Short-Term Program for Laboratory in NCU

Date: July 4 ~ July 17, 2022

Laboratory Field: Structural Engineering, Geotechnical engineering, Material Engineering,

Week 1: July 4 ~ July 8

Date	7/4	7/5	7/6	7/7	7/8	7/9	7/10
Time	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
09:00 12:00	Prof. Hsieh-Lung Hsu Prof. Wen-Yi Hung	Prof. Shih-Huang Chen Dr. Putri Adhitana	Prof. Wen-Yi Hung	Prof. Wen-Yi Hung	Prof. Wen-Yi Hung	Weekend	
12:00 14:00	Lunch						
14:00 17:00	Prof. Yuan-Chien Lin	Prof. Tzu-Hsuan Lin	Prof. Wen-Yi Hung Jun-Xue Huang (Ph.D. Candidate)	Prof. Wen-Yi Hung Yi-Hsiu Wang (Ph.D. Candidate)	Prof. Wen-Yi Hung Trần Minh Cảnh (Ph.D. Candidate)		

Week 2: July 11 ~ July 17

Date	7/11	7/12	7/13	7/14	7/15	7/16	7/17
Time	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
09:00 12:00	Prof. Chih-Chung Chung	Prof. Wei-Chien Wang Duong Hoang Trung Hieu, M.S.	Prof. Wen-Yi Hung Ida Agustin Nomleni, M.S.	Prof. Wen-Yi Hung Wan-Ying Chien, M.S.	Prof. Wen-Yi Hung	Weekend	
12:00 14:00	Lunch						
14:00 17:00	Prof. Peng-Yu Chen	Prof. Yong-An Lai	Wen-Yi Hung Farid Sitepu (Ph.D. Candidate)	Prof. Wen-Yi Hung	Prof. Wen-Yi Hung		

Prof. Yuan-Chien Lin

- Interdisciplinary environmental disaster risk management and information technology applications: Hydrological and Environmental Information Laboratory (HEILAB).

The Hydrological and Environmental Information Laboratory combines statistical methods with data science, environmental science, hydrology and water resources to cultivate interdisciplinary research capabilities, solving hydrological and environmental problems with the latest big data and spatio-temporal data analysis methods, and further investigate the risks and provides information for government and management.

Prof. Shih-Huang Chen and Dr. Putri Adhitana

- Green Pavement Material and Technology

The world has been witnessed population growth with the increasing of resource use and various technological achievement. Construction and maintenance of roads use up lots of raw materials which requires massive amounts of energy and disrupts the environment. Material and pavement technology are two most important parameters for the sustainable pavement construction and need to more critically addressed. Porous, Permeable pavement, recycled pavement, warm and cold mix asphalt, bio-based sealant and paint were contained high performance structures and meet certain standards for reducing natural resource consumption. Hence optimize the sustainable designs with environmental concern, waste reduction, recycling, safety, and energy efficiency.

Prof. Tzu-Hsuan Lin

- Introduction of IOT and Infrastructure Sensing Laboratory

Prof. Tzu-Hsuan Lin is the PI at the IOT and Infrastructure Sensing Lab in NCU. The research activities are wireless sensor networks, infrastructure sensing, Robot, structural health monitoring, embedded system integration, AI and Internet of things. In this lecture, he will introduce several projects that have been completed or are in progress in his lab.

Prof. Chih-Chung Chung

- Disaster and Environment Monitoring Laboratory (DEMon)

Disaster and environment monitoring lab (DEMon) utilizes the time domain reflectometry (TDR), distributed optical fiber sensing, Internet of Things (Iot), and Intelligent technology (IT) for Geotechnical, Hydrology, Environmental disasters monitoring and characterization.

Prof. Peng-Yu Chen

- AI-informed seismic assessment and resilience evaluation for infrastructures

As the core of the recent development of computational algorithms, artificial intelligence (AI) has shown its capability to reduce labor-intensive and computationally expensive engineering issues. In this course, state-of-the-art deep-learning methods will be introduced for assisting seismic hazard assessment of infrastructures at a regional scale. Non-ductile reinforced concrete buildings are selected as target structures and evaluated through the AI-informed models and the performance-based earthquake engineering methodology. The resilience index is introduced to quantify the ability of a city to recover after a natural hazard. The regional-scale evaluation has the potential to provide information to decision-makers and next-generation engineers for developing resilient infrastructures. Multiple machine learning models will also be introduced in this course to inspire the audience to apply them to civil engineering.

Prof. Wei-Chien Wang and Duong Hoang Trung Hieu, M.S.

- Utilization of recycled and waste materials and special concrete

Recycling of waste materials saves natural resources, saves energy, reduces solid waste, reduces air and water pollutants and reduces greenhouse gases. In our laboratory, the industrial waste was collected and processed and then applied to concrete materials. Those research not only can achieve the detoxification effect, but also increase the recycling and utilization of resources, reduce carbon emissions, and create economic value. Hence, our research aims to utilize and recycle waste materials for concrete applications. Besides, our laboratory also research special concretes such as high early-strength concrete for rigid pavement, low-alkaline and low-alkaline self-filling concrete for nuclear waste final disposal sites, etc.

Prof. Yong-An Lai

- Structural Control Application in Civil Engineering

This lecture introduces the fundamental concepts of modern control theory and its application in the field of civil engineering. The sense of using active or passive control technology to dissipate/isolate vibration energy of structure will be presented. Some simple examples will be also demonstrated this lecture.

Prof. Wen-Yi Hung (Geotechnical Centrifuge Modeling Laboratory)

- Concept of Physical Modeling on Geotechnical Engineering

Centrifuge modeling plays an important role in geotechnical engineering to simulate a prototype situation through a reduced-scale version, reproducing soil behavior (stress and strength). This lecture would introduce the basic concept and application of centrifuge modeling on the soil-structure interaction, soil liquefaction, slope stability, dynamic response of structures, and the effectiveness study of countermeasures for disaster mitigation.

Jun-Xue Huang, Ph.D. Candidate (Geotechnical Centrifuge Modeling Laboratory)

- Mechanical and Dynamic Properties of Soil

Mechanical properties, aka engineering properties, are often used on foundation design in Geotechnical Engineering. Dynamical properties are usually used on the assessment of soil liquefaction potential. This lesson would introduce what are these properties and how to get these properties from the experiments.

Yi-Hsiu Wang, Ph.D. Candidate (Geotechnical Centrifuge Modeling Laboratory)

- Soil Mechanics Laboratory Tests

Soil is formed by different particles. Determine the soil properties is necessary before the construction project. This lesson would introduce the laboratory tests methods for obtaining the properties of soil (index properties, permeability characteristics, consolidation properties, cohesion and friction angle, etc.).

Trần Minh Cảnh, Ph.D. Candidate (Geotechnical Centrifuge Modeling Laboratory)

- LabVIEW application to control and read data

Laboratory Virtual Instrument Engineering Workbench (LabVIEW) is a graphical programming environment engineers use to control automatically and record data from the transducers. LabVIEW is applied worldwide in plenty of specializations. In the centrifuge modeling technique, LabVIEW is utilized to record data from sensors (accelerometers, LVDT, pore water pressure transducers, etc.) and remote control the devices such as motors, pressure switches, and air cylinders through the computer system. In conclusion, LabVIEW is a necessary tool for contributing successfully to centrifuge modeling tests.

Farid Sitepu, Ph.D. Candidate (Geotechnical Centrifuge Modeling Laboratory)

- Modeling the Offshore Wind Turbine in Geotechnical Centrifuge

Designing the OWT foundation need to deeply understand the behavior. The OwT foundation need to adapt to the marine environment.The OWT stability consider the dimensions and the force acting on structure and the ground including axial and horizontal force, static and cyclic types of loading and seismic. therefore, the geotechnical centrifuge still take special place in modeling the OWT foundation. The content of modeling the OWT on the centrifuge will included; scaling, mounting the model, loading system and analysis.

Ida Agustin Nomleni, M.S. (Geotechnical Centrifuge Modeling Laboratory)

- Image analysis in centrifuge modeling tests and UAV

The use of visual tools to illustrate engineering concepts is extremely important, as existing research has shown that visual input significantly enhances learning. As a supplement to traditional lectures, digital image analysis can help students understand complicated concepts in an easy-to-understand and engaging manner, while also providing them with hands-on experience. This summer camp will feature image analysis for centrifuge modeling tests and UAV data analysis. As part of in-field geotechnical site reconnaissance, UAV-enabled photogrammetry is being used to generate 3D models to study the damage to a site after natural disasters.

Wan-Ying Chien, M.S. (Geotechnical Centrifuge Modeling Laboratory)

- Effect of stratigraphic model uncertainty at a given site on its liquefaction risk assessment

Due to spatial variability of geological formation and lack of borehole data, it is necessary to evaluate the reliability (or probability) of geotechnical performance by considering geological or geotechnical uncertainty. In the first lesson, we will briefly introduce the example of liquefaction potential evaluation in Datong district (Taipei) by considering the geological and geotechnical uncertainties. The second lesson is an illustrative class, which is focused on the calculation of the uncertainty of factor of safety in a typical geotechnical engineering problem. The final lesson introduces the maximum likelihood estimation that is widely applied in the reliability-based analysis.