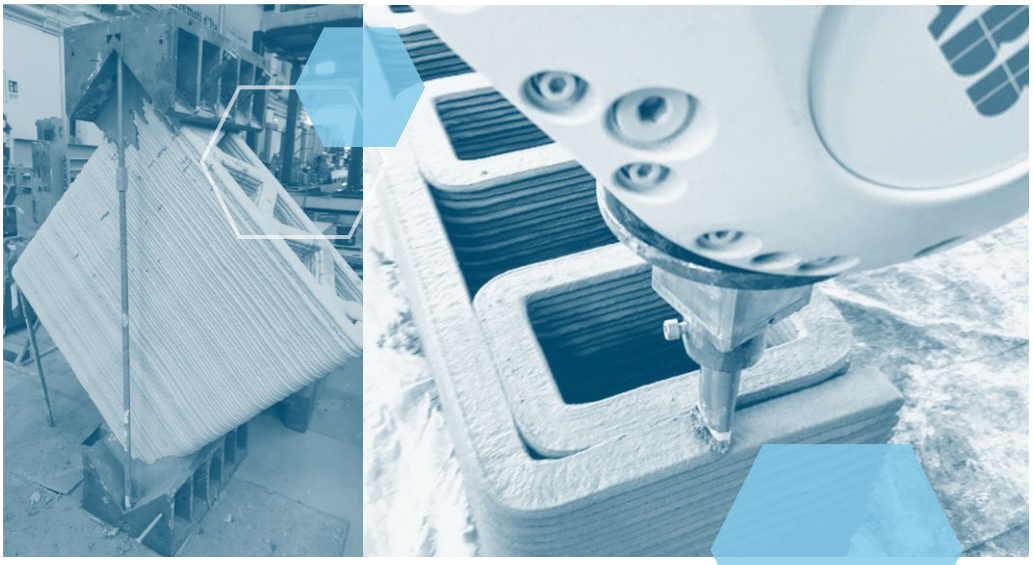
2nd INTERNATIONAL SUMMER SCHOOL

Naples, Italy - July 15-19, 2024

ADDITIVELY MANUFACTURED CONCRETE STRUCTURES



UNIVERSITY OF NAPLES FEDERICO II

Department of Structures for Engineering and Architecture

DiSt 2023-2027 DIPARTIMENTO DI ECCELLENZA MUR

Within the courses of the Ph.D. program in *Structural & Geotechnical Engineering and Seismic Risk*

LOCATION

Federico II Conference Centre
Via Partenope, 36 - 80121 Naples, Italy

CHAIRS

Costantino Menna
University of Naples Federico II

Freek Bos
Technical University of Munich

WHO SHOULD ATTEND

Ph.D. students, postdoctoral researchers, practitioners interested in research and applications of additively manufactured structures

CONTACTS

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PRE-REGISTRATION

URL: https://cutt.ly/zwBDrnT8
Deadline: April 30, 2024

AIM and SCOPE

The additive manufacturing (AM) of cementitious materials, particularly through the technique of 3D Concrete Printing (3DCP), is rapidly expanding in the construction industry with relevant developments in the material and production technologies as well as in the advanced design of high TRL projects. This growth necessitates a comprehensive understanding of various factors, including the control of material properties in their fresh state, structural analysis with reinforcement considerations, and the robust integration of applications on a large scale.

Currently, there is a pressing demand for establishing a solid academic foundation among researchers engaged in the digital design-to-fabrication process of innovative 3D printed structures. Enhancing technological and engineering expertise in 3DCP promises to elevate awareness within the construction field, thereby optimizing the socio-economic-environmental benefits derived from its effective implementation.

The primary objective of this Summer School is to train participants with the most advanced technical knowledge—analytical, numerical, and practical—on designing and constructing structures using 3DCP. A novel addition to this year's program includes sessions by distinguished guest lecturers on specific research themes or practical applications of 3DCP, alongside increased opportunities for students to engage with their research activities. This initiative aims to foster exchange and discussion on these topics, promoting a richer learning experience and deeper understanding of 3DCP's potential and challenges.

INTERNATIONAL LECTURERS

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)

DATES

15-19 July 2024

24 hours (3 CFU)

REGISTRATION

Link: https://tinyurl.com/b5uatt79
Deadline: June 30, 2024
Fee: 350 € for Master and PhD students – 600 € for post-doc, senior researchers, professionals, companies

Included: lunches and coffee breaks for the 5 days of the Summer School, social event, printed book of lecture notes, printing of the poster for the summer school competition (350€ prize).

VENUE

The summer school will be held in the **Conference Centre** of the University of Naples Federico II, in Via Partenope, 36 - 80121 Naples (Italy).

Via Partenope belongs to the "Lungomare di Napoli" which is a route of about 3 km that runs along the sea and that starts from Santa Lucia, from Via Nazario Sauro, and goes up to Mergellina, where it ends via Caracciolo, skirting one of the most beautiful "views" in the world, able to fascinate tourists but also the inhabitants themselves who crowd the splendid promenade during the whole year.

The Conference Centre is located in front of the **Castel dell'Ovo** which is the oldest castle of Naples. Its aspect has changed over the centuries after many wars: in fact, the castle was originally built by the Normans, restored by the Angioinians first and then Aragonese.

INVITED TALKS

Tim Wangler - ETH Zurich (Switzerland)
Manu Kurungod Mohan - Ghent University (Belgium)
Yamei Zhang - Southeast University (China)
Josephine V. Carstensen - Massachusetts Institute of Technology (USA)
Eric Kreiger - U.S. Army Engineer Research and Development Center (USA)

COURSE OUTLINE

- Additive Manufacturing processes using concrete
- 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 and practical applications

FINAL PROGRAM

Monday July 15, 2024 – Day 1

12.00 – 12.45: *Registration of participants*
12.45 – 14.00: *Welcome Lunch*
14.00 – 15.00 | ***Menna*** - ***Bos***: Introduction and presentation of AMCS-2024
15.00 – 16.00 | ***Bos***: AM Processes in the Digital Fabrication of Concrete
16.00 – 17.00 | ***Bos***: 3DCP Projects in practice
17.00 – 18.00: *Poster Session nr. 1 and research presentation by participants*
18.00 – | *Walking/Dinner around the city (not included in the SC fee)*

Tuesday July 16, 2024 – Day 2

09.00 – 11.00 | ***Perrot***: Materials & Rheology basics
11.00 – 11.20: *Coffee Break*
11.20 – 12.20 | ***Kruger***: How to print & cure (tools and equipment)
12.20 – 13.20 | ***Perrot***: Materials & Rheology – modeling and applications – Part I
13.20 – 14.30: *Lunch Break*
14.30 – 18.30: *Laboratory Visit* - ***Practical printing session***

Wednesday July 17, 2024 – Day 3

09.00 – 11.00 | ***Kruger***: Fresh state characterization – Part I
11.00 – 11.20: *Coffee Break*
11.20 – 13.20 | ***Perrot***: Materials & Rheology – modeling and applications – Part II
13.20 – 14.20: *Lunch Break*
14.20 – 15.20: *Poster Session nr. 2 and research presentation by participants*
15.20 – 19.20: Social event: *Guided Tour in* ***Galleria Borbonica***
19.30 – : Social dinner (offered by the Summer School)

Thursday July 18, 2024 – Day 4

09.00 – 10.00 | ***Kruger***: Fresh state characterization – Part II
10.00 – 11.00 | ***Kruger***: Printing process modeling
11.00 – 11.20: *Coffee Break*
11.20 – 13.20 | ***Bos*****:** Hardened state characterization and properties
13.20 – 14.30: *Lunch Break*
14.30 – 15.30 | ***Menna***: Structural Optimization – basics for 3DCP applications
15.30 – 16.15 | Invited Talk nr.1 - ***Wangler***: 3DCP chemistry basics
16.15 – 16.45: *Coffee Break*
16.45 – 17.30 | Invited Talk nr.2 - ***Mohan***: 3DCP durability issues

The Conference Centre is part of the numerous historical buildings of the University of Naples Federico II.

The University of Naples Federico II celebrates its **800th anniversary** this year, a milestone celebrated with the entire city.

The Federico II University, in addition to being one of the oldest in Europe, was the first university institution founded by a secular public authority. This prestigious distinction traces its origins to the enlightened Frederick II, the emperor who, 800 years ago, on June 5, 1224, founded the University where knowledge was made accessible to anyone in the Kingdom

Social Event

The Social Event of this year's Summer School will take place at the stunning **Galleria Borbonica** in Naples. This historical underground tunnel, originally commissioned by King Ferdinand II of Bourbon in the 19th century, offers a unique glimpse into the rich cultural and architectural heritage of the city. Attendees will have the opportunity to explore the intricate network of tunnels and passageways, marvel at the engineering feats of the past, and enjoy an evening of networking and cultural immersion in one of Naples' most fascinating historical sites.

Friday July 19, 2024 – Day 5

09.00 – 09.45 | Invited Talk nr.3 - ***Zhang***: 3DCP developments in China
09.45 – 10.45 | ***Bos*****:** Reinforcement technologies – Part I
10.45 – 11.15: *Coffee Break*
11.15 – 12.15 | ***Bos*****:** Reinforcement technologies – Part II
12.15 – 13.15 | ***Menna***: Structural analysis and principles – Part I
13.15 – 14.15: *Lunch Break*
14.15 – 15.15 | ***Menna***: Structural analysis and principles – Part II
15.15 – 16.00 | Invited Talk nr.4 - ***Carstensen***: Methods and tools in the 3DCP topology opt.
16.00 – 16.45 | Invited Talk nr.5 - ***Kreiger***: 3DCP developments in the US
16.45 – 17.15: *Coffee Break*
17.15 – 17.45 | Poster Session Award and ***Closing of the Summer School***

SOCIAL EVENT: GUIDED TOUR AT THE BOURBON TUNNEL (GALLERIA BORBONICA)

We are delighted to announce that we will be organizing and providing all participants with a half-day guided tour of the Galleria Borbonica on Wednesday, July 17th (Day 3). The tour will commence from the Summer School venue, which is conveniently within walking distance. Afterwards, we will conclude the day with a social dinner. Here are further details about the attraction and the restaurant:

- Galleria Borbonica - https://www.galleriaborbonica.com/en/home/home
- Tour Via delle Memorie - https://www.galleriaborbonica.com/en/tours/via-delle-memorie
- Restaurant for the Social Dinner: https://www.labersagliera.it/

Costs for the tour tickets and social dinner are already covered for all Summer School participants.

TRAVEL INFO - **How to arrive to the Conference Centre in Naples**

From Rome to Naples:

- From *Rome Airport* (Leonardo da Vinci-Fiumicino Airport): take the Leonardo Express train or other regional trains to Roma Termini, the main train station in Rome. From the airport, you can follow the pedestrian path to take the Leonardo Express (https://www.trenitalia.com/en/services/connections-to-and-from-rome-fiumicino-airport.html). The journey takes approximately 30 minutes. Train tickets can be purchased at the airport or at the train station.

- By train, from *Roma Termini*, the main train station in Rome. Take a train to Naples Central Station (Napoli Centrale). The journey takes approximately 1-2 hours, depending on the type of train (fast or regional, respectively). Train tickets can be purchased at the station or online in advance (https://www.trenitalia.com/en.html).

From Naples to the Conference Centre:

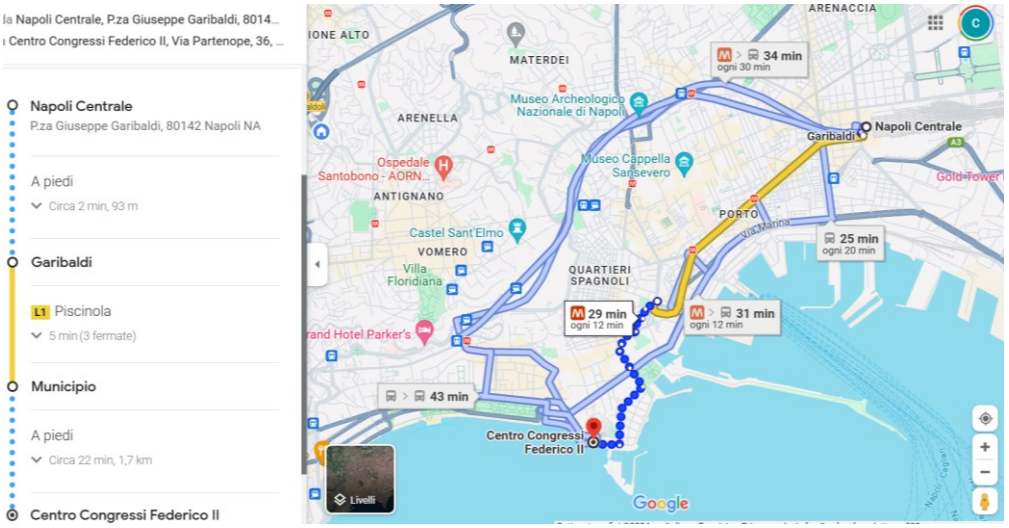
- From *Naples Airport* (Napoli Capodichino Airport): take the Alibus shuttle service (https://www.aeroportodinapoli.it/en_GB/collegamenti-con-napoli-centro) that connects the airport to Naples Central Station ("Napoli Centrale", in Italian). The journey takes approximately 20-30 minutes.

- From *Naples Train Station*: once you arrive in Naples Central Station ("Napoli Centrale", in Italian), make your way to the Conference Centre in Via Partenope.

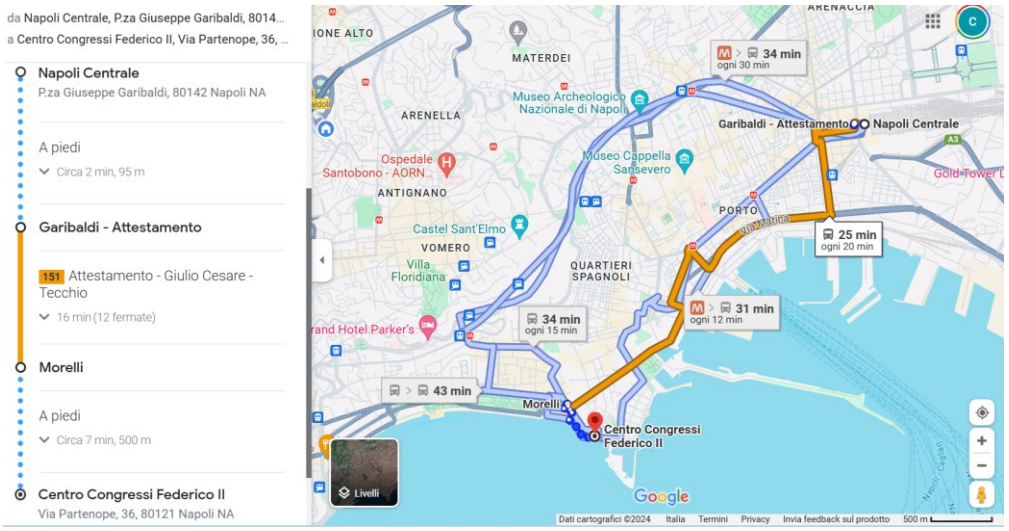
    - Option 1 - By Metro Line 1: At Napoli Centrale, take Metro Line 1 (direction Piscinola). Get off at the "Municipio" station. Exit the station and walk towards Via Partenope (approximately 15 minutes on foot).

- Option 2 - By Bus 151: At Napoli Centrale, take the bus 151 from the Piazza Garibaldi bus stop. Stay on the bus until you reach the "Via Acton - Porto" stop. From the bus stop, it is a short walk to Via Partenope.

Option 1 (Metro – Line 1)



Option 2 (Bus Nr. 151)



SUGGESTED HOTELS

The list includes some suggested accommodation in Naples. However, being July high season in Naples, applicants are encouraged to check accommodation availability in the whole city.

B&B/Hotel	Website	Mobile
At home Lettieri	https://bnbathomelettieri.wixsite.com/athomelettieri	+39.347.6533386
Bed in Naples	https://beb.it/bedinnaples/it/	+39.348.7556557
Casetta partenopea	https://www.airbnb.com/h/casettapartenopea	+39.389.8842803
Hotel Cimarosa	https://www.hotelcimarosa.it/	+39.331.4464424
La Maisonette	http://www.lamaisonnettebb.it/	+39.329.7483282
Luna Vomerese	https://abnb.me/weSRTh5BiS	+39.329.2948894
Villino Manina	https://beb.it/villinomanina/it/	+39.335.498412
Casa e Studio Gravina	https://abnb.me/aXduwgi93Eb	+39.333.4112510
Casa Valparaiso	https://air.tl/NEGiJWrz	+39.328.1569936
Charming Naples	https://www.charmingnaples.it/	+39.335.5874052

DETAILS

Please check periodically the link below for updates and further instructions.
https://www.dist.unina.it/-/57065587-additively-manufactured-concrete-structures-2024

PARTNERS

The summer school is supported by:

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