

**Course offered by the PhD program
in Civil, Chemical and Environmental Engineering
a.y. 2026/2027 (41 cycle)**

(course is open for participation of students from other PhD cycles or programs)

1. Title: EXPERIMENTAL TESTING OF MATERIALS AND STRUCTURES

2. Course Objectives and Description

To provide students with both theoretical and practical knowledge related to *in situ* and laboratory tests on materials and structures.

Experimental testing is an important issue that is underestimated at all academic levels. The course aims at filling this gap.

The large experience of the DICCA Laboratories on R&D new testing procedures and on the application of existing ones is the background for practical issues on experimental testing.

3. Course Organization

The course is hold in English by means of frontal lessons in class 2.5 hours long/each. Students may access the facilities that are discussed in the course and may use them in the Laboratory. If possible, they will take part in some identification campaign that is periodically performed by the Laboratory.

4. Teacher

Antonio Brencich

5. Duration and credits

40 hours, 6 credits

6. Activation mode and teaching period

The course begins at the beginning of January 2027 and ends by the end of February 2027.

7. Deadline for registration

Beginning of the course

Students are requested to register through a mail message to: brencich@dicca.unige.it

8. Final exam

Oral only, in the date requested by the student.

APPENDIX. Short Program

General issues

Testing materials and structures. What is the strength of a material? Directly measured and derived quantities. Control schemes of a test: force and displacement control, Calibration of a test. Reduced scale testing. The concept of precision. Error theory (basics).

Equipment

Load and Displacement sensors. Data acquisition. Universal testing machines.

Material testing - Concrete

Fresh concrete (in situ tests). Hardened concrete (from 3 days to 12 months). Existing structures: NDTs and MDTs. Combined methods. Other tests/methods (thermography). Critical discussion of the procedures. Case study.

Material testing - Masonry

NDTs: sonic tests, rebound hammer, georadar. MDTs: flat jacks, core drilling, endoscope. Compression tests (axial) of brickwork. Diagonal compression test: in situ and in Lab tests. Case study.

Structure testing – Static tests

Aims and scope. Experimental setup. Technology. Designing the test. Data processing. Load tests on slabs. Theoretical estimation of the displacements. Acceptable-vs-failed tests. Load tests on bridges. Case study.

Structure testing – Dynamic tests

Aims and scope. Experimental setup. *Electric measures*: sampling and aliasing. Technology. Designing the test. Data processing. Case study.

Appendix: The collapses that changed Structural Engineering.... and some others

This Appendix has the form of 4 seminars (2hours/each) discussing relevant structural collapse case studies (and minor ones):

- Silver Bridge (built 1928 – collapsed 1967) and the Bridge Management Systems
- Hyatt Regency Walkway – Kansas City, 1981: the worst disaster in USA till 9.11 and other case studies
- Collapse of a steel warehouse
- Structure-excavation interaction: a case study