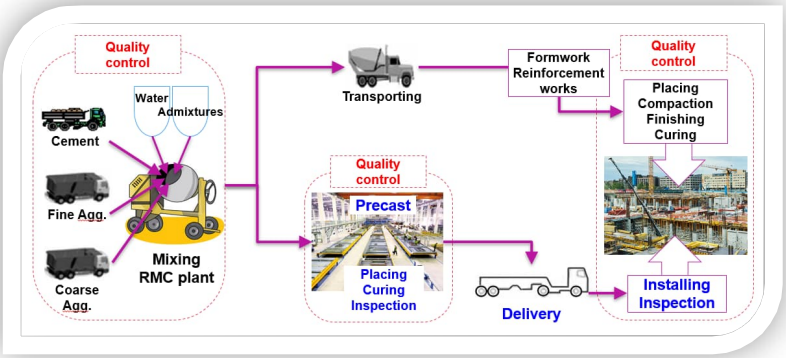


CIV-E2060 Production Technology of Concrete Structures D (5 cr)

Course Syllabus

26.2.2024-17.4.2024

1. Course information

Status of the Course:	Programme Name: Building Technology Major studies; Construction and Maintenance
Level of the Course:	Aalto Eng, master's degree course
Teacher in charge:	Prof. Jouni Punkki Staff Scientist: Fahim Al-Neshawy
Course assistanta:	Saranya Ravichandren and Kanwar Osama Zulfiqar

Teaching Period: IV 2024 (Period IV)
Organization: Department of Civil Engineering
Grading: 1 – 5
Language: English

2. Learning Outcomes

Upon successful completion of the course, students will be able to:

1) Understand the manufacturing process of the in-situ and precast concrete structures.
2) Plan the various stages of the in-situ process (different forming systems, reinforcement systems, batching, mixing, placing, curing and finishing of site-cast concrete).
3) Understand the common precast concrete fabrication process (manufacturing of elements, transporting and installing of elements).
4) Apply the practical concreting technologies under extreme environmental production conditions.
5) Perform quality control of concrete production.

3. Course Content

The course covers the following topics:

- On site concrete production.
- Precast concrete manufacturing.
- Special concretes and concreting under extreme environmental condition.
- Quality control of concrete.

4. Teaching methods

The course includes the following teaching methods and activities:

1) Lectures and expert talks
2) Concrete work plan and concrete production related topics - group assignment and seminar
3) Excursions - (Concrete element factory and construction site)
4) Learning diaries
5) Final written exam

4.1 Lectures and expert talks

The course includes lectures covering the content of the course. These lectures are divided into 2 parts:

1) introductory lecture by the course teachers and
2) concrete industry – expert talks. Expert talks are presented by experts in the field of concrete structures production to introduce new technologies and advancements of the concrete industry.

The lecture schedule listed in the table is preliminary and may change during the term based on the experts' timetable.

Table 1. Lecture timetable and contents.

Date and time			Topic	Lecture hall
Mon	26.02.2024	12:00 - 14:00	Introduction to the course	R266
Wed	28.02.2024	10:00 - 12:00	Special types of concrete	R266
Mon	04.03.2024	12:00 - 13:00	Concreting site practices (Ready Mix Concrete, pumping, compaction, curing etc.)	R266
		13:00 - 14:00	Guest lecturer: Ready-Mix Concrete plants – Tuomas Mannonen, Ruskon Betoni Oy	
Wed	06.03.2024	10:00 - 11:00	Concreting plan	R266
		11:00 - 12:00	Guest lecture: Special aspects of infra structures – Jussi Vuotari, Väylävirasto	
Mon	11.03.2024	12:00 - 13:00	Related site practices - formworks and reinforcement	R266
		13:00 - 14:00	Guest lecturer: BRE formworks – Kimmo Matikainen, BRE Group	
Wed	13.03.2024	No teaching – replaced by the EXCURSION – Crown Bridges (Kruunusillat) construction site on Friday 15.03.2024		
Thu	14.03.2024	10:00 - 11:00	Precast concrete production	R266
		11:00 - 12:00	Guest lecturer: Hollow-core slab production – Mikko Koskinen, Consolis	
Fri	15.03.2024	10:00 - 12:00	EXCURSION – Crown Bridges (Kruunusillat) construction site	
Mon	18.03.2024	12:00 - 14:00	EXCURSION – Hollow-core slab PRE-CASTING factory, HYRYLÄ	
Wed	20.03.2024	10:00 - 12:00	Guest lecturer: Concrete pipes and manhole – Mika Tulimaa, Rudus Oy	R266
		11:00 - 12:00	Guest lecturer: Shorcreting – Miika Kalliokari, Oy Rockplan Ltd	
Mon	25.03.2024	12:00 - 13:00	Guest lecturer: Precast production Design aspects, delivery models. Juha Rämö, Consolis	R266
		13:00 - 14:00	Hot and cold weather concreting	
Wed	27.03.2024	12:00 - 14:00	Guest lecturer: Construction of special concrete structures - Slipform structures and Underwater concrete casting – Esa Kunnassaari, Fimpec Oy - TEAMS LECTURE	R266
Mon	01.04.2024		Easter holiday week	
Wed	03.04.2024		Easter holiday week	
Thu	04.04.2024		Easter holiday week	
Mon	08.04.2024	12:00 - 13:00	Key factors involved Quality Control of concrete production	R266
		13:00 - 14:00	Guest lecturer: Practice QC and requirements – Ari Mantila, The Confederation of Finnish Construction Industries RT (CFCI)	
Wed	10.04.2024	10:00 - 12:00	Seminar I	R266
Thu	11.04.2024	10:00 - 12:00	Seminar II	R266
Wed	17.04.2023	9:00 – 12:00	Course examination	R1 - 160a

4.2 Group assignments

The assignment summarizes existing construction sites concrete production plan. This assignment report include:

1) General description of the construction project (location, exposure class(s), nearest materials and equipment suppliers).
2) Site arrangement (layout of the construction site – principal (basic) layout).
3) Concrete specifications (BY65): basic (typical) mix design, site work (the needed placing, compaction (if needed), curing, strength development (based on maturity age).

4) Production technology: Site related wok (formwork, reinforcement), concreting plan report and quality control testing plan.
5) Safety guidelines (shortly)

The main objective of the assignment is to enable students to combine knowledge related to the production technology of concrete structures. Groups are asked to prepare (i) a maximum of 20 pages assignment report including the concreting plan and (ii) a presentation at the course seminar about the assignment. The presentation is max. 10 slides length, and the presentation time is about 15 min including feedback/oral examination.

The weighted grade of the course assignment is 30% of the final grade of the course.

4.3 Excursions - (Prefabricated concrete element factory and construction site)

Two excursions are arranged during the course:
1) Excursion - I (Prefabricated concrete Element Factory)
2) Excursion - II (Construction site)

4.4 Learning diaries

A learning diary is a tool for assessing and developing one's own learning. It helps you describe your own experience, which helps identify weaknesses and strengths related to learning.
This course include:

- 10 learning diaries about the topics of the course lecturers (maximum of 2 pages per learning diary)
- 2 learning diaries about the excursions to the prefabricated concrete element factory and the construction site.

The weighted grade of the learning diaries is 10% of the final grade of the course.

4.5 Final exam

The written exam includes 4 questions covering the course outcomes. The questions are (short) essay question types. The weighted grade of the final exam is 60% of the final grade of the course.

5. Course Workload

The estimated student workload (5 cr = 135h) includes:

Table 2: Course estimated workload.

Student activities	Quantity	Duration (Hour)	Total workload (Hour)	Total hours	Portion %
Individual work - Exam					
Lectures including guest lectures	10	2	20		
Weekly assignment session	4	2	8		
Course excursions	2	4	8		
Independent reading for the exam	1	42	42		
Final examination	1	3	3	81.0	60
Individual work - Learning diaries					
Lecturers - learning diaries	10	1	10	13.0	10
Ecxursions - Learning diaries	2	1.5	3		
Group work - Course assignment					
Assinment work (group meeting, discussions etc.)	3	3	9	41.0	30
Writing the assignment report	1	25	25		
Seminar presentation (preparing and presenting)	1	7	7		
Total workload (Hours)			135		
ECTS Credit of the course (workload / 27)			5		

6. Assessment methods and grading scale

The total points of the course are 100 and the grading scale for the course is: 5; 4; 3; 2; 1 (lowest); 0 (failed).

Table 3: Course grading

Total points	Grade
<50	0
50 ··· <60	1
60 ··· <70	2
70 ··· <80	3
80 ··· <90	4
90 ··· 100	5

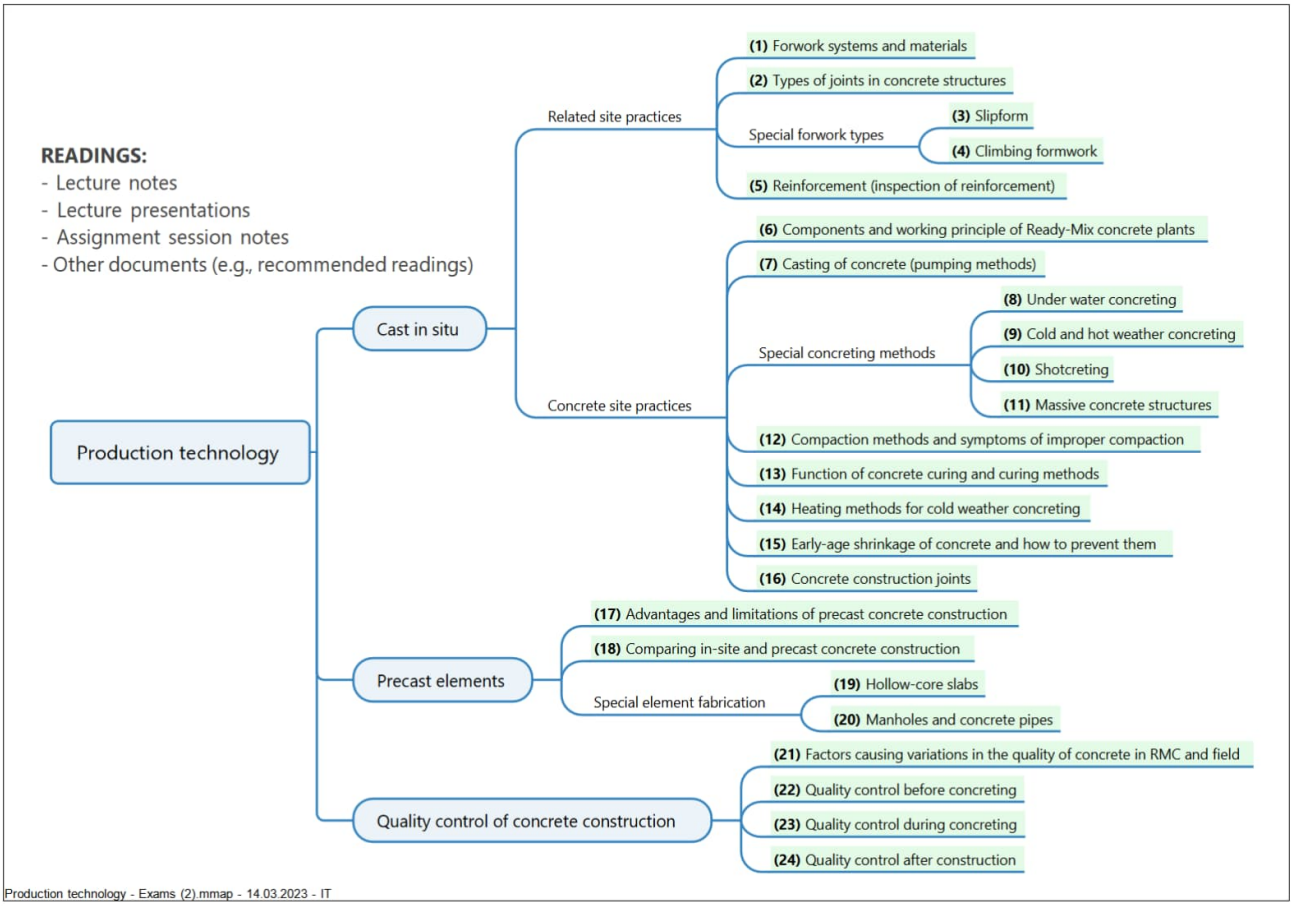
7. Study Materials

Recommended readings for the course:

1) Newman, J. and Choo, B. S., (2003). Advanced Concrete Technology, Volume 3: Processes (*chapters related to the production of concrete structures*). Available at Aalto University Primo center: https://app.knovel.com/kn/resources/kpACTVS00R/toc?cid=kpACTVS00R
2) BY 201 - Betonitekniikan oppikirja 2018 (in Finnish)
3) Course handouts

8. Prerequisites

1) CIV-E1010 Building Materials Technology 5 op
2) CIV-E2020 Concrete Technology L, 5 op


READINGS:
- Lecture notes
- Lecture presentations
- Assignment session notes
- Other documents (e.g., recommended readings)
Production technology
Cast in situ
Related site practices
(1) Forwork systems and materials
(2) Types of joints in concrete structures
Special forwork types
(3) Slipform
(4) Climbing formwork
(5) Reinforcement (inspection of reinforcement)
Concrete site practices
(6) Components and working principle of Ready-Mix concrete plants
(7) Casting of concrete (pumping methods)
Special concreting methods
(8) Under water concreting
(9) Cold and hot weather concreting
(10) Shotcreting
(11) Massive concrete structures
(12) Compaction methods and symptoms of improper compaction
(13) Function of concrete curing and curing methods
(14) Heating methods for cold weather concreting
(15) Early-age shrinkage of concrete and how to prevent them
(16) Concrete construction joints
Precast elements
(17) Advantages and limitations of precast concrete construction
(18) Comparing in-site and precast concrete construction
Special element fabrication
(19) Hollow-core slabs
(20) Manholes and concrete pipes
Quality control of concrete construction
(21) Factors causing variations in the quality of concrete in RMC and field
(22) Quality control before concreting
(23) Quality control during concreting
(24) Quality control after construction
Production technology - Exams (2).mmap - 14.03.2023 - IT