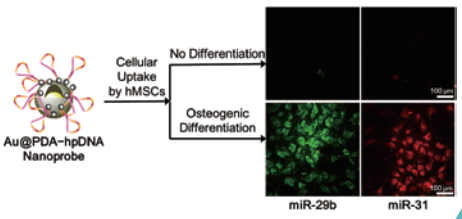


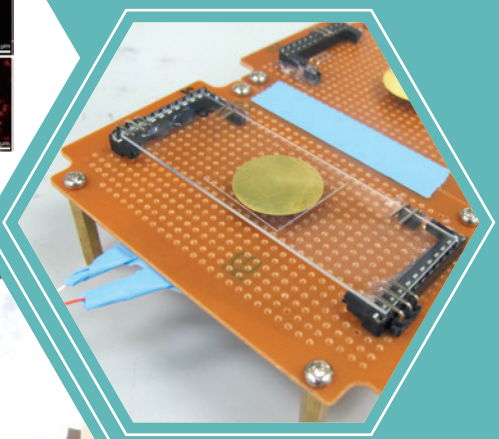
Biomaterials and Regenerative Medicine

Biomaterials scaffolds and bioactive coatings, stem cell technology, microenvironmental cues in stem cell differentiation, biophysical stimulation and mechanobiology



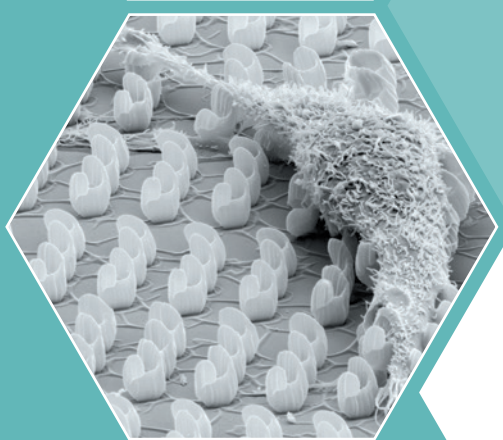


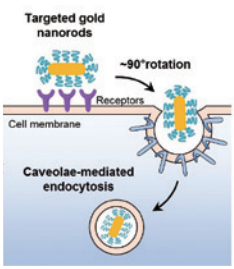


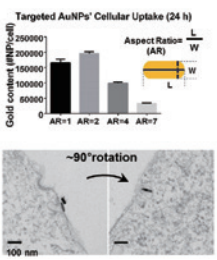


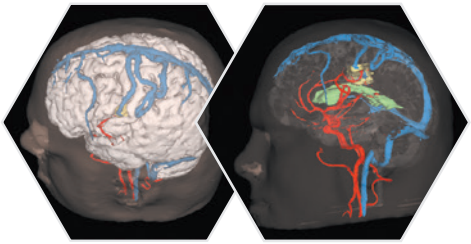
Biomolecular Engineering and Nanomedicine

Lab-on-a-chip biosensors, point-of-care devices, microfluidic manipulation and detection of biomolecules, research into bacterial and mammalian cells, bionanotechnology and delivery of diagnostic and therapeutic molecules



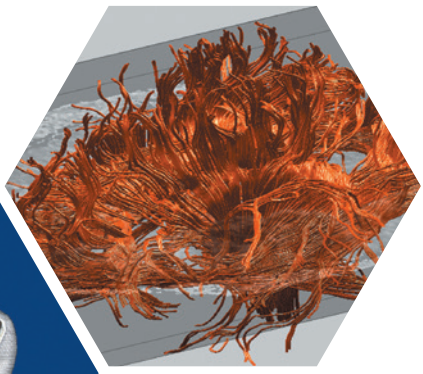


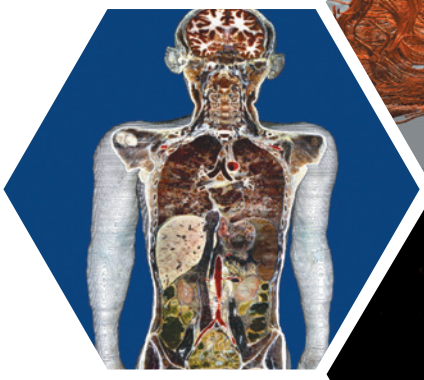


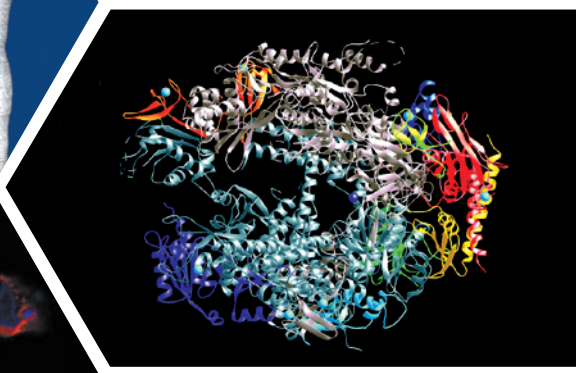


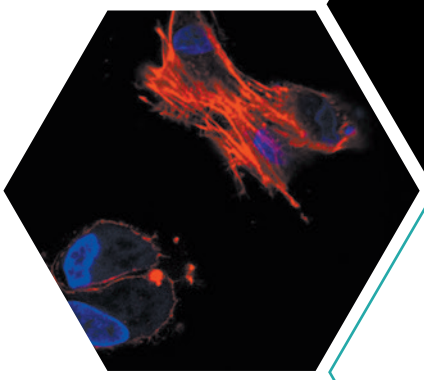
Medical Imaging and Informatics

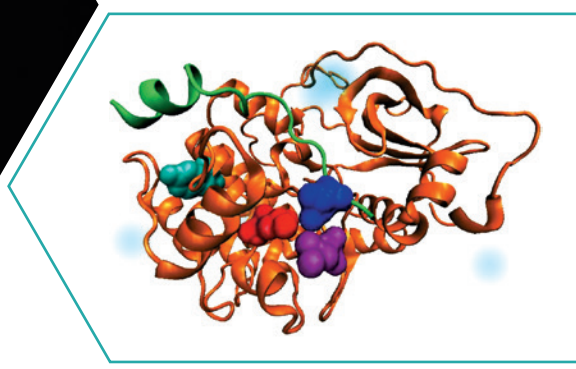
Computer-aided diagnosis, functional magnetic resonance imaging, terahertz imaging and spectroscopy, bioinformatics, health informatics, telemedicine

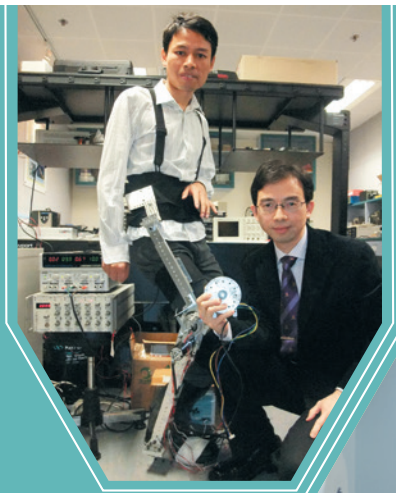


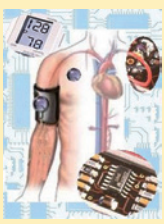


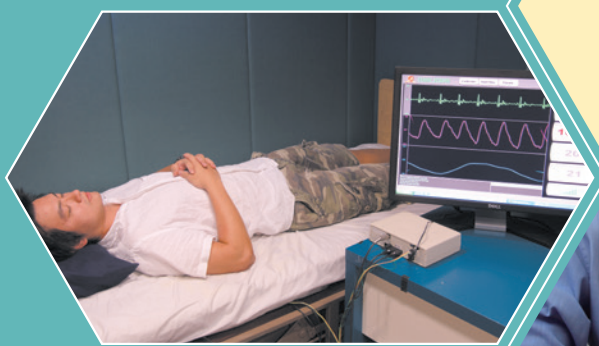


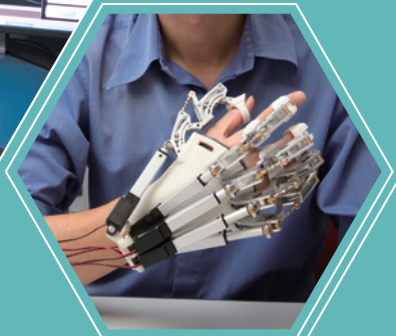










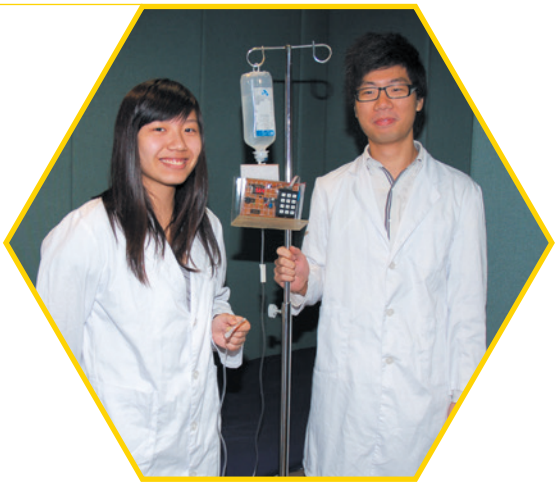


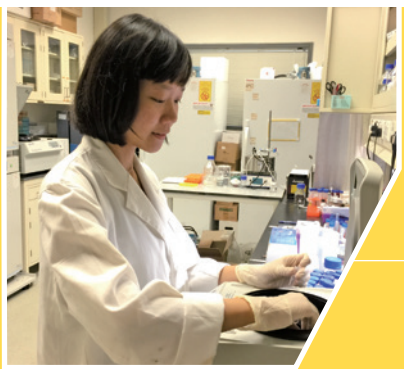
Medical Instrumentation and Biosensors

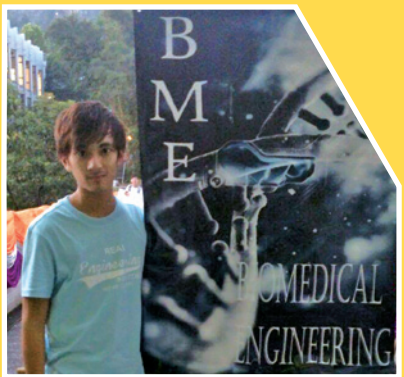
Wearable sensors and mobile health, home healthcare technology, surgical robotics, wireless capsule endoscopy, wearable robotics for rehabilitation

Hospital Training

Students are required to participate in a two-week summer training in the Prince of Wales Hospital. During the training, students can experience the daily operation, information flow and logistics in the running of a hospital. They will also learn about the fundamentals and daily operation of medical instruments. The summer training provides a valuable chance for students to relate theory and engineering knowledge to practice in a real-world setting.







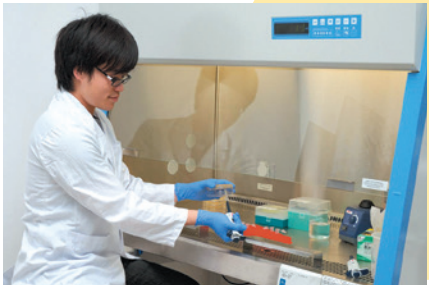
Students' sharing:

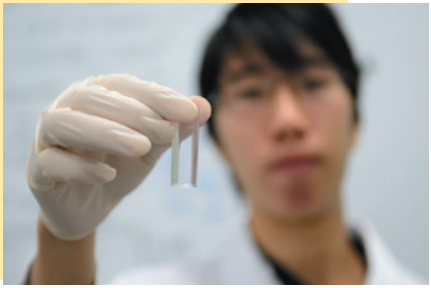
Ho Lok Wai:

It was surely an unforgettable experience which urges me to think about the contributions of biomedical engineers to those who desperately need help.

Nico Chen:

The training was eye-opening and exposed us to multitudinous hospital equipment and facilities, granting us a real-time perception of the state-of-the-art technologies adopted by hospital personnel. We were invited to observe the machinery operation on patients with their consent, polishing our viewpoint on our role as biomedical engineers of the next generation.





Graduation Project

All students in their final year of study are required to complete a graduation project. The project is designed to provide students with an opportunity to carry out an independent project with research elements in biomedical engineering. BME students will be under the supervision of and examined by academic staff spanning over numerous departments in the Faculty of Engineering and the Faculty of Medicine. Recent project topics include:

- Automatic scoring of sleep measures
  (Co-supervised by Department of Psychiatry and BME programme)
- Biophotonics: Improvement in image quality in laparoscopic general surgery using smaller size laparoscope
  (Supervised by Department of Surgery)
- Development of a therapeutic game for patients with Alzheimer's disease
  (Co-supervised by Department of Radiology and BME programme)
- Manipulation and detection of cancer tissues on a microfluidic device
  (Co-supervised by Department of Oncology and BME programme)
- To develop a mobile app for learning cardiac anatomy
  (Supervised by Department of Computer Science)

Co-Curricular Programmes

Based on interests, students are encouraged and supported to participate in various co-curricular programmes, such as

- Academic exchanges
- Community services
- Early research exposures
- International design competitions
- Study field trips
- Summer internships
- Work-study programmes

Recent examples of these co-curricular activities include

- World Congress of Medical Physics and Biomedical Engineering in Beijing
- iGEM, International Genetically Engineered Machine Competition at the Massachusetts Institute of Technology (MIT)
- Engineering Medical Innovation Global Competition
- Hong Kong University Student Innovation and Entrepreneurship Competition
- Summer research internships at the Chinese Academy of Science Shenzhen Institute of Advanced Technology
- Overseas summer research internships at Columbia University, Northwestern University, University of Pittsburgh, University of Toronto, etc.
- Summer internships in companies such as Ample Link, etc.
- Summer internships in hospitals such as the Hong Kong Adventist Hospital and Prince of Wales Hospital
- Summer internships in organizations such as Hong Kong Government Electrical and Mechanical Services Department and Hong Kong Productivity Council

Overseas summer research internship at:

- Columbia University, USA
- Imperial College, UK
- Korea Institute of Science & Technology, Korea
- National University of Singapore, Singapore
- Northwestern University, USA
- University of California at Irvine, USA
- University of California, San Diego
- University of Pittsburgh, USA
- University of Toronto, Canada

Student Sharing on Co-Curricular Programmes

Visit to the World Congress on Medical Physics and Biomedical Engineering

Hu Dawei

In the congress, we were exposed to the latest information on global health challenges, advanced technologies and innovative applications. The congress was a different learning environment to us. A lot of the ideas were new to us and they really broadened our horizons. We really appreciate the state-of-the-art knowledge and technology in the field of biomedical engineering. We treated it as an invaluable learning opportunity. After the 6-day congress, we have a better understanding on the global health situation and related technology. In this way, we have a clearer idea on the role of a biomedical engineer.

International Genetically Engineered Machine Competition (iGEM)

Winnie So

Joining iGEM is an amazing adventure in my university life. This competition is launched by the Massachusetts Institute of Technology (MIT) and requires teams to show their knowledge in biotechnology, innovation, teamwork and public outreach. For half a year, students from both Life Science and Engineering cooperate with each other to finish a synthetic biology research project. It is my great pleasure to be one of the teammates of iGEM CUHK 2011. Several teammates and I also feel delighted to conduct further research on ChloriColight - development of a microbial desalination power plant in the Biomedical Engineering Laboratory after the competition. This iGEM experience has broadened my horizons and enriched my study life in CUHK.

Global Educational Exchange Program (GLOBEX) at Peking University

Lo Po Wen

GLOBEX constitutes an initiative for international and educational exchange between the College of Engineering at Peking University and engineering schools all around the world. Studying at Peking University with foreigners gave me countless opportunities. The course on Nanomaterials and Nanotechnology was in some way difficult for a freshman but I really enjoyed knowing things at the nanometer length scale and their special properties and applications. The course on Orthopedic Biomechanics was really full of fun. I learned a lot of new and in-depth knowledge about mechanics and anatomy of bone during such days. I feel really grateful to join the Global Educational Exchange Program. Not only did I learn a lot of new knowledge, but I also made a lot of foreign friends.

Summer Overseas Research Internship at Musculoskeletal Research Center (MSRC), Department of Bioengineering, University of Pittsburgh

Bonnie Leung

I was so glad to be given an opportunity to gain research experience at the Musculoskeletal Research Center (MSRC). I learnt not only research skills, but also cooperation that a good researcher requires. During the summer internship, my project was to perform computational and in vitro tests on a magnesium-based suture anchor. My training as a problem solver at the MSRC provided me with a chance to further sharpen my analytical skills. Throughout my short stay at MSRC, I experienced what research is and learned what to do whenever I encounter setbacks in the research process.

Overseas Exchange

University provides overseas exchange opportunities to students to immerse in multi-cultural settings and to enrich their study life and personal experience. Many undergraduate students in Biomedical Engineering participate in overseas exchange programmes around the world. Recent examples include:

- Ewha Woman University, Korea
- Karlasruhe Institute of Technology, Germany
- KTH Royal Institute of Technology, Sweden
- Nanyang Technological University, Singapore
- National University of Singapore, Singapore
- Pompeu Fabra University, Spain
- San Diego State University, USA
- State University of New York at Stony Brook, USA
- University College London, UK
- University of Illinois at Urbana-Champaign, USA
- University of Ottawa, Canada
- University of Tennessee, USA
- University of Western Australia, Australia

Scholarships

Students with good academic results can apply for scholarships at the university level, college level, and programme level.

Work-Study Programme

In addition to the regular academic study on campus, students can choose to participate in "Work-Study Programme" upon completion of third year of their major study. The Programme aims to provide students an opportunity to apply engineering principles and methods from their studies to an authentic working environment of biomedical engineering related industries. Students will continue their final year of study on campus afterwards. Partners of the Programme include companies from the biomedical engineering industries, private hospitals, the Hospital Authority, etc. Recent examples include:

- AML Health Plus Ltd.
- Asia Satellite Telecommunications Co. Ltd
- ASM Technology Hong Kong Ltd.
- Automatic Manufacturing Ltd.
- Electrical and Mechanical Services Department , HKSAR Government
- The Hongkong and Shanghai Banking Corp. Ltd. (HSBC)
- ITE Smartcard Solutions Ltd.
- Medisen Ltd.
- Ove Arup & Partners Hong Kong Ltd.
- Paul C. Lauterbur Research Centre

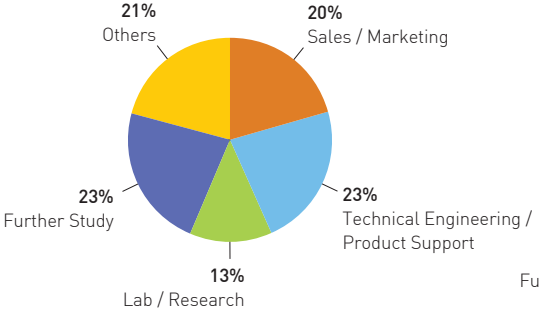
Career Opportunities

Biomedical engineering, which integrates expertise in engineering, medicine and bioscience for the enhancement of healthcare, is one of the fastest growing engineering disciplines today. It is an area of rapid expansion with promising career prospects. According to a long-range forecast of the U.S. Bureau of Labor, employment of biomedical engineers is expected to grow much faster than average (72% from 2008-2018) for all occupations. The aging population and the focus on health issues will increase the demand for better medical devices and equipment designed by biomedical engineers. The development of biomedical engineering is therefore a worldwide trend. The first cohort of graduates in 2013 is pursuing the following career paths.

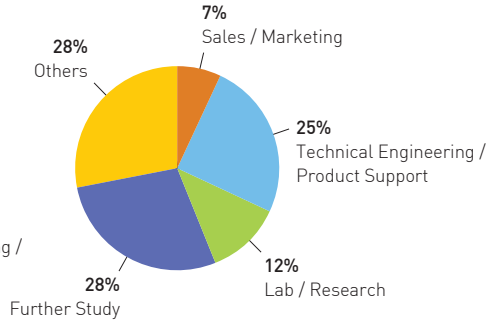
- Research and development
- Further study pursuing a postgraduate degree in BME, medical research and other fields
- Further study pursuing a medical degree
- Consulting services for medical device industry
- Medical device manufacturing
- Medical device distribution and sale

Employers include: AB Sciex, ArjoHuntleigh, ASM Pacific Technology, Electrical and Mechanical Services Department of HKSAR Government, Healthlink Holdings Limited, Hong Kong Adventist Hospital, Hong Kong Aircraft Engineering Company Ltd. (HAECO), Hong Kong Applied Science and Technology Research Institute (ASTRI), Hong Kong Productivity Council, Hong Kong and Shanghai Banking Corp. Ltd. (HSBC), Innotronik Hong Kong Ltd, Johnson & Johnson, Medisen (Sengital), Medtronic, Philips, Siemens (Healthcare sector), Transmedic, Ultronics Enterprise Limited

Employment Survey of Our BME Alumni



Class of 2014



Class of 2015

BME Alumni Sharing

Jason Lau *(Class of 2014)*
Biomedical Equipment Technician, Hong Kong Adventist Hospital

My job is to maintain the medical devices in the hospital. Specifically, I am required to fully understand the operating principles of these biomedical equipment items so that I can trouble-shoot any on-site technical issues independently. From my undergraduate studies in biomedical engineering at CUHK, I have well understood the principles of different medical devices such as MRI, CT scanner, pulse oximeter, and infusion pump.

As a technician, I am also responsible on procurement, sorting out the merits of medical devices from different brands to determine the best suited ones use in the hospital. As I learned about the regulations of medical devices at CUHK, I was well equipped for the task of procurement before I officially started my current position at the hospital.

T.Y. Wong *(Class of 2013)*
Assistant Engineer, Electrical and Mechanical Services Department (EMSD), Hong Kong Government

I belong to the first cohort of graduates from the BME Program at CUHK. After my graduation in 2013, I joined the Electrical and Mechanical Services Department (EMSD) of the Hong Kong Government as a Biomedical Engineering Graduate and participated in a 2-year training programme (Graduate Scheme "A" Training of the Hong Kong Institution of Engineers). The technical know-how and the vision I gained during my undergraduate years have become the most important and trusted stepping stone in my career. I am now an assistant engineer, serving various hospitals and clinics in Hong Kong.

CUHK's BME education is comprehensive, as it covers laboratory-based research, mechatronics invention, IT-applied BME solution, medical electronics manufacturing, etc. The well-structured and broad curriculum gave me innumerable ways to make an impact in the BME field. At CUHK, I learned to become a logical, reasonable, caring, and responsible person. My BME experience at CUHK trained and developed me to become a healthcare professional. I encourage you to enroll in the BME program to experience excellence and passion.

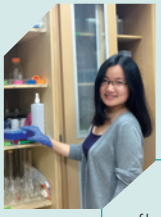
I want to express my special gratitude to the Faculty of Engineering for their mentorship programme. Students were grouped and assigned to an engineering expert as mentees. Other than academic matters, my engineering mentor also took care of my all-rounded personal development.

Tracy Wong *(Class of 2014)*
Student, Bachelor of Medicine and Bachelor of Surgery (MBChB), CUHK

Having studied Medicine as my second bachelor's degree for around one year, I feel grateful that I studied Biomedical Engineering as my first bachelor's degree a few years ago.

Biomedical Engineering and Medicine have very different studying modes and styles. Biomedical Engineering emphasizes on understanding the principles underlying medical instruments and doing hands-on experiments, while Medicine emphasizes on the clinical knowledge and practice as well as application of medical instruments. However, there is overlapping between the two disciplines. My previous education in Biomedical Engineering has undoubtedly equipped me with the basic knowledge and skills for my current study in Medicine. For example, the knowledge of Biomechanics that I learnt helped me understand the clinical manifestation of a gait when a hip muscle is impaired.

Apart from the knowledge that I learnt in Biomedical Engineering, participating in a summer research internship in The University of Toronto was a great and inspiring experience for me. In that summer, I worked on characterizing the physiological patterns for activity engagement in youth with severe disabilities. It was an invaluable opportunity for me to apply and consolidate my engineering knowledge. More importantly, this research experience revealed to me the possibility of Biomedical Engineering in the advancement of Medicine. I look forward to doing medical research armed with my Biomedical Engineering knowledge and skills in future!



Shirley Wu *(Class of 2014)*
Ph.D. student in Bioengineering, University of California, San Diego, USA

As a Ph.D. student, I work in the Wang Lab that specializes in engineering fluorescence resonance energy transfer (FRET) - based biosensors for the visualization of molecular interactions at high resolution. I am currently investigating the quantitative coupling between biochemical activities and biophysical dynamics at cellular focal adhesions by integrating FRET imaging, single particle tracking algorithm and cross-correlation analysis. Besides live cell imaging, my project also involves intensive programing in MATLAB, which requires solid theoretical knowledge in mathematics and programing. I am glad that my undergraduate education at CUHK has equipped me with these knowledge and skills. Indeed, the informative courses, practical training and research experience that I had in the BME programme at CUHK laid a solid foundation for me to pursue further research. More importantly, I also learnt to think critically and work efficiently during my undergraduate study in such a professional and friendly environment. Situated along the coastline, UCSD constantly reminds me of CUHK and those memorable days I spent there. I am grateful to the BME programme at CUHK for her guidance on my way to becoming a better biomedical engineer.

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