

# Educating the Future Engineers

## A Trilogy of Design Courses at the Civil Engineering Department of National Taiwan University

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Presented By

**Liang-Jenq Leu, Ph.D.**

- Professor, Department of Civil Engineering, National Taiwan University
- Secretary General and Executive Director of the Accreditation Council, IEET



Students of the Civil Engineering Department at the National Taiwan University (NTU CE) are among the best students scholastically in Taiwan. They are typically very good in learning theories but less prepared for practical, hands-on engineering work. To change this historical phenomenon and to motivate the young students who aspire to be the future civil engineers, the NTU CE has structured a trilogy of design courses in the undergraduate program since 2010, namely the Cornerstone, Keystone and Capstone courses.

The Cornerstone, consisting of two required courses for the first-year students before the professional disciplinary training takes place, asks students to work in teams and to design digital and physical models of structures out of their own experience and creativity. Keystone, an elective, is offered to the second-year students while they are taking some professional disciplinary courses. Keystone features two intensive design projects: design and construct a full scale, at least 5 meters in span, bridge; design and fabrication of a pneumatic-powered copper float toy. The final and originally also an elective Capstone is a last-mile, culminating design course for students in the third/fourth year with a realistic design task on themes that vary yearly.

Some important and interesting findings now become available as the trilogy of engineering design courses are offered into the eighth year. Based on student feedbacks, these courses received the highest rating among student interests compared to other courses offered in the same semester for the same cohort of students. That is, despite the amount of time and energy consumed, students have rather high remarks on the trilogy. Meanwhile, there is convincing evidence that students with prior Cornerstone and Keystone design trainings perform better in the Capstone course than those that are without. In addition, student teams from the NTU CE have won three years in a row (2015-2017) the top prizes in the National Civil Engineering Design Competition. These findings are very rewarding to the faculty members and have changed a lot of mindsets. Curriculum of NTU CE has since resulted in a much more fresh and up-to-date look and is also better positioned to prepare students for future engineering practice.

IEET, the accreditation agency for engineering education in Taiwan, revised its criteria in 2014 to include the Capstone course as a requirement for graduation and programs must use the course to assess student outcomes as evidence of graduate attributes. Prior to the IEET's new mandate, the NTU CE program has moved the Capstone course to be a required course for entering class of 2013. Such an evolutionary change in curriculum is expected to motivate and enhance student learning and lead the graduates toward a better transition to the civil engineering profession.

