

## Doctoral Course

The Department of Structural Engineering at NTNU is hosting this doctoral course on hydration and microstructure characterization of cementitious materials (KT8308).

[www.ntnu.edu/studies/courses/KT8308#tab=omEmnet](http://www.ntnu.edu/studies/courses/KT8308#tab=omEmnet)

## Scope of Course

The course will provide the students with an understanding of the typically used techniques for microstructure characterization of cementitious material and ability to interpret data.

## Topics

- Physical principles of the following techniques: TGA, XRD, SEM-EDS, calorimetry, chemical shrinkage measurement
- Evaluation and interpretation of measurements
- Sample preparation
- Prediction of kind and amount of phases using ternary diagrams

## Collaboration Empa and NTNU

The doctoral course is jointly organized by the Department of Structural Engineering, NTNU, Norway, and the Laboratory for Concrete and Construction Chemistry, Empa (Swiss Federal Materials Research Institute) Switzerland.

Dr. Barbara Lothenbach, Empa, is joining the Concrete Group at Department of Structural Engineering at NTNU as International Chair, 20% Adjunct Professor, for a five-year period (2017-2021). Within the frame of this collaboration we are organizing this doctoral course.

## Scientific Support by RILEM

RILEM is an international union of experts in construction materials, systems and structures with the aim to promote scientific cooperation.

All doctoral students registered in the full doctoral course are offered a free 3-year RILEM membership.

More information about RILEM can be found at: [www.rilem.net](http://www.rilem.net)



Department of Structural Engineering  
Doctoral Course

# Hydration and microstructure characterization of cementitious materials

Trondheim, Norway  
June 11-15, 2018

## Organizers

**Klaartje De Weerd**t, NTNU, Norway  
**Barbara Lothenbach**, Empa, CH and NTNU, NO  
**Mette Geiker**, NTNU, Norway

## Lecturers

**Klaartje De Weerd**t, NTNU, Norway  
**Barbara Lothenbach**, Empa, CH and NTNU, NO  
**Mette Geiker**, NTNU, Norway  
**Wolfgang Kunther**, DTU, Denmark  
**Frank Winnefeld**, Empa, Switzerland  
**Alisa Machner**, NTNU, Norway

## Sponsors RILEM



## Work Load

The course counts for 5 ECTS points. This is reflected in the approx. 140 hours required for the lectures at NTNU, preparatory reading before the course, and completion of an individual report after the course. Social activities during the course are planned to promote a stimulating study atmosphere.

## Study Materials

Notes will be provided before the course. The following book is used: "*A practical guide to microstructural Analysis of Cementitious Materials*" Edited by K. Scrivener, R. Snellings, and B. Lothenbach, CRC Press 2016

## Evaluation and Diplomas

Diplomas will be issued based on active participation in the entire course and the delivery of individual reports after completion of the course (pass/fail grade).

## Participants

The participants are expected to have basic knowledge of cement hydration and concrete durability. All lectures will be given in English.

The maximum amount of participants is limited to 20.

## Accommodation

A list of hotels in the vicinity of the NTNU Gløshaugen campus in Trondheim is available on request.

## Travel

Plane: Trondheim airport (Værnes) is about 40 km east of Trondheim. There are international flights from Copenhagen and Amsterdam. If you travel from other cities Oslo is a good connection point.

Airport-taxi: This type of taxi from the airport to the city or the venue should be ordered upfront. You will share a taxi and you will be driven to your destination for a fixed price NOK 429. The regular fare to Trondheim might well be double. Taxi companies are:

Trøndertaxi: +47 930 073073 or

Norgestaxi: +47 910 08000

Busses connect the airport with Trondheim city centre and with Gløshaugen campus ([www.flybussen.no](http://www.flybussen.no) or [www.vaernesekspresen.no](http://www.vaernesekspresen.no)). The busses depart every 10 min directly in front of the airport.

## Costs

A course fee of 5000 NOK will apply for the entire course. The students will be responsible for travel, meals and accommodation.

## Further Information and Registration

To register please contact the workshop secretary before **23<sup>rd</sup> of April 2018**:

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