

# **Course: Measurements in civil engineering, transport, environmental engineering, mining and power engineering**

**Teaching hours:** 30 h

**Prerequisites:** The course is primarily open to all PhD students at Gdansk University of Technology. This course is compulsory for PhD students assigned to Civil Engineering and Transport as well as Environmental Engineering, Mining and Power Engineering tracks at Doctoral School of GUT.

## **Course outline**

### **Content**

This course allows the PhD students to obtain the knowledge related to the experimental equipment and types of experiments carried out at GUT in the field of civil engineering, transport, environmental engineering, mining and power engineering. PhD students participate in experiments carried out in different departments. They have a possibility to see the advanced measuring stations, modern equipment and devices.

### **General topics coverage:**

1. Interpretation of CPTU and DMT tests. Calibration chamber and centrifuge as modern tools for physical modelling in geotechnics. Measurements with piezometers. Reliability assessment of engineering structures, random modelling of action and resistance parameters.
2. Advanced measuring instruments used in geodetic surveys.
3. Measurements in earthquake engineering using shaking table.
4. Selection of appropriate methods of chemical and/or microbiological analysis. Methods of data evaluation.
5. Measurements of mechanical and electromagnetic wave propagation. Measurements for non-destructive testing of materials and structures.
6. Measurements in rivers. ADCP technics.

### **Teaching mode**

The course consists of laboratories delivered by different departments. The teaching method is carried out in the form of participating in measurements. PhD students answer questions, make individual reports or descriptions of their progress.

### **Examination**

PhD students are required to participate in all measurements and answer the questions asked by lecturers. At the end of the course, they are also advised to write an essay on one of the completed tests or measuring stand/apparatus that they will use for their PhD studies.

### **Fundamental readings:**

1. Lunne T., Robertson P.K. and Powell J.J.M.: *Cone Penetration Testing in Geotechnical Practice*. B A&P 1997.
2. Uren J., Price B.: *Surveying for Engineers*. Red Globe Press 2010.
3. Chopra A.K.: *Dynamics of Structures: Theory and Applications to Earthquake Engineering*. Prentice-Hall 1995.
4. Mackenzie L.D.: *Water and Wastewater Engineering: Design Principles and Practice*. 2020.
5. Wai-Lok Lai W., Dérobert X., Annan P.: A review of ground penetrating radar application in civil engineering: A 30-year journey from locating and testing to imaging and diagnosis. *NDT&E International* 96, 58–78, 2018.

6. Jol M.: *Ground Penetrating Radar: Theory and Applications*. Elsevier 2009.
7. Su Z., Ye L.: *Identification of Damage Using Lamb Waves: From Fundamentals to Applications*. Springer 2009.
8. World Meteorological Organization, *Guide to Hydrological Practices*, Volume I, Hydrology – From Measurement to Hydrological Information. Weather-Climate-Water, No.168, WMO 2008.