

INVITATION

Advanced Concrete Engineering

PhD course, 7,5 ECTS credits, 2024, Chalmers University of Technology

Content and objectives

Advanced Concrete Engineering is a course on PhD level, aiming at giving an overview of ongoing research within the area Concrete Engineering. This includes structural materials, components, connections, structural systems and special applications of reinforced and prestressed concrete. Issues related to different phases are treated, such as conceptual design, design and detailing, production, operation, ageing, and assessment. The course content builds on education about concrete structures at undergraduate and Master's levels.

The area Concrete Engineering can be further described with the following main areas:

- material behaviour, mechanics and modelling of various types of concrete, reinforcement and prestressing units,
- behaviour, modelling, design and detailing of components and connections in concrete structures,
- solutions with regard to efficient use of resources and sustainability during production and operation.

Learning outcomes

After the course the participant should be able to

- describe the field of concrete engineering, its challenges and possibilities,
- demonstrate advanced and up-to-date specialised knowledge in a limited area of this field,
- communicate fundamental knowledge in the field of concrete engineering in a pedagogical way,
- relate their own research topic or development work to the field of concrete engineering, and
- demonstrate the ability to review and evaluate research work within the area.

Attendance

Recommended basis for the course is Master's level in Structural Engineering, including MSc courses in Concrete Structures. The course should be of interest for

- PhD students, teachers and researchers in structural concrete,
- practising structural engineers specializing in concrete engineering.

Time plan

The course will take place in 2024.

Startup: Online meeting defining topics, groups and timeplan (*Preliminary March 8, 13-15; alternatively March 12, 13-15*)

Preparation period 1a: At least two weeks

Outcome: Literature and detailed learning outcomes for all topics decided.

Preparation period 1b: At least four weeks

Outcome: Lectures for Session 1 planned, quizzes designed and published.

Session 1, Introductory lectures: Three days (*Preliminary: April 24-26; alternatively May 22-24. To be decided latest on the Start-up meeting*)

Preparation period 2a: At least two weeks

Outcome: Literature read; quizzes done by all participants.

Preparation period 2b: At least four weeks

Outcome: Lectures for Session 2 planned.

Session 2, Continuation lectures: Three days (*Preliminary: June 24-26; alternatively August 26-28. To be decided latest on the Start-up meeting*)

Note! The value of the course depends very much on the effort of the participants during the preparation periods and the active contributions to discussions and group work at the sessions. Therefore, engagement and involvement are requested.

The literature and lectures are in English.

Registration

Registration for the course should be made no later than **January 30, 2024 on this link:**

<https://ui.ungpd.com/Surveys/dabf4589-1813-45fa-8196-d1a31d97ae2c>, where you will state your name, e-mail address, affiliation, your research topic (or special area of interest if you are practicing engineer), link to you Lic. thesis if you have one, email address of your PhD supervisor (please leave blank if you are a practising engineer), and which of the alternative dates above that work in your calendar.

The basic registration fee is 20 000 SEK (payment after the start-up meeting when the topics are decided). Participation is free for PhD students from:

- research groups within the Structural Engineering field of [Sveriges Bygguniversitet](#) (i.e. Chalmers, KTH, Luleå and Lund)
- [Nordic Five Tech](#) universities (i.e. DTU, NTNU, Aalto University, KTH and Chalmers)

For other PhD students, information about payment can be obtained from the contact person.

The cost for travel and accommodation has to be covered by each participant.

Course organization

The course is a part of the course program in the National graduate school in Structural Engineering within “Sveriges Bygguniversitet”. The course venue is Chalmers.

Contact: Course responsible Karin Lundgren, Karin.Lundgren@chalmers.se

Detailed procedure for preparations and contributions

Selection of topics

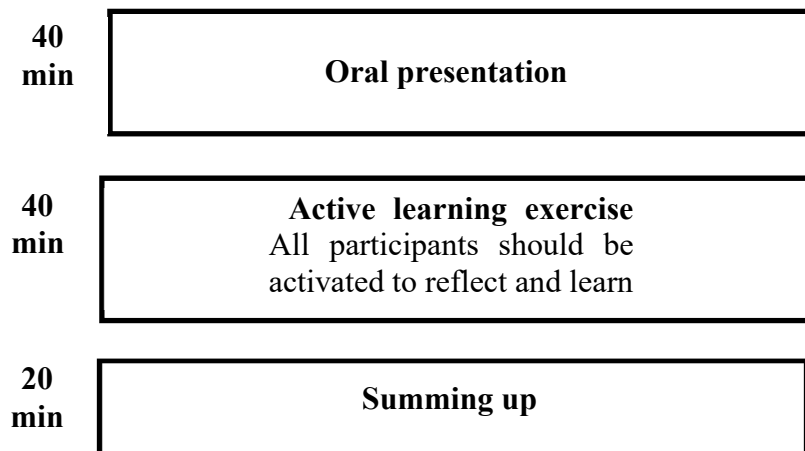
The topics covered by the course will largely be guided by the research topics of the participants that are PhD students within Concrete Engineering. If participating PhD students have very similar topics, we will slightly direct them in different parts to gain synergies but avoid overlap. Course participants that are not PhD students within Concrete Engineering will be assigned a suitable topic. All course participants will thus act as responsible for one topic (which when applicable will be their own research topic), and as “sidekick” for another topic. Lectures will be prepared during the preparation periods by the participants.

For PhD students within Concrete Engineering: Their PhD supervisors are expected to contribute by supervising the lecture preparation of their PhD student during the preparation period. It is also very much appreciated if the PhD supervisor attends the lecture (can be done online in a hybrid format, even if the course participants meet at the course venue).

Literature and detailed intended learning outcomes

For each topic, the responsible participant suggests literature and detailed intended learning outcomes, which are commented by the PhD supervisor and “sidekick”, and finally decided by the course responsible. When suitable, the kappa of the responsible PhD student’s Lic. thesis will be used as literature, with focus on the State-of-the-Art part of it. Else, the kappa of a recent PhD thesis, or suitable (review) papers will be used. Note that the learning outcomes should be reached by all participants during the lecture, not only by the participants preparing the lecture.

Design of a lecture (multiple shorter blocks with the same overall structure are also most welcome)



Each topic is treated during a 2-hour lecture at both Session 1 and 2. The lectures should be prepared such that all participants can reach the detailed intended learning outcomes of the topic.

The responsible course participant introduces the topic by a prepared oral presentation (40 minutes). This is followed by an active learning exercise (40 minutes including presentation of the task), prepared by the responsible course participant and the “sidekick”. The responsible course participant sums up the discussion and gives, if needed, complementary information (20 minutes).

The active learning exercises are very important. They shall be designed to force the course participants to reflect over the topic and get a deeper understanding. The “sidekick” has an important role in designing the active learning exercises to ensure that they end up on relevant level. The active learning exercises can e.g. be discussions in small groups, exercise or problem solving. Some general examples of suitable questions to discuss:

- What is “common ground” in this topic; i.e. what do different research studies agree upon? What are the major research gaps?
- What methods are commonly used? Can you think of alternative methods? What are the pros and cons with the methods used, and with alternatives?
- How do different methods address the major research gaps?
- What are the practical implications of the major research gaps? How are these handled today?

These general types of questions are likely suitable at Session 1. At Session 2, the ambition is to deepen the knowledge on the topic in question. Variants of the earlier stated example questions may work at this occasion too, together with e.g.:

- How can specific results be interpreted? Any alternative interpretations? Any examples of conflicting results?

Note that these questions are given for inspiration only! The developed intended learning outcomes should be used to design suitable active learning activities for each topic.

Design of a quiz

For each topic, the responsible course participant together with the “sidekick” design a quiz suitable for the other course participants to carry out latest two weeks after Session 1. The quiz shall assess whether the participants have reached a basic level of the intended detailed learning outcomes.

Requirements to obtain credits

To obtain credits for the course, the participant must act as responsible for one topic and “sidekick” for another. The following should be prepared for each topic:

- **Detailed intended learning outcomes.**
- **Two oral presentations**, supported by slides.
- **Active learning exercises** that force the participants to reflect over the topic and get a deeper understanding.
- **A quiz** for the other participants to assess whether they have reached a basic level of the intended detailed learning outcomes.

Further, to obtain credits for the course, the participant shall:

- **Actively participate in all lectures.**
- **Pass the quizzes for all topics.**