

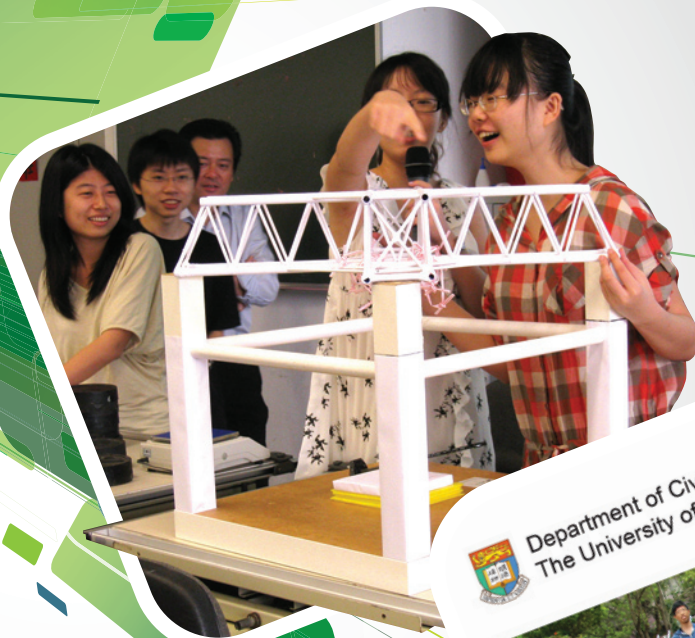


香港大學土木工程系

DEPARTMENT OF

CIVIL ENGINEERING

The University of Hong Kong



Department of Civil Engineering
The University of Hong Kong, 2016 - 2017



Head's Message



Professor S.C. Wong

Since the establishment of The University of Hong Kong and the Faculty of Engineering in 1912, the Department of Civil Engineering has nurtured many brilliant leaders in the civil engineering discipline and made significant contributions to the local and overseas community. The Department is constantly looking ahead to enhancing its goals in education, research and community services in order to keep abreast of the ever-changing demands of modern society. We are very pleased to have ranked 9th globally for the second year under the QS University Subject Rankings 2016 in the subject area of Civil Engineering.

The Department has switched to a new and innovative 4-year curriculum in 2012, to equip students with knowledge beyond traditional civil engineering coupled with versatile options, for example the double degree and the major/minor. In our new 4-year curriculum, greater emphasis is placed on experiential learning in the form of project-based design, where students participate in engineering projects relevant to their fields of study. A new curriculum development plan has also been developed in the new triennium and from the 2017-18 academic year, we would introduce new 'specialisations' for students, to allow them to focus on certain areas for more in-depth studies.

Since 2004, the Department has also established the Project Mingde, where arrangements are made for our students to take up the design and construction of real life projects in China. The first project - Mingde Building, a primary school, was built in the Guangxi province in 2005 and the second project - Gewu Building, a dormitory for the Rong Shui Vocational Training School, Guangxi province, was completed in 2008. The third project, a kindergarten in Chongzhou, Sichuan Province was completed in Nov 2011. The fourth project was building of Chaoyang Bridge at Yingdong Village, Guangxi Province and it was completed in June 2013. The fifth project, a Community and Cultural Centre at Dabao Village, Guangxi Province was completed in May 2015. In 2016, the latest project of Project Mingde is to build a teacher accommodation for Daping Primary School in Guangxi Province. We would continue to look for meaningful and educational projects and opportunities for our students.

Through the Mingde Projects, the educational goal of bringing real projects into the classroom and, vice versa, bringing the classroom into the projects, is realized. The Department is very fortunate to have a group of dedicated alumni to provide professional guidance and mentorship to our students for these various projects.

The Department has continuously attracted top students and earned a good reputation in both academic and industry. With the government's implementation of mega-infrastructure projects, there is a great demand for civil engineers. Moreover, the construction boom in the Mainland, the Middle East and beyond, also opened up new opportunities for young and enthusiastic civil engineers to participate in the boundless infrastructure developments in China and overseas. The Department of Civil Engineering will continue to devote itself to teaching and research for the betterment of society.



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Teaching & Learning

Undergraduate Programme

In line with the changing roles of civil engineers, the undergraduate programmes are now becoming more versatile. Besides the main stream civil engineering programme, students may also take a minor programme from a range of disciplines, such as in Business, Finance or Economics. A double degree in BEng in Civil Engineering and Bachelor of Business Administration (BBA) is also available. All courses are fully accredited by The Hong Kong Institution of Engineers. At HKU, we emphasise on creative thinking and problem-solving skills, and our Department will continue with the fine tradition of nurturing the next generation of leaders in the civil engineering profession through our undergraduate programme.



Postgraduate Programmes

Research Postgraduate (RPg) Programmes

The Department offers world-class research postgraduate (RPg) programmes for degrees of Master of Philosophy (MPhil) and Doctor of Philosophy (PhD). RPg studies are supervised by leading researchers in various areas of civil engineering, including environmental, geotechnical, structural and transportation engineering and infrastructure project management.

Taught Postgraduate (TPg) Programmes

Taught postgraduate programmes are offered for part-time/full-time study. The taught Master of Science in Engineering (MSc(Eng)) programmes provide advanced education in various fields to cater for the increasing demand for further specialisation in civil engineering. The MSc(Eng) degree programmes include:

- Environmental Engineering
- Geotechnical Engineering
- Infrastructure Project Management
- Structural Engineering
- Transportation Engineering

Research Activities

Structural Engineering

Computational mechanics; finite element and finite strip analysis; earthquake engineering; tall buildings; bridge engineering; concrete technology and reinforced concrete structures; fibre-reinforced polymer composites; steel structures and fire resistance of metal structures; concrete-filled composite structures; soil-structure interaction; computer-aided design/analysis; strengthening and repair of civil engineering infrastructure; RC structures under fire; semi-rigid joint connections.



Stonecutters Bridge



Resonant column testing system for soil dynamics research

Geotechnical Engineering

Soil/structure interaction - foundation engineering, tunnelling, cavern engineering, monitoring; rock and slope engineering - landslide investigation, mitigation; ground improvement; geoenvironmental engineering; soil mechanics - micromechanics, unsaturated soils, soil particle wettability, soil dynamics and earthquake engineering; advanced testing - field testing, field studies, laboratory testing; numerical modelling of geomaterials - constitutive modelling, continuum modelling, discrete element modelling.

Water and Environmental Engineering

Hydrology; environmental hydraulics and fluid mechanics; wind engineering; water quality modeling; advanced water and wastewater treatment; environmental biotechnology; solid and hazardous waste management; material resources recovery; environmental impact assessment.



Environmental Analysis



The Hong Kong Transportation System

Traffic and Transportation Engineering

Bike sharing and network design; continuum modeling in transportation; dynamic traffic assignment; green and smart transportation; public transportation; road safety; taxi; traffic and pedestrian flows; traffic management and control; traffic signals; transportation demand modeling; transportation, land use and the environment; transportation logistics; transportation network design; transportation network reliability and resilience; transportation systems engineering.

Construction Engineering and Management

Smart, sustainable and resilient city; zero carbon building; life cycle assessment; building information modelling; infrastructure asset management; project delivery; construction productivity and performance; construction informatics; innovative construction technologies; off-site prefabrication and lean construction.

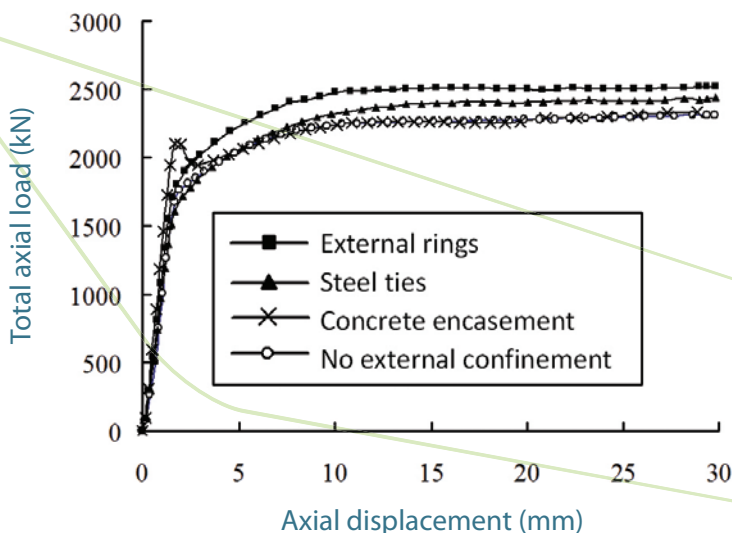


Brainstorming and refining R&D outputs with Industry

Recent Research Projects

Uni-axial Behaviour of Concrete-Filled-Steel-Tube (CFST) Columns with External Confinement

Concrete-filled-steel-tube columns have been increasingly adopted for the construction of columns in tall buildings because of their improved strength, stiffness and ductility. It reduces the consumption of steel, cement and concrete, and thus contributes to a greener construction environment. However, one of the problems for CFST columns is that the confinement of steel tube is not fully effective during the initial elastic stage due to the different Poisson ratios of steel and concrete. To overcome the problem, different forms of external confinement, including steel rings and ties, to confine the steel tube as well as the concrete core that enables a perfect interface bonding, have been adopted. A series of uni-axial compression tests have been carried out in the Department of Civil Engineering since January 2011. It has been found from the test results that the externally confined CFST columns possess superior strength and stiffness when compared with the ordinary CFST columns without external confinement.

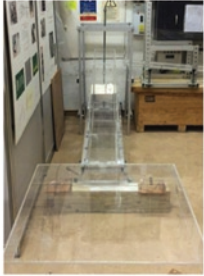
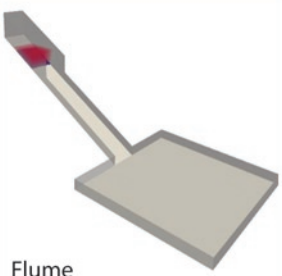
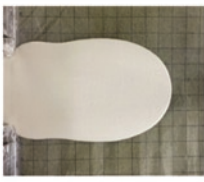
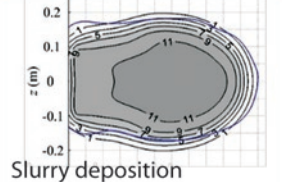

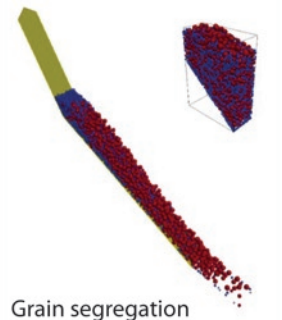


Recent Research Projects

Modelling Debris flow

Debris flow is one of the most destructive natural hazards. Its high mobility (high velocity and long run-out distance) and impact force cause loss of human life, destruction of houses and facilities, and interruption of transportation. Debris flow remains poorly understood due to its high fluidity and complicated multi-phase interactions among water, soil, debris and other geo-materials. Grain size segregation in debris flows usually yields a boulder-rich surge front, increases the kinetic energy, and enhances the impact of debris flows.

Dr. Fiona Kwok and her research team are currently using a newly developed coupled air-liquid-solid numerical model together with flume tests to understand the grain-scale mechanisms that control the velocity and height profile of a debris flow under the influence of geometric and geologic parameters (e.g. viscosity, density, particle size distribution, slope angle, and base roughness). This improved understanding of the physics and mechanisms of debris flow will be translated into an enhanced ability of engineers to make safer and more economic designs of barriers in Hong Kong. The study is funded by the Research Grants Council of the HKSAR Government and is in collaboration with the Geotechnical Engineering Office (GEO) of HKSAR Government, AECOM (HK) and The Hong Kong Polytechnic University.

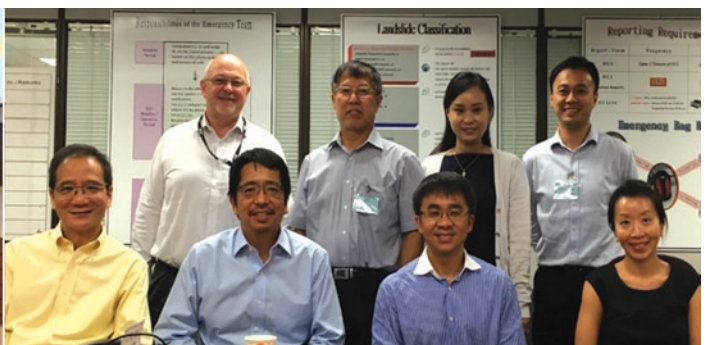
Lab. Experiment	Numerical Modeling
	 <p>Flume</p>
	 <p>Slurry deposition</p>
	 <p>Grain segregation</p>



Presentation at Institution of Civil Engineers (ICE)



Presentation at Institution of Engineer Malaysia (IEM)



Hong Kong Institute of Engineers (HKIE) working group on application of innovative technology in debris flow

Recent Research Projects



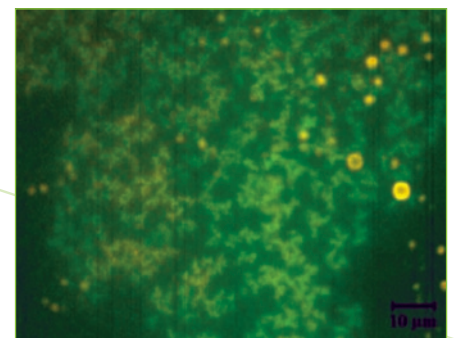
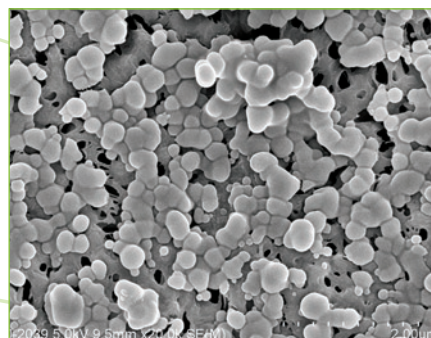
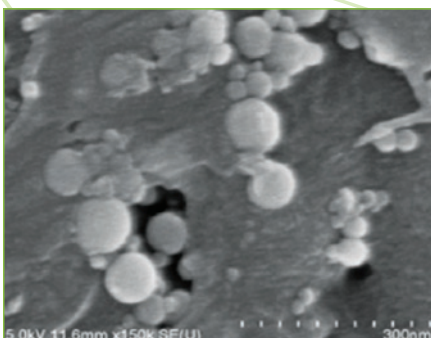
Membrane fabrication



Membranes testing system

Design of Next Generation Anti-Biofouling Membrane for Water Treatment

The ability to control, manipulate, and design novel materials to remediate contaminated natural resources, while avoiding the release of environmental pollutants, will be a major challenge of the 21st century. Pollution of water resources is an emergent issue that is quickly widespread and the technological advancement in water reuse strategy is urgently needed. Therefore, the reliable and efficient membrane technology has become a legitimate alternative to both conventional water and wastewater treatment processes. However, biofouling on the membrane surface significantly reduce the treatment efficiency of membrane systems and is a key need for achieving the membrane technology breakthrough. An innovative surface modification technique with permanent impregnation of alumina nanomaterials into the membrane was invented by the research team in the Department, and the new membrane has proven to effectively reduce the biological adhesion on the surface. This research work had successfully attracted the Innovation and Technology Fund from the government of HKSAR, and the result of technological invention was selected by the university to file as an U.S. patent.



Alumina anchoring, surface modification, and bacteria adhesion reduction on membranes

Recent Research Projects

A software tool with a strategic approach for identifying critical transport infrastructures and building resilience of urban transport systems



Transport infrastructures often fail to ensure smooth and quick movements of goods and people due to man-made or natural disruptions, such as heavy rains, typhoons, train operation failures, and traffic accidents. This 2-year project, which was jointly funded by Arup China and the Innovation and Technology Commission, aims to develop a software tool to systematically identify the critical transport infrastructures under disruptions, determine the

ranking of these infrastructures, the maximum impact of each infrastructure failure, and build resilience of urban transport systems cost-effectively. This tool is particularly suitable for the applications to Asian cities, such as Hong Kong, with multimodal and dense transport networks. Case studies of Eastern District in Hong Kong is carried out to illustrate the usage and functions of the tool, mitigate the potential impacts of the disruptions to the current transportation system, and give recommendations to improve this system. The project can help (1) improve the reliability of supply chain and other transport related services, (2) minimize the losses of Hong Kong economy and productivity, the business of private companies, and time of people due to disruptions, (3) minimize the reduction of mobility of goods and people during disruptions, as well as (4) effectively allocate the limited budget to build and maintain transport infrastructures.

The following figure illustrates the results for Eastern District in Hong Kong. NRI is the difference in total travel time of all flows in the entire network after and before the removal of the link concerned. The higher the value of NRI, the more the critical the link is. According to the figure, majority of links with high NRI values are located along on Island Eastern Corridor and King's Road, meaning that they are critical from the perspective of resilience. Measures should be set up to mitigate the impacts due to the complete blockage of these major sections.

Recent Research Projects

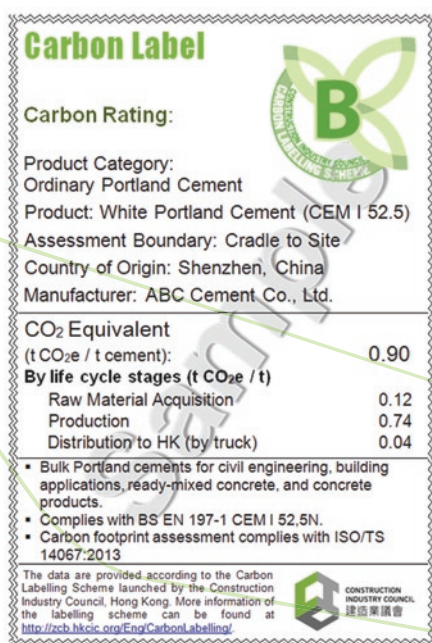
A Hong Kong Based Carbon Labelling Framework for Construction Materials

While Hong Kong aims to be a sustainable low carbon economy city, the construction industry has a critical role to play. Apart from the energy consumed by running assets, the embodied carbon impacts of a construction project associated with the extraction, manufacture, transport, assembly and even decomposition of construction materials would result in significant environmental consequences. Minimising the output of carbon emission in the construction field through prudent selection of construction materials is therefore highly desirable.

Commissioned by the Construction Industry Council (CIC), the research project aims to develop a framework for classifying construction materials according to their greenhouse gas (GHG) emission level and so as to help building Hong Kong into a low carbon economy as envisaged by the Chief Executive in his 2009-10 Policy Address. By measuring and benchmarking the lifecycle carbon footprint of a building product,

consumers or those responsible for sourcing can decide which product to order to meet their specific emission goal. More importantly, a recognised carbon labelling scheme will create incentives for designers, contractors and manufacturers to develop novel ideas, select low carbon materials and invest in new technologies to reduce the emission level of construction facilities relentlessly.

This research project marks a milestone in collaboration between the industry and academia for the promotion of sustainability in construction. It is anticipated that the carbon labelling framework for construction materials will help achieve the target of emission reduction as proposed by the government. The findings should also put Hong Kong at the forefront of sustainable development as well as accreditation service and carbon auditing.



Courtesy of the Construction Industry Council





Student Activities

Civil Engineering Society

Civil Engineering Society, ENS, HKUSU is a student-run, academic-oriented organisation under the Department of Civil Engineering in HKU. It is the sole organisation of civil engineering programmes that represents students, and over 95% of full time undergraduates of the curriculum are a member of the Society. The objectives of the Society include serving the civil engineering students and facilitating communication between the Society and external bodies. Furthermore, the Society also aims at promoting civil engineering to the general public and to other students of The University of Hong Kong.



The Society was established in 2001. Throughout the past decade, the Society organised various activities such as site visits, experience sharing with engineers and connection with external professional engineering bodies, hoping to broaden the horizons of our members. Every August, the Society organises an Orientation Camp to welcome fresh undergraduates to embark upon their journey in civil engineering at HKU. An academic forum is organised in the open area of the University which encourages discussion on recent civil engineering projects.



The Society organises an anniversary Annual Dinner in November to highlight a memorable milestone. With guests and students of different years, the Annual Dinner is a good opportunity for distinguished alumni and civil engineering students to gather together and pass on valuable traditions.

Student Activities

Experiential Learning Experience – Project Mingde

Project Mingde is a charity project to build schools and facilities in underprivileged areas initiated by the Department of Civil Engineering of The University of Hong Kong. It aims to provide education opportunities for children in impoverished villages or disastrous areas and to let our students contribute their skills and knowledge to the society. Since 2004, over 400 university students, teaching staff and alumni have deeply involved into five projects in Gaungxi and Sichuan Provinces namely the Mingde Building, the Gewu Building, the Zhengdong Jie Kindergarten, the Chaoyang Bridge, and the Mingde Pan Cultural and Community Centre. In 2015, Project Mingde collaborated with the Faculty of Social Sciences and World Vision, to start up our first overseas project in Vietnam, to build sanitation facilities for a local secondary school.

For the Mingde Pan Cultural and Community Centre Project, 157 student-visits in total were arranged to Dabao Village to participate in the construction works. The majority of students were from Civil Engineering while the rest of them were from Social Sciences, Education, Industrial and Manufacturing Systems Engineering, Law, Landscape Architecture, and Geology. Besides experiencing the hardship and poverty in the remote impoverished region of China, they acquired the practical knowledge of how to monitor and supervise a construction project as well as to prepare a feasibility study report which cannot be learnt from textbooks or lectures. Through these visits, they contributed to the underprivileged and the needy by applying their professional skills and care.



Opening ceremony at the Mingde Pan Cultural and Community Centre



Students helped the local construction workers for ground excavation work



Group photos of participated guests, students and teaching staffs



All participated students and the lavatory they helped construct in the past 7 weeks



Student Activities

Last summer, 8 students from Civil Engineering and 8 students from Social Sciences joined our service trip to Vietnam for 7 weeks. They were assigned to work on a small construction project of building sanitation facilities for Tan Hung Secondary School in Hung Yen Province (about 2.5 hours travel from Hanoi City). A one-storey high lavatory was constructed during their 7-week training. They had been deeply involved into the project acting as Assistant Resident Engineers to supervise the construction works, and also help the local workers to complete part of the construction on site. About 200 school children benefit from this new lavatory and it improves their basic hygienic standard. For the coming summer, Project Mingde will continue collaborating with World Vision to build a library for another secondary school.

to apply and utilize their knowledge and skills gained in the classroom to hands-on multi-disciplinary Civil Engineering projects in the process of becoming competent and accountable engineers. Also through participation in real-life projects, students understand the needs of the society; learn how to communicate with different parties and to contribute to the society with their own efforts and expertise. This experience will not only fortify their confidence and interests in the Civil Engineering discipline but also give them a sense of satisfaction while caring for the society.



Kenji (left one) and Marcus (left two) shared their stories in Vietnam during RTHK1 radio interview



Students interviewed the Principal of Daping Primary School for their needs

In the meanwhile, we are working on another project at Daping Village in Guangxi Province. A visit trip was arranged to there to explore the needs and feasibility of expanding the teacher and student accommodations for an existing primary school. We have successfully approached a donor to support the construction cost of this project, and students are now working on the architectural and structural designs with collaboration with the Civil Engineering students from Guangxi University. The construction work is expected to commence in July, and to be completed by November.

Internship Programmes

All civil engineering undergraduate students have to complete at least 4 weeks of internship and the Mandatory Basic Safety Training (MBST) course as part of the Bachelor of Engineering Civil Engineering degree programme. Most students would take their training in Hong Kong while some would go abroad. They usually work as engineer's assistant with consultant or contractor firms. In recent years, students have had some new training programmes held in the Mainland China, such as those in Beijing and at the Three Gorges and Jinsha River sites.

Project Mingde is a pioneer program of experiential learning to provide our students with the opportunity



Student Activities

Site Visits and Field Trips



Site visit to study large-diameter bored pile construction in Hong Kong



Students visited a high-rise building construction site in Guangxi



Students' field trip to the ruins of 5.12 Sichuan Earthquake in China



Students' field trip to a dam site in China

Student Awards

- **Mr. Hu Tsz Fung** and **Mr. Lau Kai Ming** (Year 3 CivE students) were awarded the Hui Yin Hing Scholarships 2013-14.
- **Mr. Lee Ho Yin Matthew** (Year 3 BEng student), was elected by HKIE Environmental Division as the First Runner-up for his achievement at the HKIE Environmental Project Competition 2013/2014.



- **Miss Mao Yanping** (PhD student under supervision of Professor Zhang Tong) was awarded the Reaching Out Award under the HKSAR Government Scholarship Fund for the academic year 2013-14.
- **Mr. Ng Tsz Man** (Year 3 CivE student) was awarded the HSBC Hong Kong Scholarship 2013-14.



Student Awards

- **Mr. Saif Ur Rehman Muhammad** (Year 3 CivE student) was awarded the Talent Development Scholarship under the HKSAR Government Scholarship Fund 2013-14.



- **Mr. Chau Tsz Kin, Mr. Cheng Kam Hung, Mr. Lam Yan Wai** (Year 2 CivE students), **Mr. Ng Tsz Man** (Year 3 CivE student) and **Mr. Kan Chi Cheung** (Year 3 CivE-Law student) were awarded the Reaching Out Award under the HKSAR Government Scholarship Fund 2013-14.

- **Mr. Chen Long, Mr. Chen Mantai, Miss Lin Lin, Miss Meng Boyang and Miss Wang Fangying** (current PhD students) were awarded the Hong Kong PhD Fellowships (HKPF) in 2014-15 for their excellent academic record. The Award Presentation Ceremony was held on December 9, 2014.

- **Mr. Huen Ka Yu** (Jan 2014 Grad) and **Mr. Wang Li Cheng** (Year 3 CivE student) were awarded the YS and Christabel Lung Undergraduate Scholarship for Engineering Students (Renewal in 2013-14).

- **Mr. Wan Hon Ming** (Year 2 CivE student) was awarded the HKU Engineering Alumni Association Scholarship 2013-14.

- **Mr. Chan Chung Lok** (CivE 3 2014-15); **Mr. Chan Shung Hin Caleb, Mr. Lam Wing Cheung, Mr. Leung Wang Yan, Mr. Li Pak Hei, Mr. Ma Wenlin, Mr. Wong Tsz Pui** (CivE 3 2014-15) and **Ms. Zhu Yuxi** (CivE 2 2014-15) were awarded the Reaching Out Award under the HKSAR Government Scholarship Fund 2014-15.

- **Mr. Chai Tze Ho Ivan** (2015 BEng graduate) received the Emerging Engineers Award from the Institution of Civil Engineers Hong Kong Association Graduates and Students Division in May 2016 for his paper on permeability of granular soils (supervisor: Dr. J. Yang).

- **Miss Chan Wing Lam** (CivE 2 2014-15) was awarded the YS and Christabel Lung Undergraduate Scholarship for Engineering Students (Renewal in 2013-14).

- **Mr. Cheung Yan Long** (CivE 3 2014-15) was awarded the HSBC Hong Kong Scholarship 2014-15.

- **Mr. Chong Shing Tak and Mr. Wong Kin Wai** (CivE 3 2014-15) were awarded the Endeavour Merit Award under the HKSAR Government Scholarship Fund 2014-15.

- **Ms. Li Hiu Kwan Huky** (2014 BEng graduate) won the "Award of Merit" in Geotechnical discipline in the G&S Papers Competition 2014 organized by the Institution of Civil Engineers Hong Kong Association. The award-winning paper, supervised by Dr. J. Yang, was entitled "Triaxial compression behaviour of granular materials".

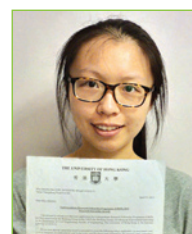
- **Mr. Liang Jiahao and Mr. Tsui Tik Fung Dave** (CivE 3 2014-15) was awarded the Hui Yin Hing Scholarships 2014-15.

- **Mr. Liu Junchang** (June 2014 Graduate) was awarded the HKIE Geotechnical Division Prize and the AECOM Prize for Best Student of the Year 2014.



- **Ms. So Wing Sze** (CivE 3 2014-15) was awarded the LPM Contractors Scholarship 2015.

- **Ms. Zhang Bei and Mr. Zhang Bolun** (CivE 3 2014-15) were awarded the Undergraduate Research Fellowship Programme 2014-15 and Research Internship Awards.



Ms. Zhang Bei



Mr. Zhang Bolun

- **Mr. Ng Hei Yin** (CivE 2015 June graduate) was awarded the HKIE Geotechnical Division Prize - Competition on AECOM Prize for Best Final Year Geotechnical Project 2015.

- **Mr. Wong Kin Wai** (CivE 4 2015-16) was awarded the Endeavour Merit Award under the HKSAR Government Scholarship Fund 2015-16.

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