Civil engineers (from structural and environmental programs) are primarily responsible for the planning, design and construction of infrastructure which includes major buildings, bridges, dams, pipelines, sewage and water treatment works, and various transportation systems and facilities. In order to provide workable, durable, and affordable solutions to society’s infrastructure needs, civil engineers must develop an understanding of the physical laws that govern the actions of nature and its environmental forces, and the behavior of natural and man-made materials. It is not surprising therefore that the basic research on the mechanics of solids and fluids was initially conducted by civil engineers working on solutions to practical problems. The importance of a sound knowledge base of these subjects is likely to increase in future as civil engineers are called upon to build in more hostile and delicate environments, to handle new materials, and to preserve natural resources.

As society evolves, the solutions to civil engineering problems are no longer exclusively technical issues. Instead, they require consideration of demographic trends, human aspirations, laws of supply and demand, and in general, social, economic and political factors. The civil engineers of the future will have to develop a better appreciation and understanding of these subjects to assume their rightful place in society.

The problems civil engineers face in the next century are likely to be increasingly complex. They should be viewed, however, as a new challenge and an opportunity to play a leadership role in shaping the future society, improving the quality of life and protecting the environment. To respond to this challenge, civil engineers will need a solid knowledge of the physical sciences, and an understanding of human and social behavior, familiarity with new methodologies and emerging technologies, and a continued eagerness to explore new areas and apply the latest research results. Research efforts should be closely related to the interest and needs of society. In this way the results will be more practical, the work itself will be more exciting and rewarding, and the contribution to mankind will be more meaningful. The civil engineering program at HKUST aims at giving students the technical skills, intellectual inspiration and appreciation of human factors to meet the challenges facing modern-day civil engineers.

UNDERGRADUATE PROGRAMS

Civil engineers are concerned with both the built and the natural environment. They plan, design and construct modern infrastructural systems, manage various natural resources such as air and water, and protect us from natural catastrophes and toxic wastes. Civil engineers’ major role is more than just technical, which requires a high ability to communicate with and to lead groups. To build up capable civil engineers for our society, the civil and environmental engineering programs prepare students to take on leadership roles, emphasizing the social, political and economic
context in the curriculum design. This broad perspective is the current educational trend considered essential for those being educated to take the lead in society and hopefully creates a truly civic-minded and environmentally-conscious profession. The curriculum strikes a balance between short gains possible with a practice-oriented curriculum and long-term benefits of acquiring problem solving skills important for self-directed learning, enabling students to develop an integrated, analytical view of civil engineering sub-specialties along with exceptional communication skills.

The three-year curriculum is designed to allow first-year students to take most of the basic mathematics and engineering courses in order to strengthen their understanding of the fundamentals which are the foundation of civil engineering. The second-year curriculum concentrates primarily on the required core courses. These courses are intended to (1) show how the various sub-specialties are inter-related and thereby provide an integrated view of the civil engineering profession; and (2) introduce various aspects of civil and environmental engineering and show how they are related to broader social, political and economic issues. During the third year of study, students are given more freedom to take electives ranging from advanced engineering subjects, business and management, to humanities and social science. All students are required to complete six credits in an approved third-year civil engineering project and two credits in an integrated design project under the supervision of an advisor from either the University or industry.

The Department offers two undergraduate programs, namely Bachelor of Engineering (BEng) in Civil and Structural Engineering, and Bachelor of Engineering (BEng) in Civil and Environmental Engineering.

**Curriculum**

Description of the curriculum and courses for the following programs are presented online at [http://publish.ust.hk/calendar](http://publish.ust.hk/calendar):

- BEng in Civil and Structural Engineering
- BEng in Civil and Environmental Engineering

**POSTGRADUATE PROGRAMS AND RESEARCH**

The postgraduate programs in civil engineering aim at training students to solve problems in civil engineering by enlarging and deepening their knowledge base as well as encouraging the intellectual pursuit of creative ideas to improve human and natural environments.

The in-progress and planned projects in Hong Kong for railway construction, port facility expansion, improved road systems, pollution control, and urban re-development demand the work of large teams of civil engineers. As the practice of civil engineering itself develops rapidly, the leaders of these teams are likely to be those who have broad-based and in-depth knowledge of the discipline as well as a good grasp of new design concepts and technologies. Postgraduate training develops such potentials and offers excellent opportunities for students who wish to become future leaders in this profession. Students engaging in postgraduate study in civil engineering may concentrate on structural, environmental, geotechnical, water resources, transportation, construction engineering or infrastructure development.
The research postgraduate programs lead to degrees of Master of Philosophy (MPhil) and Doctor of Philosophy (PhD) in Civil Engineering. The MPhil program focuses on strengthening students' knowledge in certain areas of civil engineering and exposing them to the issues involved in the conception, design, construction, maintenance, and use of structures and facilities. The PhD program aims at developing the skills needed to identify issues related to civil engineering and the ability to formulate and propose solutions to a problem in an independent manner. In addition to the research programs, the Department also offers taught postgraduate programs, namely Graduate Diploma (GD) and Master of Science (MSc) programs in Civil Infrastructural Engineering and Management, and Environmental Engineering.

Applicants for research postgraduate programs in the Department of Civil and Environmental Engineering should normally have completed a Bachelor's degree in Civil Engineering or a related engineering field. Students must demonstrate sound training in physical sciences and mathematics and a good knowledge of basic civil engineering, including the use of computers. Qualified applicants may be admitted directly to the PhD program.

Non-native speakers of English must also show sufficient command of English. TOEFL and/or Graduate Record Examination (GRE) scores or equivalent are required as evidence of English proficiency.

The Department's research lies in four broad areas with many sub-groups within each. In line with our cutting-edge approach to the field, research areas are likely to evolve as new technologies emerge.

- Infrastructure Development and Planning: building-system design and analysis, monitoring and analysis of highway bridges, geotechnical engineering and soil-structure interaction, construction materials, transportation system modeling and operation, integrated risk and reliability assessment, and infrastructure system enhancement.

- Green Building and Sustainable Development: multidisciplinary area, with projects including development of green building design standards, eco-friendly materials and technologies, recycled construction materials, green retrofit and renovation technologies, optimization of energy and water usage.


- Environmental and Water Resources Studies: contaminated sediment transport, innovative physical, chemical and biological water and wastewater treatment processes, mathematical models for environmental quality management, mixing and transport phenomena of pollutants in natural and man-made systems, water resources management and engineering.
Curriculum
Description of the curriculum and courses for the following programs are presented online at http://publish.ust.hk/calendar:

**Taught Postgraduate Programs:**
- Graduate Diploma (GD) in Civil Infrastructural Engineering and Management
- Master of Science (MSc) in Civil Infrastructural Engineering and Management

**Research Postgraduate Programs:**
- Master of Philosophy (MPhil) in Civil Engineering
- Doctor of Philosophy (PhD) in Civil Engineering

FACULTY AND THEIR RESEARCH INTERESTS

Chair Professors

M. S. CHEUNG (張慕聖), BSc Chu Hai Coll; MSc, PhD Calgary; FCAE
(Director of Smart and Sustainable Infrastructure Research Center)

Research Interests: Finite element and finite strip methods; static and dynamic analysis of bridges and buildings; composite materials; reliability-based structural assessments; and durability of concrete structures.

Joseph Hun-Wei LEE (李行偉), BSc, MSc, PhD Massachusetts Inst of Tech; FREng, FASCE, FHKEng
(Vice-President for Research and Graduate Studies (from 1 November 2010))

Research Interests: Environmental hydraulics/fluid mechanics; water quality modelling.

Professors

Chih-Chen CHANG (張志成), BSc National Taiwan; MS, PhD Purdue
(Associate Director of Smart and Sustainable Infrastructure Research Center)

Research Interests: Structural health monitoring; damage identification; structural dynamics and measurement; earthquake and wind engineering; photogrammetric applications; signal processing and analysis.

Guanghao CHEN (陳光浩), BAgriSc Zhejiang Agric; MEng, DEng Kyoto

Research Interests: Sustainable sewage treatment systems; sludge minimization in biotreatment; sewer process modeling; MBR process optimization; low-cost and compact wastewater treatment technology.
Mohamed S. GHIDAOUI (招捷達), BEng, MASc, PhD Toronto

Research Interests: Mathematical and physical modeling in hydraulics and environmental fluid mechanics: flow stability, waves in open and closed conduits, turbulence in environmental flows, leakage detection, surcharging in drainage systems.

Lambros S. KATAFYGIOTIS (簡達福), DipCE National Tech Univ, Athens; MS, PhD California Inst of Tech

Research Interests: Structural dynamics; control and reliability; numerical simulation; computational stochastic mechanics; system identification; damage detection; random vibrations; earthquake and wind engineering.

Jun-Shang KUANG (鄺君尚), BSc South China Inst of Tech; PhD Hong Kong and Cambridge

Research Interests: Structural concrete design; earthquake-resistant and blast-resistant structures; seismic vulnerability assessment; tall building structures; large-scale experiment of structural concrete.

Christopher K. Y. LEUNG (梁堅凝), BSc Hong Kong; MS Univ of California, Berkeley; PhD Massachusetts Inst of Tech
(Head of Department, and Director of Advanced Composite Materials Technology Research Center)

Research Interests: Construction materials; fiber-reinforced concrete; composites in civil engineering; composite micro-mechanics; fracture mechanics; optical fiber sensors.

Zongjin LI (李宗津), BE Zhejiang; MS, PhD Northwestern

Research Interests: Durability of concrete; non-destructive test of infrastructure; using extrusion technique to develop new building products; functional material development; sustainable construction materials.

Hong-Kam LO (羅康錦), BSc Hong Kong; MSc, PhD Ohio State

Research Interests: Transportation systems modeling; intelligent transportation systems; dynamic traffic assignment; traffic simulation; traffic signal control; traffic flow theory; traffic safety analysis.

Irene M. C. LO (勞敏慈), BS National Taiwan; MS, PhD Univ of Texas, Austin

Research Interests: Permeable reactive barriers for remediation of groundwater; Chemical reduction of chlorinated hydrocarbons; Chelant-enhanced soil washing and mineral dissolution; migration of heavy metals in soils; Waste containment facilities; Waste recycling and reuse.
Charles W. W. NG (吴宏伟), MSc Southampton; PhD Bristol (Associate Dean (Outreach and External Affairs) of Engineering, and Director of Geotechnical Centrifuge Facility)

Research Interests: Centrifuge modeling; numerical analysis and constitutive models; slope stability; soil-structure interaction problems such as piles, retaining walls, excavations and tunnels; unsaturated soils.

Yeou-Koung TUNG (汤有光), BS Tamkang; MS, PhD Univ of Texas, Austin (Director of CLP Power Wind/Wave Tunnel Facility)

Research Interests: Water resources systems analysis; reliability and uncertainty analyses applied to hydrosystems engineering; stochastic modeling of rainfall-runoff process.

Hai YANG (杨海), BSc Wuhan; MEng, DEng Kyoto

Research Interests: Transportation economics; analysis, modeling and optimization of urban transportation systems.

Limin ZHANG (张利民), BSc, MSc, PhD Sichuan (Associate Director of Geotechnical Centrifuge Facility)

Research Interests: Pile foundations; embankment dams and slopes; multiphase flow; centrifuge modeling; geotechnical risk and reliability-based design.

Adjunct Professors

Andrew K. C. CHAN (陈嘉正), BS National Taiwan; PhD Cambridge

Research Interests: Analysis of structures and soils, sustainable design of urban infrastructure and buildings, and engineering education.

Kwok-Leung CHUNG (锺国樑), BSc Hong Kong; MSc Imperial Coll of Sc, Tech & Med

Research Interests: Project implementation; contract management; construction site work; consultant practices; engineers in society; new town development; sustainable development; flood control and environmental protection.

Martin Hoi-Chau KWONG (鄺海疇), BSc Hong Kong; MBA York; PhD Hong Kong

Research Interests: Sustainable development; project management; wind and seismic effects and engineering education and training.
James Chi-Wang LAU (劉志宏), MSc Manchester and London; MBA Chinese Univ of Hong Kong; PhD London

Research Interests: Construction law; construction management; dispute resolution; forensic investigation into structural and geotechnical failures.

Associate Professors

Chun-Man CHAN (陳俊文), BSc, MSc Massachusetts Inst of Tech; PhD Waterloo (Associate Director of CLP Power Wind/Wave Tunnel Facility)

Research Interests: Structural optimization of tall buildings; seismic performance-based design; computer aided engineering; wind effects on tall buildings; design of steel and composite structures.

Alexis Kai-Hon LAU (劉啟漢), BSc Chinese Univ of Hong Kong; MSc British Columbia; MA, PhD Princeton (Associate Professor of Environment, Adjunct Associate Professor of Mathematics, Director of Atmospheric Research Center, Associate Director of the Institute for the Environment, and Director of Environmental Central Facility)

Research Interests: Geophysical data analysis, numerical modeling of the atmosphere, regional and urban air pollution, weather and climate, satellite remote sensing applications, and environmental education.

Chii SHANG (商啟), BSc National Taiwan; MSc, PhD Purdue

Research Interests: Physico/chemical processes; environmental chemistry/instrumentation; disinfection processes/DBPs; heavy metal removal; subsurface contaminant transport/remediation.

Yu-Hsing WANG (王幼行), BSc, MSc National Taiwan; MSc, PhD Georgia Inst of Tech

Research Interests: Attenuation mechanisms in soils (damping); wave-based characterizations (using mechanical and EM waves); physico-chemical soil behavior; flow landslides.

Assistant Professors

Jack C. P. CHENG (鄭展鵬), BSc, MPhil Hong Kong Univ of Sc & Tech; PhD Stanford

Research Interests: Construction information technology and knowledge management; construction supply chain management; service computing in construction; building information modeling; construction data mining.
Gustaaf A. KIKKERT, BEng, PhD Univ of Canterbury, Christchurch

Research Interests: Experimental fluid mechanics; flow visualization techniques; buoyant jets; turbulent fluid processes; gravity-driven flows; hydrodynamics of waves in the swash zone; sediment transport in the swash zone.

Gang WANG (王刚), BEng, MEng Tsinghua; PhD Univ of California, Berkeley

Research Interests: Geotechnical earthquake engineering and soil dynamics; computational geomechanics; numerical modeling of soil-structure interaction; micromechanics of heterogenous materials.

Jui-Pin WANG (王瑞斌), BSc, MSc National Taiwan; MPhil, PhD Columbia

Research Interests: Uncertainty and reliability analysis in geotechnical engineering and geoscience; geotechnical centrifuge modeling; geotechnical earthquake engineering; risk and probability analysis in natural hazard.

Xiangru ZHANG (张相如), BS, MS Nankai; PhD Univ of Illinois, Urbana-Champaign

Research Interests: Water and wastewater treatment process chemistry; emerging contaminant characterization and control; environmental sensors; drinking water security; environmental impact assessment.

Xueqing ZHANG (张学清), BSc, MSc Hohai; PhD Hong Kong and Alberta

Research Interests: Project management and financial engineering; construction engineering and management; management information system; computer simulation.

Jidong ZHAO (赵吉东), BSc, MSc, PhD Tsinghua

Research Interests: Constitutive modeling of geomaterials; nonlinear finite elements; micromechanics and multiscale modeling of granular materials; gradient plasticity; limit and shakedown analysis; soft soil.

Visiting Assistant Professor

Wei Chung HU (胡惟忠), BA Univ of California, Berkeley; MS Univ of California, Santa Barbara; PhD South Australia

Research Interests: Adjustment computations, satellite geodesy and Hamiltonian mechanics, symmetry groups in PDEs, engineering education with emphasis on implementation of e-mathematics (CAS/spreadsheet methods/VBA).