

Quality control and technical evaluation of building and civil engineering structures

- Initial requirements: Students should possess basic knowledge of building and civil engineering structures and building materials.
- Name, surname, title of teacher: **MOCZKO Andrzej, Ph.D.**
- Course's aims and educational outcomes:

The main aim of proposed course is to provide knowledge concerning procedures and advanced testing methods which can be applied for quality control and technical evaluation of different building and civil engineering structures. Proposed subject is intended to introduce students with basic principles and practical applications of several modern testing systems are discussed. Particular attention is focussed on the NDT methods (Non Destructive Testing) that can be applied for „in-situ” examination. One of most important aspects of proposed course is to offer for students a possibility for practical training in using modern testing systems in laboratory and „in-situ” conditions.

- Lecture – content:

Form of classes - lecture		Number of hours
1	Introduction, aims, scope and plan of the subject. Brief history review of the development of testing methods addressed for building structures.	2
2	Description of main quality control procedures and recommendations concerning technical inspection of building and civil engineering structures. Monitoring systems.	2
3	Modern methods for locating and identifying the reinforcing steel bars (Cover-Master, Profometer, Ground Penetrating Radar, radiography).	1
4	Characteristics of modern testing methods for non-destructive evaluation of “in-situ” concrete compressive strength (LOK-Test, CAPO-Test, COMA-Test, Rebound measurements).	3
5	Nondestructive evaluation of concrete tensile strength using “pull-off” measurements.	2
6	Characteristics of modern testing methods for non-destructive evaluation of corrosion risk assessment of building structures (Rainbow-Test, Aquamerck Test, Rapie Chloride Test, Corrosion Mapping Systems – Bloodhound, Galva Pulse).	2
7	Modern testing procedures for quality control of geotechnical works (PIT – integrity testing of piles, SLT – static load testing, DLT –dynamic load testing)	4
8	Modern testing methods for non-destructive examination of structural integrity of building structures (Impact-Echo, Impulse Response, infrared thermography, ultrasonic tomography).	4
9	Modern testing methods for monitoring underground infrastructures	3
10	Final examination test	1

- Laboratory – content:

Form of classes - laboratory	Number of hours

Lab.1	Introduction. Safety regulations. General description of non-destructive testing methods. Introduction to laboratory exercises with ultrasonic measurements	2
Lab.2	Exercises no 1 – ultrasonic measurements. Determination of ultrasonic pulse velocity in different building materials and determination of Young modulus of concrete.	2
Lab.3	Exercises no 2 – rebound measurements. Principles of the concrete compressive strength evaluation by means of rebound measurements. Introduction to laboratory exercises. Overview of available testing systems and measurement techniques. Interpretation of obtained results.	4
Lab.4	Exercises no 3 – Evaluation of the concrete compressive and tension strength by means of “pull-out” and “pull-off” measurements.	4
Lab.5	Exercises no 4 – Localization and identification of the reinforcing steel bars in concrete structures. Non-destructive cover layer measurements.	2
Lab.6	Exercises no 5 – Non-destructive moisture measurements in different materials.	2
Lab.7	Exercises no 6 – Quality and capacity control of foundation piles.	4
Lab.8	Exercises no 7 – Non-destructive integrity testing (Impact-Echo, Impulse Response)	2

- Seminar – content:

Each Friday students will prepare multimedia presentations showing current results of their work performed during last week.

- Basic literature:

[1] Sansalone M.J., W.B. Streett W.B., Impact-Echo Nondestructive Evaluation of Concrete and Masonry, Buullbrier Press, 1977.

[2] Schickert G., Wiggenhauser H., Non-Destructive Testing in Civil Engineering. Berlin, 1995. Bungey J.H., Millard S.G., M.G., Testing of Concrete in Structures, 4th Edition, Taylor&Francis, London and New York, 2006.

[3] Breyse D., Non-Destructive Assessment of Concrete Structures: Reliability and Limits of Single and Combined Techniques, State of the Art, Report of the RILEM Technical Committee 207-INR, Springer Dordrecht Heidelberg London New York, 2012.