

# HKUST CBE



The Department of Chemical and Biological Engineering  
Issue of 2023

Think  
beyond,  
Discover  
Tomorrow





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# Spearheaded to the Science Forefront

Welcome to the Department of Chemical and Biological Engineering (CBE). This year marks a momentous occasion as CBE celebrates its 30<sup>th</sup> anniversary. From its humble beginnings with HKUST, CBE has flourished over the past three decades, offering some of the most unique programs exclusively available in Hong Kong. With a pioneering spirit at our core, we are dedicated to leading the way and remaining at the forefront of scientific advancements.

Commemorating this significant milestone, we are thrilled to present our inaugural newsletter, where I am delighted to share with you the strategies and plans that I have in mind to elevate our department to new heights.

## Elevating CBE to New Heights: Strategies for Success

Our success can be driven by three main areas: curriculum, partnerships, and fostering an entrepreneurial mindset amongst students. We will ensure our curriculum stays relevant by incorporating emerging technologies, interdisciplinary collaborations, and industry skills. We also aim to strengthen industry partnerships for internships, research, and mentorship. Furthermore, we will promote entrepreneurship to turn ideas into ventures, contributing to economic growth and job creation for our students.

## Addressing Societal Challenges & Positive Impact on Well-being

One of our missions is to address societal challenges. Through our dedication to community engagement, we intend to establish outreach programs and collaborate with NGOs and government agencies to address issues such as pollution, sustainable energy, and public health. Ultimately, by leveraging our expertise, we will actively contribute to the development of healthcare solutions, such as drug discovery/delivery, personalized medicine, and biotechnological advancements, to improve global health outcomes.

## Expectations for CBE in the Next 5-10 Years

Leading the way towards a sustainable and globally renowned future in chemical and biochemical engineering education and research. CBE is expected to grow steadily and become a mid-size department. We are committed to staying at the forefront to pioneer sustainable solutions, attract top global talent, and shape a greener world.

## Supporting Our Students

Through internships, exchanges, and corporate networking opportunities, our goal is to empower CBE students with a strong problem-solving mindset and effective communication skills. This will enable them to analyze complexities, think critically, propose innovative solutions, and emerge as leaders in their respective fields.

I hope in this edition, you will see our dedicated faculty, talented students, and passionate alumni who are innovative and shape a future with groundbreaking discoveries and transformative contributions to society.

Join us and Stay Connected. Together, let us explore the endless possibilities to build a brighter tomorrow in the field of chemical and biological engineering.



## Professor Minhua Shao

Head and Chair Professor, CBE  
Cheong Ying Chan Professor  
of Energy Engineering and  
Environment





# CBE at a glance

## Faculty and Staff

Regular Faculty	20	Research Assistant Professor	2
Jointly Appointed Faculty	4	Teaching Track Faculty	2
Zero Percent Jointly Appointed Faculty	11	Adjunct Faculty	6
		Emeritus Faculty	5
		Research Staff	62
		Administrative Staff	7
		Technical/IT Staff	9

## Students:

PhD: 122 (CBME , BIEN)	MPhil: 29 (CBME, BIEN)
TPG: 123 (CBME, CEE, BEHI)	UG: 192 (CENG,CEEV, BIEN, SUSEE)





		Title	Research Interest
Minhua Shao		<ul style="list-style-type: none"> <li>• Head and Chair Professor</li> <li>• Cheong Ying Chan Professor of Energy Engineering and Environment</li> <li>• Director of HKUST Energy Institute</li> <li>• Program Director of MSc in Chemical and Energy Engineering</li> </ul>	<ul style="list-style-type: none"> <li>• Battery</li> <li>• Electrocatalysis</li> <li>• Electrochemical energy technologies</li> <li>• Electrochemistry</li> <li>• Fuel cell</li> </ul>
Henry H N Lam		<ul style="list-style-type: none"> <li>• Associate Head and Professor</li> <li>• Director of Center for Engineering Education Innovation</li> </ul>	<ul style="list-style-type: none"> <li>• Bioengineering</li> <li>• Bioinformatics</li> <li>• Mass spectrometry</li> <li>• Metabolomics</li> <li>• Microbiomes and microbial communities</li> <li>• Proteomics</li> </ul>
Furong Gao		<ul style="list-style-type: none"> <li>• Chair Professor</li> <li>• Director of Center for Polymer Processing and Systems</li> </ul>	<ul style="list-style-type: none"> <li>• Process modeling</li> <li>• Control and monitoring</li> <li>• Polymer processing</li> </ul>
Ying Chau		<ul style="list-style-type: none"> <li>• Professor</li> <li>• Director of Student Innovation for Global Health Technology</li> </ul>	<ul style="list-style-type: none"> <li>• Biomedical engineering (BME)</li> <li>• Drug delivery</li> <li>• Cancer</li> <li>• Tissue engineering</li> <li>• Biomaterials</li> <li>• Bioengineering</li> </ul>
Ping Gao		<ul style="list-style-type: none"> <li>• Professor</li> <li>• Associate Director of Center for Polymer Processing and Systems</li> </ul>	<ul style="list-style-type: none"> <li>• Polymer</li> <li>• Polyethylene</li> <li>• Nanocomposites</li> </ul>
I-Ming Hsing		<ul style="list-style-type: none"> <li>• Professor</li> <li>• Program Director of MSc in Biomolecular Engineering and Health Informatics</li> </ul>	<ul style="list-style-type: none"> <li>• Biosensors</li> <li>• Biomedical engineering (BME)</li> <li>• Microsystems</li> <li>• Bioengineering</li> <li>• Bioelectronics</li> </ul>
Xijun Hu		<ul style="list-style-type: none"> <li>• Professor</li> </ul>	<ul style="list-style-type: none"> <li>• Environmental catalysis and reaction</li> <li>• Nanomaterials</li> <li>• Adsorption engineering</li> </ul>
Zhengtang Luo		<ul style="list-style-type: none"> <li>• Professor</li> </ul>	<ul style="list-style-type: none"> <li>• Advanced materials</li> <li>• Graphene chemistry and physics</li> <li>• Functional polymer</li> </ul>
Yongli Mi		<ul style="list-style-type: none"> <li>• Professor</li> </ul>	<ul style="list-style-type: none"> <li>• Nanotechnology</li> <li>• Biotemplating preparation of nanomaterials</li> <li>• Polymer</li> <li>• Nanoparticles</li> <li>• Functional polymer</li> <li>• Bioengineering</li> </ul>
King Lun Yeung		<ul style="list-style-type: none"> <li>• Professor</li> <li>• Director of France-HKUST Innovation Hub</li> <li>• Co-Director of HKUST ENVF-INA/LMA Joint Laboratory on Environment</li> <li>• Associate Director of Environmental Central Facility</li> </ul>	<ul style="list-style-type: none"> <li>• Environmental pollution treatment</li> <li>• Nanoporous and nanostructured materials</li> <li>• Biomedical engineering (BME)</li> </ul>



## Faculty profile - Regular

		Title	Research Interest
Richard Lakerveld		<ul style="list-style-type: none"> <li>• Associate Professor</li> <li>• UG Programs Coordinator (Chemical and Biological Engineering)</li> </ul>	<ul style="list-style-type: none"> <li>• Process system engineering</li> <li>• Pharmaceutical manufacturing</li> <li>• Crystallization</li> <li>• Chemical process design and optimization</li> <li>• Process control</li> </ul>
Fei Sun		<ul style="list-style-type: none"> <li>• Associate Professor</li> <li>• PG Programs Coordinator (Chemical and Biological Engineering)</li> <li>• Program Director of Bioengineering Graduate Program</li> </ul>	<ul style="list-style-type: none"> <li>• Bioengineering</li> <li>• Biopolymers</li> <li>• Biomaterials</li> <li>• Advanced materials</li> </ul>
Jiguang Wang		<ul style="list-style-type: none"> <li>• Associate Professor</li> <li>• Padma Harilela Associate Professor of Life Science</li> <li>• Co-Director of Center for Evolution and Health</li> </ul>	<ul style="list-style-type: none"> <li>• Cancer genomics</li> <li>• Cancer</li> <li>• Bioinformatics</li> <li>• Bioengineering</li> </ul>
Yiwen Wang		<ul style="list-style-type: none"> <li>• Associate Professor</li> <li>• PG Programs Coordinator (Electronic and Computer Engineering)</li> </ul>	<ul style="list-style-type: none"> <li>• Brain machine interfaces</li> <li>• Adaptive signal processing</li> <li>• Computational neuroscience</li> <li>• Neuromorphic engineering</li> <li>• Bioengineering</li> </ul>
Angela R H Wu		<ul style="list-style-type: none"> <li>• Associate Professor</li> <li>• Associate Director of Center for Epigenomics Research</li> <li>• Associate Director of HKUST-MGI Joint Research Center</li> </ul>	<ul style="list-style-type: none"> <li>• Genomics</li> <li>• Cancer genomics</li> <li>• Systems biology</li> <li>• Microfluidics and nanofluidics</li> <li>• Single particle / molecule / cell studies</li> <li>• Bioengineering</li> </ul>
Yuan Yuan (Alvin) Zhou		<ul style="list-style-type: none"> <li>• Associate Professor</li> </ul>	<ul style="list-style-type: none"> <li>• Perovskite semiconductors and (opto) electronics</li> <li>• Multimodal characterization at high spatio-temporal resolution</li> <li>• High-throughput synthesis</li> <li>• Discovery of new semiconductors</li> <li>• Screening</li> </ul>
Hanyu Gao		<ul style="list-style-type: none"> <li>• Assistant Professor</li> </ul>	<ul style="list-style-type: none"> <li>• Chemical process design and optimization</li> <li>• Artificial intelligence</li> <li>• Polymer</li> <li>• Reactor engineering</li> </ul>
Yonseob Kim		<ul style="list-style-type: none"> <li>• Assistant Professor</li> </ul>	<ul style="list-style-type: none"> <li>• Advanced materials</li> <li>• Polymer</li> <li>• Nanoporous and nanostructured materials</li> <li>• Membrane technology</li> <li>• Electrochemical energy technologies</li> </ul>
Becki Y Kuang		<ul style="list-style-type: none"> <li>• Assistant Professor</li> </ul>	<ul style="list-style-type: none"> <li>• Synthetic biology</li> <li>• Biomaterials</li> <li>• Biomedical engineering (BME)</li> <li>• Bioengineering</li> </ul>
Yong Lai		<ul style="list-style-type: none"> <li>• Assistant Professor</li> </ul>	<ul style="list-style-type: none"> <li>• Synthetic biology</li> <li>• Microbiome engineering</li> <li>• Living therapeutics and diagnostics</li> <li>• Genome engineering</li> <li>• Functional metagenomics</li> <li>• Bioengineering</li> </ul>


## Faculty profile - Regular

		Title	Research Interest
		Hnin Yin Yin Nyein • Assistant Professor	<ul style="list-style-type: none"> <li>• Bioelectronics</li> <li>• Electrochemistry</li> <li>• Biosensors</li> <li>• Wearable devices</li> <li>• Material science</li> <li>• Bioengineering</li> </ul>
		Julie Semmelhack • Assistant Professor	<ul style="list-style-type: none"> <li>• Neurobiology and neurosciences</li> <li>• Neural circuit</li> <li>• Sensory neurobiology</li> <li>• Bioengineering</li> </ul>
		Terence T W Wong • Assistant Professor • Director of Center for Medical Imaging and Analysis	<ul style="list-style-type: none"> <li>• Biomedical engineering (BME)</li> <li>• Bioinstrumentation</li> <li>• Bioengineering</li> <li>• Medical imaging systems</li> <li>• Bioimaging</li> </ul>
		Danqing Zhu • Assistant Professor	<ul style="list-style-type: none"> <li>• Bioengineering</li> <li>• Neuroscience</li> <li>• Computational medicine and health informatics</li> <li>• Synthetic biology</li> <li>• Protein engineering</li> <li>• Biomaterials</li> </ul>

## Faculty profile - Teaching






		Marshal YS Liu • Senior Lecturer • Associate Professor of Engineering Education • Associate Director of Center for Engineering Education Innovation	<ul style="list-style-type: none"> <li>• Bioprocess engineering</li> <li>• Food Processing</li> <li>• Engineering education</li> </ul>
		Frank L Y Lam • Lecturer I • Associate Dean of Students • Assistant Professor of Engineering Education	<ul style="list-style-type: none"> <li>• Environmental pollution treatment</li> <li>• Nanotechnology</li> <li>• Catalysis</li> <li>• Electrocatalysis</li> </ul>

## Faculty profile - Research

		Quanhua Mu • Research Assistant Professor	<ul style="list-style-type: none"> <li>• Cancer</li> <li>• Genomics</li> <li>• Computational medicine and health informatics</li> <li>• Bioinformatics</li> </ul>
		Qinbai Yun • Research Assistant Professor	<ul style="list-style-type: none"> <li>• Advanced materials</li> <li>• Materials synthesis and characterization</li> <li>• Nanoporous and nanostructured materials</li> <li>• Electrocatalysis</li> <li>• Battery</li> </ul>



## Faculty profile - Emeritus

	Title	Research Interest
Chi Ming Chan	 <ul style="list-style-type: none"> <li>• Professor Emeritus</li> <li>• Adjunct Professor, Division of Integrative Systems and Design</li> </ul>	<ul style="list-style-type: none"> <li>• Surface and interface science</li> <li>• Polymer blends and alloys</li> <li>• Conductive composite polymers</li> <li>• Crosslinking of polymers</li> <li>• Adhesion phenomena</li> </ul>
Chi Wai Hui	 <ul style="list-style-type: none"> <li>• Professor Emeritus</li> </ul>	<ul style="list-style-type: none"> <li>• Energy conservation</li> <li>• Chemical process design and optimization</li> <li>• Production planning and scheduling</li> <li>• Site-modeling</li> <li>• Waste minimization</li> </ul>
Gordon McKay	 <ul style="list-style-type: none"> <li>• Professor Emeritus</li> </ul>	<ul style="list-style-type: none"> <li>• Wastewater treatment for dyes and metals using adsorption</li> <li>• Ions exchange and ozonation</li> <li>• Biopolymers from crab and prawn shells</li> <li>• Processing design</li> <li>• Ions dioxin removal</li> <li>• MSW processing</li> <li>• Production of new adsorbents</li> </ul>
Ka Ming Ng	 <ul style="list-style-type: none"> <li>• Professor Emeritus</li> </ul>	<ul style="list-style-type: none"> <li>• Development of processes with multiphase reactions</li> <li>• Separation and purification using extraction and crystallization</li> <li>• Solids processing</li> <li>• Applications in manufacture of pharmaceuticals and specialty chemicals</li> </ul>
Po Lock Yue	 <ul style="list-style-type: none"> <li>• Professor Emeritus</li> </ul>	<ul style="list-style-type: none"> <li>• Detoxification of hazardous waste and wastewater</li> <li>• Advanced oxidation and membrane separation</li> <li>• Waste minimization</li> <li>• Novel reactor engineering and applied catalysis</li> <li>• Artificial intelligence</li> </ul>

## Distinguished Visiting Professor

## Prof. Ben Zhong Tang

Prof. Tang received BS and PhD degrees from South China University of Technology and Kyoto University in 1982 and 1988, respectively. He conducted postdoctoral research at the University of Toronto in 1989–1994. He joined the Hong Kong University of Science & Technology in 1994 and was promoted to Chair Professor in 2008. He was elected to the Chinese Academy of Sciences in 2009, the Asia Pacific Academy of Materials in 2017 and the World Academy of Sciences for the Advancement of Science in Developing Countries in 2020. In 2021, he joined the Chinese University of Hong Kong, Shenzhen, as Dean of the School of Science and Engineering, with a concurrent appointment of X.Q. Deng Presidential Chair Professor.

Prof. Tang has published >2,000 scientific papers, which have been cited by peers >180,000 times. His h-index is 187. He has delivered >500 invited talks at international conferences and has been granted >100 patents. He is currently serving as Editor-in-Chief of *Aggregate* published by Wiley, and is sitting in the editorial boards of >20 international scientific journals.



Mainly engaged in materials science, macromolecular chemistry and biomedical theranostics. He coined the concept of aggregation-induced emission (AIE), and his labs are spearheading the AIE research in the world.

Prof. Tang has been listed as a Highly Cited Researcher in both areas of *Chemistry* and *Materials Science* since 2014. He received a series of awards, scholarships and honors, such as Croucher Senior Research Fellowship Award in 2007, MACRO Lecture Award (American Chemical Society) in 2012, Khwarizmi International Award (Iranian Research Organization for Science and Technology) in 2014, Honorary Citizen of Guangzhou City in 2015, National Natural Science Award (1<sup>st</sup> Class) in 2017, Scientific and Technological Progress Award (Ho Leung Ho Lee Foundation) in 2017, *Nano Today* Award in 2021, and *Biomaterials Global Impact* Award in 2023.



## New Faculty Aboard in 2023



### Prof. Yong Lai

Prof. Yong Lai has completed postdoctoral studies at the Synthetic Biology Center and Research Laboratory of Electronics at MIT, where he worked on genome editing and genetic circuit design. He received his Ph.D. from the University of Hong Kong, studying polymicrobial interactions mediated by secondary metabolites. His research focuses on leveraging synthetic biology to study digestive diseases and gut microbiota. His lab is developing genetic tools for non-model bacterial cells in the human gut, enabling investigations into fundamental questions and microbiome engineering.

Recently, Prof. Lai has been featured and shared his insights on the Synthetic Biology industry in Hong Kong and the Greater Bay Area (GBA), highlighting its competitive and attractive aspects. He reveals that the local government has recognized the significance of biotechnology, and there is robust support from the central government to transform Hong Kong into an international innovation and technology hub. In addition, the Hong Kong Stock Exchange has also revised its listing rules for biotech companies, allowing even those without revenue or profit to find a home on the HKEX. Prof. Lai further suggests that despite the current 'capital winter' caused by the recent increase in U.S. interest rates, he anticipates the biotechnology industry, driven by innovation, to swiftly rebound in the near future.



### Prof. Hnin Yin Yin Nyein

Specializing in the field of bioengineering, Prof. Hnin Yin Yin Nyein completed her bachelor's degree with top honor and PhD in Materials Science and Engineering at the University of California, Berkeley, before joining Stanford University as a postdoctoral fellow. Her exceptional work in the field of wearables has earned her recognition, including the prestigious Innovators Under 35 Asia Pacific 2021 Award from MIT Technology Review.

Prof. Nyein's primary research lies in the interface of materials science and bioengineering, with a particular interest to develop wearable bioelectronics for personalized and remote healthcare. Her groundbreaking research includes the development of a cutting-edge wearable device that utilizes resting sweat as a constant biofluid source for assessing health metrics non-invasively. Her technology enables investigations of stress, metabolic conditions, and potentially neurological afflictions at the molecular level. Ultimately, Prof. Nyein envisions the application of wearables to various domains with the aim of tackling current diagnostic shortcomings for decentralized settings.



### Prof. Yuanyuan (Alvin) Zhou

Prof. Yuanyuan Zhou has joined HKUST as part of the university's "30 for 30" talent acquisition campaign. Prof. Zhou brings a wealth of expertise in the field of Advanced Materials, Data Science, and Energy and Environment. His current research interests are at the forefront of semiconductor science, which include but are not limited to perovskite semiconductors and optoelectronics, multimodal characterization at high spatio-temporal resolution, and high-throughput synthesis/discovery of new semiconductors.

Prof. Zhou's academic journey includes a B.S. degree from Xi'an Jiaotong University and a Ph.D. degree from Brown University. Before joining HKUST, he was a "Talent100" Assistant Professor in the Department of Physics at Hong Kong Baptist University. Prof. Zhou has authored or co-authored over 100 papers, including publications in renowned journals such as Nature Energy, Nature Communications, Joule, Chem, and Matter. His research program on perovskite semiconductors was showcased as one of the selected innovation projects at InnoTech 2023 for celebrating the 25<sup>th</sup> Anniversary of the HKSAR Establishment.

Not only has Prof. Zhou received numerous prestigious awards and honors, including the China's NSFC Excellent Young Scientists Fund and the China Rising Stars in Science and Technology Award (by China Association of Science & Technology), but he has also been consistently recognized as one of the World's Top 2% Scientists by Stanford University's List. He has recently been featured by the RSC Nanoscale Emerging Investigators and Wiley-VCH Advanced Materials Rising Stars. Prof. Zhou actively contributes to the academic community as an Associate Editor of the Journal of Energy Chemistry and an Advisory Board Member of Device (Cell Press). In addition to his research commitments, Prof. Zhou is dedicated to teaching, mentoring young professionals, and engaging in STEM outreach services.



### Prof. Bonnie Zhu

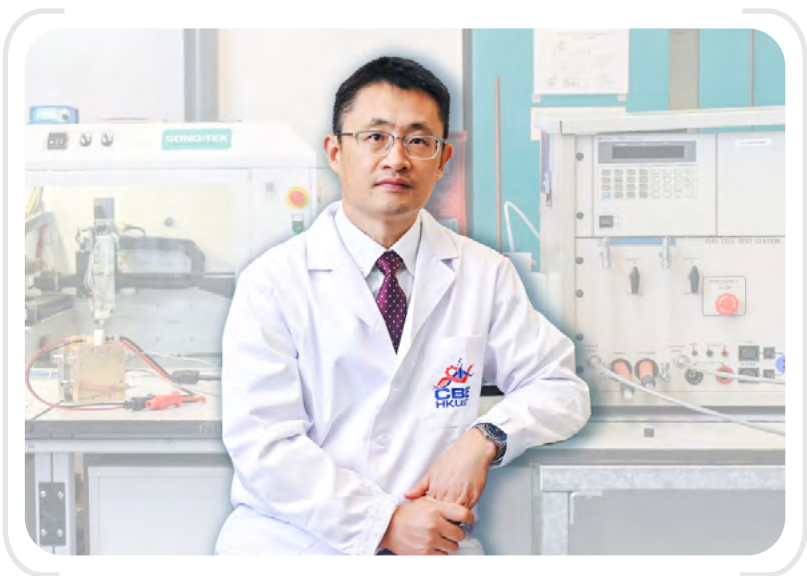
Prof. Bonnie Zhu joined the Department of Chemical and Biological Engineering (CBE) as an Assistant Professor in Spring 2023. Prof. Zhu completed her Ph.D. at Stanford University in Bioengineering, supervised by Prof. Fan Yang and Prof. Sarah Heilshorn. Her research employs materials chemistry, protein engineering, and stem cell approaches to develop models of tissue development that capture the dynamic complexity of cell-extracellular matrix interactions. She then continued her training as Siebel Scholar and CIRM Postdoctoral Fellow at UC Berkeley and UCSF. Her work focuses on using protein engineering and computational approaches to engineer safe and targeted therapeutic gene delivery vectors for treatment of neurological diseases.

Over the past decade, gene and cell therapy has become increasingly successful in clinics as a means of delivering genetic material (i.e., DNA) or reprogrammed cells to a patient for therapeutic benefit. Prof. Zhu and her group aim to engineer novel 'carriers' for delivery using a combination of protein engineering approaches and machine learning. These 'carriers' will be designed to target specific cell types and perform desirable functions, offering a next-generation delivery system for therapeutic applications in many diseases. The extension of these new technologies will have broad utility and potential for developing future treatments.

## Named professorship

### Professor **Minhua Shao**

#### Cheong Ying Chan Professorship in Energy Engineering and Environment



As technology advances and concerns about sustainability become more pressing, researchers worldwide are seeking new ways to tackle the energy- and environment-related challenges facing modern society. Some of the most promising practical applications come from materials science and electrochemistry — the main fields of expertise of Professor Minhua Shao, HKUST's appointed Cheong Ying Chan Professor of Energy Engineering and Environment.

Serving as Head & Chair Professor of HKUST's Department of Chemical and Biological Engineering and Director of the HKUST Energy Institute, Professor Shao is an internationally recognized scholar with a 20-year track record of spearheading research on electrochemical systems, nanomaterials, and electric vehicles. As such, he is the ideal recipient of the Cheong Ying Chan Named Professorship, which was created to support the University's mission of fostering breakthroughs in science and engineering that ultimately lead to the betterment of humankind.

Electrochemical energy conversion and storage represent a major area of innovation by Professor Shao and his group. He is currently leading projects on the development of high-performance and long-life hydrogen fuel cells and high-energy density solid-state lithium batteries, among other innovative directions, which are supported by major local and national funding bodies. The research team led by Prof. Shao, found a new formula which not only could cut down the proportion of platinum used by 80%, but also set a record in terms of the cell's durability level. Such research holds great promise for advanced

sustainability applications, ushering in the next generation of environmentally friendly energy devices.

After graduating in 2006 from the State University of New York at Stony Brook with a Ph.D. in Materials Science and Engineering, Professor Shao took up prominent industry positions, honing his applied skills in advanced nanomaterials and electric vehicle development at UTC Power and Ford Motor Company. He joined HKUST in 2014 as Associate Professor of Chemical and Biological Engineering, rising rapidly through the University's ranks and taking over the directorship of the HKUST Energy Institute in 2021.

In the last 20 years, Professor Shao has published over 240 peer-reviewed articles and filed over 30 patent applications (19 issued). As well as holding key editorial posts for prestigious journals, he has received myriad honors and awards in recognition of his achievements, including the International Outstanding Young Chemical Engineer Award (2022) and the Teaching Excellence Appreciation Award of the HKUST School of Engineering (2017). He is one of the founding members of the Hong Kong Young Academy of Sciences and was awarded the status of UTC Technical Fellow for his outstanding technical contributions and strategic leadership and mentoring skills.

The University is delighted to further recognize the accomplishments of this exceptional scientist by appointing him Named Professor.





## RGC Research Fellow

Prof. Fei Sun, an Associate Professor at the Department of Chemical and Biological Engineering at HKUST, has been awarded the RGC Research Fellow Award 2023 for his groundbreaking research in the development of smart materials and optogenetic tools through the combined use of synthetic biology and protein engineering. His innovative approach has enabled the faithful transfer of functions from the molecular level to the macroscopic material level and led to the discovery of emergent properties in out-of-equilibrium complex systems.

Prof. Sun's research group at HKUST has been dedicated to creating functional "living" materials – synthetic materials that possess the hallmark features of life, including growth, self-healing, stimuli-responsiveness, and capability of Darwinian evolution. By adopting the materials synthetic biology approach, Prof. Sun's team aims to create smart material scaffolds and superselective growth factors for neuroregeneration<sup>1</sup>. His research has a significant impact on synthetic biology, regenerative medicine, and chemical engineering, from the aspects of both academic breakthroughs and commercial applications.

## RGC Research Fellow Scheme

### Objective of the Award

The RGC Research Fellow Scheme (RFS) aims to provide sustained research support integrated with relief from teaching and administrative duties for outstanding researchers at Associate Professor rank at UGC-funded universities in Hong Kong, with a view to facilitating academics to dedicate their career to research and development as well as to give them the time and resources to nurture and train the next generation of local research talent for Hong Kong. RFS provides ten awards in each round of the yearly exercise.

### Award Amount

Around HK\$5.3 million per award over a period of 60 months.

<https://awards.ugc.edu.hk/award/rgc-research-fellow-scheme>



## Faculty Achievement

### Revolutionizing Cancer Research: Prof. Angela Wu's scONE-seq Unveils Hidden Tumor Cell 'Spies' and Paves the Way for Targeted Therapies"

Prof. Angela Wu's research group has developed scONE-seq, a versatile single-cell multi-omic profiling technology compatible with frozen tissue samples that enables simultaneous sequencing of genomic DNA and RNA within the same cell. In their study on gliomas, scONE-seq revealed hidden heterogeneity by identifying a rare tumor cell subpopulation resembling normal astrocytes, which cannot be detected using single-cell RNA-seq alone. This breakthrough has significant implications for understanding cancer and discovering drug targets, as it allows for the identification of rare tumor cells that can only be found using their new multi-omicron approach, which potentially leads to improved therapy response.

The study is now published in Science Advances, and was led by Prof. Angela Wu and Dr. Lei Yu in her research group, with collaborations from Prof. Jiguang Wang and his team, as well as clinician scientists Dr. Danny Chan, Dr. Aden Chen, Dr. Ho Keung Ng, and Dr. Wai Sang Poon at The Chinese University of Hong Kong/Prince of Wales Hospital.

For more information, please visit "[scONE-seq: A single-cell multi-omics method enables simultaneous dissection of phenotype and genotype heterogeneity from frozen tumors](https://science.org/science/article/doi/10.1126/science.1258888)" on science.org.



### Prof. Ying Chau featured in "Women in Materials Science collection" by RSC

Prof. Ying Chau has been featured as one of the leading female scientists in Materials Science by the Royal Society of Chemistry.

Her work is showcased in the web collection 'Celebrating International Women's Day: Women in Materials Science,' which features excellent publications led by female researchers across Materials Horizons, Journal of Materials Chemistry A, B, C, and Materials Advances.

Prof. Chau's inclusion in the collection not only demonstrates the recognition of exceptional women scientists' contributions in the field but also inspires future generations of researchers, fostering a more inclusive and diverse scientific community.

For more information, please visit: [Celebrating International Women's Day: Women in Materials Science Home \(rsc.org\)](https://www.rsc.org/celebrating-international-womens-day/women-in-materials-science)



### Prof. David Hui Awarded Professor Emeritus title

Professor David Chi Wai Hui has been honored the title of Professor Emeritus in recognition of his valuable contributions to the students and the Department at HKUST.

Having been with the institution since August 1997, he retired on 1 July 2023, after 26 years of relentless commitment and devotion to the school. He is one of the leading faculty members who have brought industry experiences to impact our chemical engineering education and research programs.







## Three Professors from CBE were awarded at the 48th International Exhibition of Inventions Geneva

The Hong Kong University of Science and Technology (HKUST) achieved remarkable success at the 48th International Exhibition of Inventions Geneva.

Prof. Ying Chau and her team were awarded the Gold Medal with Congratulations of the Jury for their research on "Advanced Polymer Therapeutics for Chronic Diseases" and the Gold Medal for their research on "AimGel- Platform for Activation and Expansion of Diverse Immune Cells".

Prof. Terence Wong and his team were awarded the Gold Medal for their research on "Label-free Histological Imaging Method and System".

Lastly, Prof. King Lun Yeung and his team were awarded the Silver Medal for their research on "Algicidal Hydrogel to Inhibit Algal Growth without Adverse Effects on Aquatic Organisms" and the Bronze Medal for their research on "HiNW as a Light Disinfection Technology for Rapid Microbial Disinfection at Low Energy Consumption".

For more details of their inventions, please visit ["HKUST Projects in the 48th Geneva International Exhibition of Invention"](#).



## No More "Take Two" in Lung Cancer Surgeries

Prof. Terence Wong Tsz-Wai, the principal investigator and his research team from HKUST have developed a cutting-edge microscope that can accurately detect remaining cancer cells in just three minutes, offering hope to lung cancer patients who may require a second surgery. Leveraging artificial intelligence, this innovative technology help doctors make near real-time judgments during surgery while sparing patients from unnecessary ordeal. The microscope's accuracy and speed make it a potential game-changer in cancer treatment, with applications beyond lung cancer.



The research team is conducting large-scale clinical trials, and the microscope is expected to be implemented in hospitals from 2024 onwards. With HKUST's support, the success of this technology has led to the establishment of a start-up called PhoMedics, aiming to translate research into applications in hospitals and clinics.

In 2020, the company was acclaimed with the Gold Award at the HKUST-Sino One Million Dollar Entrepreneurship Competition, and selected as the winner of the Innovation Nanshan Entrepreneurship Star Contest's foreign channel, one of the largest start-up competitions in Shenzhen. This year, it was further applauded in the international science arena by winning a gold medal at the 48th International Exhibition of Inventions Geneva.

Video on ["CHAMPion of Cancer Imaging: One-time Tumor Removal"](#)





# Research

## Research Achievements

### CBE Research Impact Cases

CBE has four major areas of research: Advanced Materials, Bioengineering, Data Science and Process System Engineering, and Energy and Environment. During 2017 - February 2023, CBE received more than **HK\$250 million** in total research funding for around **310 research projects**.

The University Grant Committee (UGC) organizes the Research Assessment Exercise (RAE) to promote world-class research and drive excellence through a comprehensive peer review using international benchmarks. Since RAE 2020, UGC has introduced additional assessment elements in research impact and research environment to encourage research of broader social relevance with economic and social benefits.

In RAE 2020, most of CBE's research output and impact have been ranked as either world-leading or internationally famous. For the coming RAE 2026, CBE has chosen three impact cases to highlight our excellence in transferring research to innovative solutions and bringing substantial changes to people's lives.

### Synthetic biology approaches toward materials design and regenerative medicine

Professor Fei Sun has pioneered the use of synthetic biology and protein engineering to create bioactive materials at HKUST. This approach has resulted in the establishment of new optogenetic tools for biological regulation, as well as the conceptualization of genetically encoded click chemistries for assembling proteins and living cells into high-order structures, while avoiding chemical modification. The resulting materials have shown the potential to promote axon regeneration in adult central nervous system, a long-standing challenge facing regenerative medicine. The studies have been published in a number of peer-reviewed articles in prestigious journals and have resulted in international collaborations, patents, commercial products, and startups.



### Near Real-time Cancer Imaging with CHAMP Microscopy

Histopathology is the diagnosis and study of diseases of biological tissues, which provides crucial information that enables doctors to formulate an optimal treatment for patients. However, the two existing approaches that obtain histological images compromise speed and accuracy. Computational high-throughput autofluorescence microscopy by pattern illumination (CHAMP) was developed as a versatile solution for various clinical scenarios by Professor Terence Wong. Its rapid, high-quality, and label-free on-the-spot imaging capability sets a new benchmark for clinical standards. The immense possibilities enabled by CHAMP give rise to a startup company called PhoMedics Limited, dedicated to applying this CHAMP technology to the medical community for better patient care.



### Translation of biomaterial and drug delivery research for Hong Kong's knowledge based economy

Professor Ying Chau's research uses biomaterial and drug delivery approaches to address unmet health care needs of the society. She has mentored students and postdocs from her lab on entrepreneurship and led to three award-winning spin-off companies in Hong Kong and Shenzhen: 1) Pleryon Therapeutics; 2) Opharmic Technology; and 3) Allegrow Biotech. Pleryon develops polymer technology for more effective long-term treatment of chronic diseases affecting the aging society. Opharmic uses ultrasound technology for non-invasive delivery of drug molecules to a wide range of eye diseases. Allegrow's artificial cell platform overcomes the bottlenecks of cell production and accelerates next-generation immune-cell therapy. Collectively, the companies have raised more than HKD 100M from investors to develop products for worldwide markets, including China, US, Europe and Japan. The locally grown start-ups contribute to the development of Hong Kong's knowledge-based economy, providing career opportunities for local graduates and attracting overseas talents.



## Big grants

**Prof. King Lun Yeung** Awarded Mid-stream, Theme-based Research Schemes from Innovation and Technology Fund

Prof. King Lun Yeung, Professor of the Department of Chemical and Biological Engineering, has received HK\$6.2 million of funding from the Innovation and Technology Fund (ITF) 's Mid-stream, Theme-based Research Schemes for a project entitled "Engineered Nanostructured Surfaces for Enhanced Moisture Condensation and Removal." With funding awarded under the theme "Green Engineering Technologies," the project is a broad collaboration involving HKUST, Max Planck Institute for Polymer Research, Wuhan University, and industries to tackle the vital issue of water vapor condensation in air conditioning, heat exchangers, and power generation.

Air conditioning and dehumidification systems are major energy consumers, accounting for 2000 TWh or 9.3% of the world's electricity, and are responsible for an estimated 0.5°C increase in global temperature. In Hong Kong, air conditioning and dehumidification consume around one-third of the generated electricity (1400 GWh) and emit 9 million tons of CO<sub>2</sub> annually. Over the years, electricity usage for air conditioning and dehumidification has been steadily increasing at a rate of 1.5% per year in the Asian region, and this trend is expected to worsen with global warming.

In response to these challenges, the "Engineered Nanostructured Surfaces for Enhanced Moisture Condensation and Removal" project aims to boost the air conditioner's seasonal energy efficiency ratio using the novel NanoDew/h-NanoSurface technologies on evaporator cooling fins by increasing the energy factor for moisture removal while maintaining a high fin heat transfer rate. Moreover, the technologies will support self-cleaning functionality against air pollutants and provide antimicrobial properties to keep the cooled air free of microbes. Ultimately, their implementation will contribute towards energy efficiency, decarbonization, and sustainability.



**Prof. Yuanyuan (Alvin) Zhou** was awarded HK\$3.6 million by NSFC-RGC Collaborative Research Scheme (CRS) for his project "Multi-elemental Lone-electron-pair Cations Based Pb-free Perovskite Optoelectronics: from Materials design, Synthesis to High-performance Devices." Only three projects in the area of "New Materials Science" across the entire Hong Kong have been funded under this scheme. In this four-year project, Prof. Zhou's team aims to combine the theoretical and experimental approaches and to artificial intelligence to develop new perovskite semiconductors without the involvement of toxic Pb for optoelectronic applications such as photovoltaics and light-emitting diodes.

Perovskite solar cells (PSCs) have emerged as a promising photovoltaic technology for integration into the future urban environment to power buildings and internet of things (IoT) devices. However, state-of-the-art PSCs contain toxic Pb, restricting the commercialization, while as-reported Pb-free PSCs suffer from the performance and stability issues due to the intrinsic materials shortcomings. This project proposes a multi-elemental strategy to design novel Pb-free perovskites based on lone-electron-pair cations for stable, efficient Pb-free PSCs and optoelectronics.

The field has been searching for Pb-free perovskite alternatives. As of now, potentially less toxic metal cations, including Sn, Ge, Ti, Bi, Sb, etc., have been used as Pb substitutes in perovskites, respectively. Amongst these options, Sn perovskite demonstrates the highest promise, but it still suffers from the high sensitivity to oxygen. Vast efforts have been devoted to modifying Sn perovskites, and other single- or dual-cation Pb-free perovskites. But the advancements so far have not brought sufficient excitement, calling for the re-design, exploration, and discovery of a new Pb-free perovskite system from a different perspective.

Therefore, Prof. Zhou proposes to examine and discover new promising candidates amongst the multi-elemental Pb-free perovskites, because the multi-elemental strategy largely expands the chemical space for structural and property explorations, and meanwhile, the syngenetic effects of tailoring structural factors (tolerance factor, octahedral factor), alloying ratio, and electronic dimensionality can possibly create new materials states. Prof. Zhou expect, by leveraging the strong existing research and collaboration foundations, as well as considering the vast space amongst the proposed multi-elemental Pb-free perovskite system, these project outcomes will impart impacts not only for developing high-performance devices for real-world applications, but also for unravelling new semiconductor sciences.



# Education

## Undergraduate programs

**EMBRACE CHANGE**  
IN THE CENTURY OF  
**ENGINEERING**  
掌握變革 · 擁抱工程世紀

### What is Chemical & Biological Engineering (CBE)?

Chemical and biological engineers combine knowledge of physical, material and biological sciences to develop and commercialize new products and processes in a cost-effective, sustainable and safe manner. Unique among engineers, we understand and can manipulate nature at the molecular level, yet know how to integrate and control city-sized complex systems like oil refineries. Our expertise is greatly sought after to solve all of mankind's most pressing problems, including energy crisis, environmental pollution, climate change, water scarcity, aging population and rising cost of healthcare.



#### HEALTH

- Pharmaceuticals
- Medical devices
- Regenerative medicine
- Food and drug safety
- Digital and wearable health
- Big health data

#### ENERGY

- Renewable energy
- Next-generation fossil fuels
- Batteries and fuel cells
- Carbon capture and storage
- Energy-efficient systems

#### ENVIRONMENT

- Green materials and processes
- Waste management
- Pollution remediation
- Water and air purification
- Environmental impact assessment



## CHEMICAL AND BIOLOGICAL ENGINEERING

### Broad & flexible curriculum for whole-person development

We offer four comprehensive, globally recognized degree programs to cater to students' career aspirations:

- BEng in Chemical Engineering
- BEng in Chemical and Environmental Engineering
- BEng in Sustainable Energy Engineering
- BEng in Bioengineering

### Unique features of our programs include:

- Solid foundation in the math and sciences, particularly the **molecular sciences**
- Practical training in **engineering process and product design**
- Ample opportunities to pursue research, including **overseas research exchange**
- **Internships and co-op opportunities** integrated into the curriculum
- Emphasis on **transferable skills** such as communication, teamwork, project management, design thinking, and data analytics

### Inter-disciplinary training for innovation

Technological innovations often happen at the boundaries between disciplines and when scientists and engineers work together. Chemical and biological engineers combine an engineer's quantitative skills with the strongest training in the basic sciences among all engineering disciplines. Our students and graduates are active in scientific and industrial research spanning many exciting fields such as nanotechnology, renewable energy, waste management, and regenerative medicine. The department places an increasing emphasis to train our students on data analytics, so that they can be well positioned in the era of AI to solve problems using large data sets.



A new anti-microbial coating has been developed to kill a range of bacteria and viruses - including the Omicron variant - on different materials and surfaces and can last at least five years. The team has improved the formula of the antimicrobial coating MAP-1, launched at the onslaught of the Covid-19 pandemic in early 2020, pushing the coating's durability from 3 months to 5 years.

### Did you know that ?



We are the **only** chemical engineering department in Hong Kong



We are ranked **40th worldwide** and 3<sup>rd</sup> in Greater China in 2022 (QS, Chemical Engineering Subject)



Our student population is the most **gender-balanced** among all engineering departments

### Versatility for a 21st Century Career



CBE alumnus Dr Langston Suen won the Innovation Award from the Institution of Engineering and Technology in 2017



Summer internship at the coal gasification plant owned by Towngas



Our versatile graduates are employed across a broad spectrum of industries. They build and operate large-scale factories to manufacture chemicals, process food, generate power, and produce medicines. They research and invent new smart materials, new drugs and medical devices, new zero-emission processes. They act as environmental consultants in new projects to reduce their environmental impact. They become policy makers in governments, executives in large corporations, and financial analysts in banks, where they can apply their broad scientific knowledge and engineering skills, important for decision making in a technology-driven world.

### EXAMPLES OF GRADUATE SCHOOL DESTINATIONS OF OUR GRADUATES IN PAST 5 YEARS:

MIT, Stanford, Cambridge, ETH Zurich, UC Berkeley, Michigan, Wisconsin, Columbia, U Penn, HKUST

### EXAMPLES OF EMPLOYERS OF OUR GRADUATES IN PAST 5 YEARS:

HK & China Gas, China Light & Power, BASF, Arup, Caltex, Atal Engineering, AECOM, Procter and Gamble, Fortune Pharmacal, Green Island Cement, ASB Biodiesel, BNP Paribas, Standard Chartered, Cathay Pacific, HKSAR Government

# Undergraduate programs

**EMBRACE CHANGE**  
IN THE CENTURY OF  
**ENGINEERING**  
掌握變革 · 擁抱工程世紀

## SUSTAINABLE ENERGY ENGINEERING PROGRAM

### What is Sustainable Energy Engineering Program (SUSEE)?

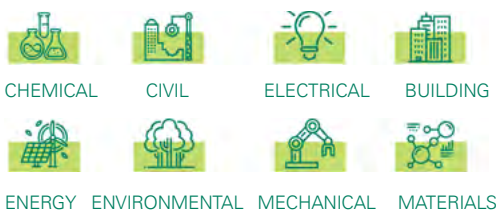
Energy poses some of the greatest challenges of our time, from meeting growing demand for clean renewable energy to minimizing environmental impact of its production. This Program aims to develop leading professionals who can **design and implement energy systems to respond to expanding global environmental and energy needs.**

### What Will You Learn In The SUSEE Program?

This interdepartmental program focuses on both traditional and renewable energy technologies, and provides a strong multidisciplinary curriculum in energy engineering.

### Why SUSEE Program?

Exposure to multiple engineering disciplines:



- Good balance of engineering knowledge and professional skill development
- Focus on both traditional and renewable energy technologies
- General understanding of energy conversion and storage, and specialization in solar energy, wind and hydropower, batteries and fuel cells
- Understanding of environmental assessment, policy and management

### Enrichment Highlights

#### SUSEE Lab Course

Specially designed and co-offered by four engineering departments

#### Capstone Projects

- Practical engineering projects to integrate knowledge and applications
- Opportunities to involve in industry-sponsored large projects

#### Training for Professional Qualifications

The program will be accredited by the Hong Kong Institution of Engineers (HKIE). Great chance to participate in research projects, field trips, internships, and industrial training

### Inter-disciplinary Program

Managed by  
Department of Chemical and Biological Engineering

Supported by  
Department of Civil and Environmental Engineering  
Department of Electronic and Computer Engineering  
Department of Mechanical and Aerospace Engineering  
HKUST Energy Institute



### Career Prospects

Potential employers include the government, power generation companies, automotive manufacturers, battery companies, and more.



# Research Postgraduate programs

## Master of Philosophy and Doctor of Philosophy Programs in Bioengineering

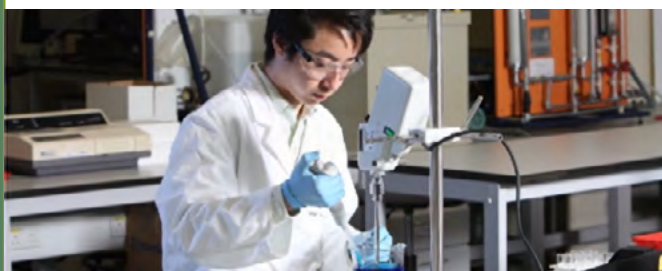


The Master of Philosophy (MPhil) and Doctor of Philosophy (PhD) Programs in Bioengineering facilitate the close integration of biological, physical, and computational sciences and engineering in the study of biological processes. The programs adopt a systematic and quantitative approach to the study of biological systems. The aim is to provide students with the necessary knowledge to contribute to the biomedical industry as well as to optimize existing bioprocesses, and to develop new biomedical technologies. The Programs are managed by the Department of Chemical and Biological Engineering.

A candidate for an MPhil degree is expected to demonstrate knowledge in the discipline and to synthesize and create new knowledge, making a contribution to the field.

A candidate for a PhD degree is expected to demonstrate mastery of knowledge in the chosen discipline and to synthesize and create new knowledge, making an original and substantial contribution to the discipline.

## Master of Philosophy and Doctor of Philosophy Programs in Chemical and Biomolecular Engineering



The Master of Philosophy (MPhil) Program aims to strengthen students' fundamental knowledge of Chemical Engineering, with specialization in the areas of chemical processing, materials, environment, energy and bioengineering. Students will be exposed to relevant issues involved in the scientific research, technology development and commercial applications in the field. A candidate for an MPhil degree is expected to demonstrate knowledge in the discipline and to synthesize and create new knowledge, making a contribution to the field.

The Doctor of Philosophy (PhD) Program aims to instill in students the skills needed to identify research issues in Chemical Engineering, formulate an original research plan, and develop creative and innovative solutions that address the research issue. A candidate for a PhD degree is expected to demonstrate mastery of knowledge in the chosen discipline and to synthesize and create new knowledge, making an original and substantial contribution to the discipline.



## Taught Postgraduate programs



### Master of Science Program in Biomolecular Engineering and Health Informatics (MSc BEHI)

#### Program Objective

Biomolecular engineering involves molecular-level design and engineering of nature derived and artificial materials and devices for applications in areas such as drug delivery, therapeutics, biosensing, point-of-care diagnostics, synthetic and systems biology, and omics technology. Health informatics combines skills from mathematics, data sciences, and computer science to acquire, process, and analyze health-related data for optimal decision making. The program integrates biomolecular engineering and health informatics so that students will be uniquely prepared for career opportunities in these fields.

#### Career Prospect

Upon completion of this program, graduates may find jobs in local and regional industries in pharmaceuticals, biomedical devices, diagnostics, biotechnology, and healthcare in general. Furthermore, the program stimulates curiosity and interest in emerging fields, which provide a foundation to continue with postgraduate programs or entrepreneurship.



### Master of Science Program in Chemical and Energy Engineering (MSc CEE)

#### Program Objective

The backbone of this program is made up of energy, environment and nanotechnology, three of the key areas of chemical engineering for which HKUST has built its global reputation.

Moreover, the program enables students to hone their understanding of and expertise in product development, material sciences, energy conversion and utilization, renewable energies, power generation, carbon neutrality, and sustainable development.

#### Career Prospect

Upon completion of this program, graduates could continue with postgraduate programs or work in chemical firms, electric vehicle manufacturers, renewable energy companies, etc.

# Departmental Academic Events

## 30 Years of Excellence

Department of Chemical and Biological Engineering Celebrated its **30th Anniversary**



» The Department of Chemical and Biological Engineering hosted the “CBE 30<sup>th</sup> Anniversary Conference: Future Research and Education in Chemical and Biological Engineering” during June 12-14, as a major event of the department’s 30<sup>th</sup> anniversary celebration.

The Department of Chemical and Biological Engineering (CBE) of the Hong Kong University of Science and Technology (HKUST) commemorated its 30<sup>th</sup> anniversary by hosting a three-day international conference and a Welcoming cum Alumni Homecoming Dinner in June, drawing more than 200 participants in each event.

Centering on the theme of “Future Research and Education in Chemical and Biological Engineering”, the CBE 30<sup>th</sup> Anniversary Conference held on June 12-14 at the HKUST Shaw Auditorium brought together world-renowned experts in chemical and biological engineering, faculty, students and alumni. The conference was kick-started by a gala in the morning of the first day, where HKUST President Prof. Nancy Ip and Provost Prof. Yike Guo delivered congratulatory speeches and CBE Department Head Prof. I-Ming Hsing gave welcoming remarks.

“**The conference aims to facilitate collaboration by connecting students, faculty, alumni, and industrial participants to the local, Greater Bay Area, and international community. In addition, this conference represents a symbolic milestone as we unveil the exciting opening of our Guangzhou campus. This expansion displays our relentless efforts to contribute to the development of sustainability, energy, healthcare, and more to our community, and the rest of the world**,” said Prof. Hsing in his remarks.

The three-day program featured a total of 44 talks, including five plenary presentations and 15 keynote invited talks, by prominent academics from leading institutions in Australia, Germany, Hong Kong, Japan, Korea, Mainland China, Singapore, Taiwan, United Kingdom and United States. The talks centered on five themes: sustainable energy and advanced materials; smart biosensors and bioimaging; data science in chemical and biological engineering; synthetic biology and biomolecular engineering; and advanced manufacturing and processing.

In the plenary sessions, HKUST Provost **Prof. Yike Guo**, also Chair Professor of Computer Science and Engineering, spoke on “An AI-based CBE: From a Computing Scientist Perspective”; **Prof. Jay Lee**, Choong Hoon Cho Chair and Professor of the Mork Family Department of Chemical Engineering and Materials Science at the University of Southern California, addressed “Role of Process Systems Engineering in Decarbonization and Energy Transition”; **Prof. Bin Liu**, Deputy President (Research and Technology) at the National University of Singapore, shared her insights on “Accelerating Biomedical Research through AI/Egen Innovation”; **Prof. Youqing Shen**, Dean of the College of Chemical and Biological Engineering at Zhejiang University, discussed “Anticancer Nanomedicine: Rational Design and Clinical Translation”; and CBE departmental faculty **Prof. King-Lun Yeung** gave a presentation on “Smart



Technologies for a Sustainable and Healthier Living Environment”

The Welcoming cum Alumni Homecoming Dinner, held on the first evening of the conference on June 12, enabled guests, faculty, and alumni to reminisce about past times, establish new bonds, and look forward to the achievements ahead. The joyous occasion was addressed by the Dean of Engineering Prof. Hong K. Lo and Department Head Prof. I-Ming Hsing. Talented students from the CBE Department, Department of Computer Science and Engineering, Department of Electronic and Computer Engineering, and Division of Emerging Interdisciplinary Areas entertained the audience with performances of trombone, piano, violin, vocal ensemble, and even yo-yo.

Established in 1993 – two years after HKUST’s

founding – as the Department of Chemical Engineering, the Department of Chemical and Biological Engineering has been instrumental in advancing knowledge in chemical, biological, environmental and energy engineering, and has played a crucial role in training the next generation of engineers and researchers. Its founding mission 30 years ago is just as relevant now, 30 years later.

The 30<sup>th</sup> anniversary celebrations not only honor the past achievements of the department, but also testify to its bright future. Amid the celebrations, there is a palpable sense of pride and optimism for what lies ahead. As the department enters its fourth decade, it remains committed to fostering a culture of innovation and excellence. The CBE Department is poised to make even greater strides in the years to come.



- » The conference was attended by President Prof. Nancy Ip (second right), Provost Prof. Yike Guo (second left), Dean of Engineering Prof. Hong K. Lo (first left), and Prof. I-Ming Hsing, Head of Chemical and Biological Engineering (first right).



- » President Prof. Nancy Ip conveyed felicitations on the Chemical and Biological Engineering Department's 30<sup>th</sup> anniversary at the opening of the conference.



- » A game to test audience's understanding of the Department of Chemical and Biological Engineering was played during the opening gala.



- » Audience were amused by the interesting questions.



# The 15<sup>th</sup> Global Chinese Chemical Engineering Symposium & Future Chemical Engineering Education and Research High-end Forum

The 15<sup>th</sup> Global Chinese Chemical Engineering Symposium (GCCES) was held successfully at the Hong Kong University of Science and Technology from August 5-9, 2023. Profs. Minhua Shao (HKUST), Guohua Chen (City University of Hong Kong), and Jesse Zhu (Western University, Canada) co-chaired the conference. Over 500 leading scientists and students from Greater China and abroad gathered to share research progress and discuss the latest trends in chemical science and engineering. The symposium fostered international collaborative innovation, interdisciplinary integration, and industrial-academic cooperation in a dynamic environment.

Prof. Shao also specially organized and chaired a high-end forum titled "Future Chemical Engineering Education and Research" to celebrate CBE's 30<sup>th</sup> anniversary. Participants include Academician Prof. Suojian Zhang (Henan University, and Institute of Process Engineering, Chinese Academy of Sciences), Academician Zaiku Xie (China Petroleum and Chemical Corporation), Academician Prof. Xiaojun Peng (Dalian University of Technology), Prof. Xueqing Qiu (Guangdong University of Technology), Prof. Shiping Zhu (The Chinese University of Hong Kong, Shenzhen), and Prof. Liangyin Chu (Sichuan University), along with over 30 presidents, vice presidents and deans from top chemical engineering schools.

Prof. Shao began by introducing CBE's establishment, academic programs, research interests, and the challenges facing education and research in the future. Participants were impressed by the rapid achievements made by the department in just 30 years. They also shared their best practices in attracting promising students, designing chemical engineering curricula to address future challenges in an ever-changing society, collaborating with industry, and fostering a research and knowledge transfer mindset in their institutions. The expertise shared during the forum provided valuable insights and new perspectives on potential directions and approaches for advancing chemical engineering education and research.



## Cross-Campus Workshop on Biology, Energy & Materials



The first cross-campus workshop on **biology**, **energy**, and **materials** was successfully held at the Guangzhou campus of the Hong Kong University of Science and Technology (GZ) from November 10<sup>th</sup> to 12<sup>th</sup>, 2023. The workshop was jointly organized by the Advanced Materials Thrust of the Functional Hub of the Hong Kong University of Science and Technology (GZ), the Department of Chemical and Biological Engineering (CBE) and the Energy Institute of the Hong Kong University of Science and Technology (CWB).

Professor Minhua Shao, the Head of CBE and Director of the Engineering Institute, led a group of over 20 faculty and research staff to attend the workshop. During the opening ceremony, he introduced the department and extended an invitation to colleagues from the Guangzhou Campus to visit the Clear Water Bay Campus for further communication and collaboration.

During his opening remarks, Professor Jingshen Wu, the Vice President for Teaching and Learning of HKUST(GZ), provided a review of the founding process of the Guangzhou campus, emphasizing the unique academic structure of "Hubs-Thrust" and the importance of interdisciplinary integration. He then proceeded to introduce the future development plan of the Guangzhou campus. Professor Wu hoped



that HKUST(GZ) would leverage the unique location advantages of Nansha to foster interdisciplinary collaboration and promote cross-campus cooperation.

Experts and scholars from academia and industry, as well as outstanding research staff and students, were invited to give presentations, sharing their research progress in the fields of biology, energy, and materials science. They discussed cutting-edge scientific issues and promoted the development of interdisciplinary integration. The workshop was also available for online live streaming, which attracted more than 100 participants from various universities and research institutions in the Greater Bay Area to attend remotely.



# Students

## Internship – LI Ka Yan Katie



### Raindrop Internship at Kerry Group Hong Kong

<https://www.raindropinternship.com/>



Li Ka Yan (Katie), a final year student at CBE, has joined the Environment Team of the Project Management Department at Kerry Properties (H.K.) Limited. Throughout the eight-week internship, she gained practical knowledge and skills in environmental management and sustainable development. She shared her exceptional experience in event planning and communication, which further fueled her strong desire to continue working with the company. She expressed,

“After this internship, my biggest wish was to return and work as a full-time staff member, and my wish has come true!”

### From Theory to Application

During her internship, Katie actively engaged in diverse responsibilities pertaining to environmental compliance in property development and management projects. She emphasized the practicality and importance of her academic learning by successfully applying the knowledge gained from her Environmental Management System and Environmental Impact Assessment courses. This enabled her to develop expertise in green building practices and comply with environmental statutory requirements in Hong Kong.



### Soft Skills through the Green Construction Site Award

One of Katie's most memorable experiences was her involvement in the company's flagship event, the Green Construction Site Award. With over 100 participants from all arrays of industry stakeholders, Katie has developed comprehensive soft skills by playing a crucial role in event organization, game development, creative designs, and performance execution for various projects.

### Tips for this program: Must Try!

Katie highly recommends the transformative internship experience to other students, emphasizing its mentoring, training, interactive workshops, site visits, and engaging events. Katie shared that prospective students should not refrain from applying even if the program indicates its exclusivity for certain applicants, and one should ensure their availability throughout the internship period to secure their position.

As Katie described this experience as a "truly fruitful, rewarding, and exciting journey in promoting green building and sustainable development," she has returned to the company and continues her journey in environmental project management, showcasing her commitment to personal and professional growth.

For more information on Katie's personal sharing, a video is available at

<https://www.youtube.com/watch?v=wWi8Dj5hBlw>





## Internship – CHAN Cho Hon Joe

### Exploring Renewable Energy Generation at Siemens Energy

Being the first-ever intern at Siemens Energy, CBE student, Chan, Cho Hon (Joe), had a unique chance to contribute to its growth in renewable energy generation. The company specializes in hydrogen gas power generation, collaborating with the Hong Kong Black Point Power Station in Hong Kong, operated by China Light and Power (CLP) Group.

### Emphasis on both Theoretical Knowledge and Hands-on Experience

Regarding the knowledge and skills acquired during the internship, Joe highlighted the significance of his academic foundation in hydrogen gas power generation such as the cycle conversation process. With this internship opportunity, he has also expanded his professional network with different stakeholders and enhanced his communication skills as he has expressed,

“The internship offered the perfect blend of soft skills development and practical experience, making it an enticing opportunity for me.”

### Eye Opening

Joe mentioned his memorable opportunity to visit and be at the power generation site. As he recalls “It is very stunning to see the giant machines came out from the book and gain firsthand exposure to the functioning of gas turbines, generators, and steam turbines,” which ultimately generate electricity with minimal environmental impact.



### Tips for our classmates: get a GREEN CARD

Joe shared the insight that safety is above all the most important aspect. To grasp an internship opportunity in this industry, newcomers should obtain the construction industry safety training certificate, known as the Green Card.

**If you want a comprehensive understanding of hydrogen gas power generation, this is the program for you.**

<https://career.hkust.edu.hk>



# CBE Chem-E Car Team Shines at Global Chemical Engineering Competition



A team of CBE students, known as the E-Car Team, representing Hong Kong in the renowned Chem-E Car Competition organized by the American Institute of Chemical Engineering, has won the **Best Video Award**, came in **11th globally**, and **2nd in Asia**. The team, comprised of 8 members, has demonstrated exceptional skills and expertise in designing and constructing a car powered by chemical reactions.

## *Motivation Behind: Transform theory to a tangible product*

Starting from scratch, this program requires students to have a deep understanding of both chemistry and engineering principles in order to build a real-life running car that could safely run a specific distance and come to a stop. It is the practicality that brings them together for this project, as they expressed,

“What makes this program special is it combines everything we learn and turns it into an actual product!”



## Our story: The Life-Death Situation

### *The Unexpected “Expected” Challenges*

The team faced difficulties from all angles and went through the “all can go wrong” experience. They shared openly, “we have had countless failures, from the first prototype that came close to a disastrous explosion to alignment problems with the car, and even the change of the weather affects our car’s performance”. In short, **the end product was something we totally unexpected!** Two weeks before flying to Orlando for the competition, they were informed to submit a documentary video highlighting the complete car-building process. However, their car was still not functional at the time due to a chemical reaction triggered by fluctuating temperatures. And that wasn't all. The team leader, Jacqueline, further added that the last trigger that could have jeopardized the entire project was the last-minute notification from the organizer that their stopping mechanism did not qualify for deployment in the competition.

- **Two weeks before the competition**

Video production submission was required to showcase their car, but their car was still not working. ▼

- **Return Home or Come up with a New Solution**

Faced with a highly pressing dilemma, the team had to either come up with an alternative solution or risk being sent back home from Orlando. ▼

- **24 hours before the competition**

They found themselves in a foreign country with the urgent need to find replacement parts and a workable design. ▼

- **2 hours before the competition**

Their car could not meet the target distance of 25. It could only go as far as 5 meters!



[Competition  
award](#)



[competition  
website](#)

### **Solution to the *Battle*: Teamwork**

The team reflected that it was the great spirit, dedication, and teamwork that made them endure those challenges. Anticipated the forthcoming challenges in the technical aspect, research and development, resources (including cost and laboratory access), and time constraints, the team swiftly divided their manpower, leveraging each individual's expertise as soon as the project kicked off. A leader was appointed to oversee the entire project, followed by the designation of team members into the electronics team (responsible for the car's mechanism), battery team, stopping mechanism team (for calibrating the car to stop without any mechanical brakes), and the video production team.

They reiterated the importance of supporting each other to withstand this battle. Their dedication was vividly shown through the creation of their own team T-shirts and the assigning of a name to their car that incorporated HKUST's school symbol, known as Turkey.

### **No Pain, No Gain, High Reward**

The team shared that in addition to the challenges of the E-Car project, they also had to manage their daily schoolwork at HKUST concurrently, despite being in different time zones. The team reflected, **“There were no day and night; the clocks ran 24 hours a day.”** They now share a common mantra:

**“At 3 am, let's get up and work with Hong Kong!”**



Throughout this project, they also learned much more than just the skills taught in school, which they found extremely helpful and crucial for their career and personal development. Completely irrelevant to chemical and biological engineering; they had to learn about design, electronics, 3D printing, budgeting for their competition and accommodation, and even cooking for a large group during their 11-day trip.

***Tips for New Comers: If you want an unforgettable memory, this is the place!***

Encouraging junior students to participate, they highlighted the learning opportunities and personal growth offered by this project. Their exceptional teamwork and problem-solving skills not only made them achievers but also gain unique memorable lifetime experiences that one would otherwise not have possible.

**“With eight of us, when it comes to disagreements, we never argued, we knew we were heading in the same direction, it was all about one team spirit and one goal. We made a lot of good friends with strong bondings that we believe we will keep holding.”**

### **From the 8 of Us: The most memorable thing**

Aaron & Chloe & Gordon:

**“It's the time together and the team feeling, from cooking, doing homework with joint deadlines, facing adversities. Precious and unforgettable!”**

Tina & Eric & Jacqueline:

**“The project/competition itself. There were lots of trials and errors, ups and downs, a sense of stress and failures, yet we then learned what teamwork, project management, and resilience are about.”**

Eagle & Timothy:

**“Our car finally worked! It's the happiest moment, and everything felt rewarding. Could this be the engineering experience?!”**



## Photos for Industrial Visits





## Photos for Social Activities





## Class of 2023 Graduation Photo



香港科技大學

THE HONG KONG UNIVERSITY OF SCIENCE AND TECHNOLOGY

### Department of Chemical and Biological Engineering 2023



香港科技大學

THE HONG KONG UNIVERSITY OF SCIENCE AND TECHNOLOGY

### Department of Chemical and Biological Engineering 2023





# Alumni

## Alumni Achievements

### CBE Alumni Named in Forbes 30 Under 30 Asia 2023 List

CBE alumni has gained a place on the Forbes 30 Under 30 Asia 2023 list, which features 300 young entrepreneurs, leaders and trailblazers across the Asia-Pacific region, all under the age of 30, who are effecting positive change and driving innovation amid global economic uncertainty and a challenging environment.

Zhang Yan (2022 PhD in Bioengineering) in the healthcare & science category. She is the lead inventor of CHAMP (computational high-throughput autofluorescence microscopy with pattern illumination), a patented medical imaging technology that helps to detect residual tumors and provides doctors with information on resection margins. She is currently a postdoctoral research associate at Cornell University.



Kenny Oktavius (2021 MPhil in Technology Leadership and Entrepreneurship, 2019 BEng in Chemical and Biomolecular Engineering), is a Co-founders of PointFit Technology, which seeks to make tracking health conditions easier with its skin patch. Currently Kenny is pursuing his PhD studies at HKUST (Guangzhou).

Two research projects led by Prof. Chau Ying (second from left) are acclaimed at the 48<sup>th</sup> International Exhibition of Inventions Geneva. One team with Dr. Yu Yu (far right), 2014 PhD in Bioengineering, works on advanced polymer-based therapeutics for chronic disease, while another team with Dr. Melody Chung (far left), 2023 PhD in Bioengineering, and Dr. Laurence Lau (second from right) is developing an artificial cell



Aging can bring challenges to our health and well-being, from declining vision to reduced mobility. Common chronic conditions like dry eye disease, macular degeneration, and knee osteoarthritis can diminish our quality of life as we get old.

Thankfully, a team of researchers led by Prof. Chau Ying from HKUST's Department of Chemical and Biological Engineering has made a groundbreaking discovery that brings new hope for healthy aging. Together with a start-up co-founded by her former PhD student Dr. Yu Yu, they have developed a method to customize materials to treat these three conditions and potentially many others. Their pioneering work has earned them a prestigious Gold Medal with Congratulations of the Jury at the 48<sup>th</sup> International Exhibition of Inventions Geneva.





# Departmental Year-end Party 2023







DEPARTMENT OF  
**CHEMICAL AND BIOLOGICAL  
ENGINEERING**  
化學及生物工程學系

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