



RILEM EAC PhD Course Report

Title: Additively Manufactured Concrete Structures

Dates: 11-14 July 2023

Venue: Villa Orlandi (University of Naples Federico II), Capri Island, Italy

1) Brief outline of course topic (photos from course can be included, if available)

The main topics addressed in the summer school are:

- Additive Manufacturing processes
- Construction materials adopted in 3DCP
- Rheological requirements to control the printing process
- Mechanical-physical characterization in the fresh state
- Mechanical-physical characterization in the hardened state
- Analytical and numerical modeling of the printing process/layered structure
- Reinforcement technologies
- Structural optimization based on free-form capabilities
- Structural analysis and approval in large-scale applications
- Examples from practice

2) Who were the teachers-affiliations?

- Costantino Menna - University of Naples Federico II (Italy)
- Freek Bos - Technical University of Munich (Germany)
- Arnaud Perrot - Université Bretagne Sud (France)
- Jacques Kruger - Stellenbosch University (South Africa)

3) How many students attended (participants) —status (PhD, MSc, industry, etc.)Affiliations?

Total number of participants was 30 (maximum number of places available in the venue), of whom:

- 25 PhD/MSc students
- 2 Post-docs
- 1 senior academic
- 2 Industry

4) Number of Registered and unregistered students.

5) Brief review of course scope, course content and lecture schedule.

- The course scope and content seemed to match very well, and judging from the interest (60 registrations for 30 places), connects very well to the education needs in academia.
- The lectures covered almost any relevant topic, and seemed to connect very well, with some overlap to reinforce concepts.
- The program was very intensive, and perhaps tried to cover too much ground in 3,5 days (of which one half day was reserved for a social activity). In the future, the course length should perhaps be expanded to 4,5 days.
- There was no practical, hands-on 3d concrete printing session included. This could be a valuable addition in the future (although most participants already had some practical experience to varying degree).
- The lecture syllabus, that was very well referenced, was highly appreciated.

6) Financial support received.

The expenses of the Summer School were covered by the Department of Structures for Engineering and Architecture of University of Naples Federico II. Specifically, the financial support was provided by the program of the Italian Ministry of University and Research “Dipartimento di Eccellenza 2023-2027”.

7) Scientific (beyond EAC) Sponsorship.

- *fib* International Federation for Structural Concrete

8) Were Course Evaluations submitted by participants?

No. The teachers did discuss the course itself informally with some participants.

9) Evaluation of Learning Outcomes (Grading, etc) ECTS points, if applicable.

The learning outcomes were evaluated through a written test (1 hour). The course is valued at 3 CFU.

10) Is it planned to continue the course in future (i.e. as a course series at regular intervals)?

The teachers are currently considering a second edition in the summer of 2024 due to the high level of interest (the number of registrations of interest was approximately double the number of available places).

11) How was RILEM presented to participants?

RILEM was introduced in the opening lecture, using some slides from the standard RILEM presentation ppt. In addition, the work of the most relevant TCs was further highlighted in the opening lecture. The 3-year free membership was presented.

In the closing remarks, the support of RILEM was again acknowledged and participants were encouraged to join RILEM and one of more RILEM TCs.

Name: Freek Bos

Date: 17.08.2023

This summary report will be published on RILEM website (on the EAC page).

Please send separately the list of student participants (with their contact information) who attended the course to the General Secretariat for a special free membership of 3 years.*