

Concrete Structures: Prestressed Concrete and Slabs (E052621)

Course size *(nominal values; actual values may depend on programme)*

Credits 6.0

Study time 180 h

Course offerings and teaching methods in academic year 2024-2025

A (semester 2)	English	Gent	seminar lecture
B (semester 2)	English	Gent	seminar lecture
C (semester 2)	Dutch	Gent	

Lecturers in academic year 2024-2025

Wan-Wendner, Roman	TW14	lecturer-in-charge
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Offered in the following programmes in 2024-2025

	crdts	offering
Bridging Programme Master of Science in Civil Engineering	4	B
Master of Science in Engineering: Architecture(main subject Architectural Design and Construction Techniques)	6	A
Master of Science in Engineering: Architecture(main subject Urban Design and Architecture)	6	A
Master of Science in Civil Engineering	6	C
Master of Science in Civil Engineering	6	A
Exchange Programme Architecture	6	A

Teaching languages

English, Dutch

Keywords

concrete structures, prestressed concrete, reinforced concrete, linear elements, slabs, design concepts, execution aspects

Position of the course

The aim of the course is to give the students insights into the mechanical behaviour of prestressed concrete structures and to make them acquainted with the design methods and guidelines for practical execution. Moreover, the elastic theory and the practical design of thin concrete slabs are treated. In this course use is made of the concepts and design models developed in "Reinforced and prestressed concrete I".

For the 4 credit offering prior knowledge concerning the design of statically determinate prestressed concrete elements is assumed.

Contents

- Prestressed concrete: Sectional design for bending under service conditions, Tendon lay-out, Ultimate limit state for bending, Shear, Statically indeterminate beams, Anchorage zones, Prestress losses, Material characteristics and prestressing systems
- Reinforced concrete: Elastic analysis of thin slabs, Internal force distribution and design of single slab panels, continuous slabs, and flat slabs

Initial competences

Mechanics of Materials, Strength of Materials, Concrete Technology, Structural analysis I, Reinforced and Prestressed Concrete I

Final competences

- 1 Describe the different prestressing systems and concepts. Substantiate the advantages and disadvantages.
- 2 Have insight in the general design philosophy of prestressed concrete structures in the framework of the semi-probabilistic safety format. Identify and characterize the relevant limit states.
- 3 Derive the stress conditions in a critical section in service conditions. Demonstrate how the prestressing force and the eccentricity can be determined by a stepwise procedure.
- 4 Discuss the criteria for the determination of the tendon profile over the length of a beam. Derive the forces exerted by a prestressing tendon on a concrete beam.
- 5 Substantiate the influence of prestressing on the shear resistance of beams.
- 6 Elucidate the verification of the ultimate limit state of flexure. Clearly identify the underlying basic assumptions and material laws.
- 7 Analyse the secondary moments that are caused by prestressing. Derive a procedure for the design of statically indeterminate systems.
- 8 Analyse the different types of splitting actions in the anchorage zones of prestressed concrete girders.
- 9 Discuss the different types of instantaneous and time-dependent losses of prestress. Analyse their interaction. Derive formulas for the practical calculation.
- 10 Have insight in the mechanical behaviour in and the state of deformation of thin elastic plates. Derive some basic design principles for slab panels in reinforced concrete.
- 11 Analyse the structural behaviour of flat plates. Discuss the current design procedures.
- 12 Detail the reinforcement in concrete slabs taking into account durability criteria and practical execution guidelines.

Conditions for credit contract

Access to this course unit via a credit contract is determined after successful competences assessment

Conditions for exam contract

This course unit cannot be taken via an exam contract

Teaching methods

Seminar, Lecture, Independent work

Extra information on the teaching methods

The theory is taught during lecture sessions.

Seminars consist of guided exercises. We may supplement the traditional way of teaching exercises with a flipped classroom concept in which the learning content is given online or offline in advance.

Study material

Type: Syllabus

Name: Prestressed Concrete
Indicative price: € 15
Optional: no
Language : English
Number of Pages : 246
Oldest Usable Edition : 2018-2019
Available on Ufora : No
Online Available : No
Available in the Library : No
Available through Student Association : No
Additional information: can be purchased at the department secretariat

Type: Syllabus

Name: Slabs
Indicative price: € 5
Optional: no
Language : English
Number of Pages : 110
Oldest Usable Edition : 2018-2019
Available on Ufora : No

Online Available : No
Available in the Library : No
Available through Student Association : No
Additional information: available in the secretariat

Type: Slides

Name: Prestressed Concrete and Slabs
Indicative price: Free or paid by faculty
Optional: no
Language : English
Number of Slides : 620
Oldest Usable Edition : 2023-2024
Available on Ufora : Yes
Online Available : No
Available in the Library : No
Available through Student Association : No

References

- "Structural ConcreteTextbook", fib Bulletins 51, 52, 53 and 54, fib, Lausanne
- Eurocode 2: Design of concrete structures - Part 1-1: general rules and rules for buildings (EN 1992-1-1), CEN, Brussels
- fib Model Code 2010, Volumes 1 & 2, fib Bulletins, fib Bulletins, 65 and 66, fib, Lausanne
- "Prestressed Concrete: Analysis and design", A.E. Naaman, Technopress, Ann Arbor, 2004
- "Prestressed concrete structures", M.P.Collins, D.Mitchell, Prentice Hall, 2001
- "Reinforced Concrete: mechanics and design", J.K. Wight, J.G. MacGregor, Pearson, 2012
- "Prestressed Concrete: a fundamental approach", E.G. Nawy, Prentice Hall, 2010
- "Reinforced concrete slabs", R.Park, W.L.Gamble, John Wiley & Sons, 2000

Course content-related study coaching

By the lecturer and assistants. Contacts are possible during or after the lectures and the problem solving sessions as well as through Ufora.

Assessment moments

end-of-term and continuous assessment

Examination methods in case of periodic assessment during the first examination period

Oral assessment, Written assessment

Examination methods in case of periodic assessment during the second examination period

Oral assessment, Written assessment

Examination methods in case of permanent assessment

Written assessment, Assignment

Possibilities of retake in case of permanent assessment

examination during the second examination period is possible in modified form

Extra information on the examination methods

End-of-term assessment:

1. Written exam open book (exercices);
2. Written exam closed book including oral explanation (theory).

Continuous assessment:

Evaluation of independently solved exercises (written) with the use of lecture notes;

Calculation of the examination mark

End-of-term assessment, open book exercise exam: 40%
End-of-term assessment, oral theory exam: 50%
Continuous assessment: 10%