

Advanced Bridge and Tunnel Engineering (E044821)

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 2025-2026

A (semester 1)	English	Gent	group work lecture peer teaching independent work	
B (semester 1)	Dutch	Gent	independent work	0.0h

Lecturers in academic year 2025-2026

De Backer, Hans TW15 lecturer-in-charge

Offered in the following programmes in 2025-2026

	crdts	offering
Bridging Programme Master of Science in Civil Engineering	6	A
Master of Science in Civil Engineering	6	B
Master of Science in Civil Engineering	6	A

Teaching languages

English, Dutch

Keywords

steel and concrete bridges, composite bridges, tunnels

Position of the course

Establishing guidelines and application examples enabling a technically consistent design of steel and composite bridges, with compliance to the building conditions and integration of the construction in its environment. The final part gives a detailed introduction to tunnel engineering.

Contents

- Generalities: Steel for bridge construction, Joints in bridge, Fatigue resistance, Global and local buckling
- Dynamics of bridges
- Seismic design of bridges
- Design of arch bridges
- Cablestayed bridges
- Suspension bridges
- Movable bridges
- Protection: waterproofing, paints, bridge joints, concrete cover
- Composite bridges: single beam bridges, continuous bridges, viaducts, composite action, connectors, box girder bridges, prestressed composite bridges
- Free bridge design: Concept of bridge, Preliminary design, Construction and erection
- Tunnels: Cut and cover tunnels, Bored tunnels, Technical equipment of tunnels, Preliminary analysis
- The use of large concrete box girders

Initial competences

Concrete Structures: Prestressed Concrete and Slabs, Metal Structures, Structural Analysis II, Concrete Structures: Reinforced Concrete, Structural Analysis I

Final competences

- 1 Understand the main principles of the design and construction of steel bridges (welds, bolts, distortion of box girders, local and general buckling, suspension bridges, arch bridges, movable bridges, seismic and dynamic design, tolerances, wind loads, ...) composite bridges (connectors, stay cable bridges, different concepts, ...) and tunnel engineering (cut-and-cover tunneling, TBM tunneling,)
- 2 Understand the impact on the overall design of certain elements from codes, construction methods, etc. Understand the influence of several boundary conditions from a technical as well as non-technical nature.
- 3 Being able to understand and discuss research material relevant to the course subject. Discuss this with others and develop an opinion about the subject.
- 4 Designing a bridge in the most suited software package. Being able to report about this and knowing how to refine the initial concept. Knowing the crucial elements of the design and understanding them.

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

Group work, Lecture, Independent work, Peer teaching

Extra information on the teaching methods

The students have to use the following software: AutoCAD, Buildsoft Diamonds, SCIA Engineer. The use of a laptop is necessary.
PGO-tutorial and microteaching are mainly organised online. On campus meetings for specific problems are possible on appointment.

Study material

Type: Syllabus

Name: Advanced Bridge & Tunnel Engineering
Indicative price: Free or paid by faculty
Optional: no
Language : English
Number of Pages : 638
Available on Ufora : Yes
Online Available : Yes
Available in the Library : No
Available through Student Association : No

Type: Slides

Name: Slides accompanying lectures
Indicative price: Free or paid by faculty
Optional: no
Language : English
Available on Ufora : Yes
Online Available : Yes
Available in the Library : No
Available through Student Association : No

References

- The Manual of Bridge Engineering, M. J. Ryall, G. A. R. Oarke, J. E. Harding, Thomas Telford, 2000.
- Steel-Concrete Composite Bridges, D. Collings, Thomas Telford, 2005.
- Bruggenbouw, Ontwerp en Constructie (Vol. II, III & IV), P. Van Bogaert, Academia Press, 2005.

Course content-related study coaching

The teacher is available before and after courses.
In addition, students can make an appointment by mail.

Assessment moments

end-of-term and continuous assessment

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

Oral assessment

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

Oral assessment

Examination methods in case of permanent assessment

Participation, Presentation, Peer and/or self assessment, Assignment

Possibilities of retake in case of permanent assessment

examination during the second examination period is not possible

Extra information on the examination methods

PE: oral closed-book examination, written preparation.

NPE: graded assignment (group work) with peer-assessment; grading of the report and presentation of the peer-teaching, with peer-assessment. Participation to all individual contact moments is mandatory.

Calculation of the examination mark

The final score is determined based on the following subscores:

- PE: 35% of the final score
- NPE: 65% of the final score.

If one or more of these subscores (examination, peer-teaching and group work) results in a score lower than 7/20, the student cannot pass for this course. The final score will be the minimum of 9/20 and the calculated value as described above.