Hanze University of Applied Sciences Groningen

Minor

Qualification awarded
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Length of the programme
6 months

ECTS credits
30

Level of qualification
Bachelor

Mode
Full-time

Language
English

School
Institute of Future Environments

Locations
Groningen

Minor Structural Engineering

Profile of the programme

The programme teaches making the connections between and recognising the mutual dependency of the various building elements below and above ground. Forces and load-bearing work top-down. Stability has a mainly horizontal component. What are the connections between these elements? How are loads distributed and what influence does horizontal stability have on the foundation design?

Using advanced applied mechanics and mathematics, students learn to calculate these connections and dependencies. These calculations are done 'by hand' and using software based on the finite element method (FEM).

Another main subject is the use of materials in civil and architectural engineering constructions. Which materials can be used in which elements? What are the possibilities and impossibilities of the materials used? Why would you construct something in cement but not in steel? Should that construction element be made with cement? Would constructive masonry be better and cheaper?

Students will be encouraged to think in terms of material use by way of lectures on various construction materials, such as prestressed and reinforced concrete constructions, as well as steel constructions and earthworks. The course will also take an in-depth look at steel constructions and foundation engineering. A number of lectures will deal with specialist subjects, such as reinforced masonry and glass in building.

In addition to a theoretical component, the minor also comprises a practical component. This practical component consists of practical and research assignments based on the theoretical component of the minor, taking place at BuildinG, Hanze UAS' living lab, and at the Hanze UAS Centre of Expertise.

BuildinG is a meeting point for 'education, research and entrepreneurship'. Students will use these three core values to resolve research questions and work on practical assignments related to the minor's theory lectures.

Learning outcomes

- Students are able to calculate normal forces using the finite element method.
- Students are able to use elasticity theory to calculate strength and stiffness for a non-homogeneous section as well as calculate the second-order distribution of forces.
- Students are able to use plasticity theory to determine the external distribution of forces for bars and sheets.
- Students are able to explain the terms 'shear centre' and 'influence line theory', and apply them in a simple structure.
- Students are able to apply the current Eurocodes to various structural elements and materials.
- Students are able to perform a structural verification calculation using a finite element software package.
- Students are able to name the various principles of prestressing and the various prestressing methods, distinguish them, and apply them in statically determinate and indeterminate beams.
- Students are able to calculate the distribution of forces, including prestressing, of statically determinate and indeterminate beams.
- Students are able to draw the detailing of prestressed beams and apply it to practical situations.
- Students are able to verify the SLS and ULS for a prestressed beam for both statically determinate and indeterminate beams.
- Students are able to calculate and verify the overall tilting stability in accordance with the Eurocode for a beam subjected to bending forces.
- Students are able to calculate and verify the overall buckling and tilting stability for a column subjected to compression and bending forces. Students are able to calculate, verify and detail bolted and welded connections designed as rigid, sprung or hinged connections in accordance with the Eurocode.
- Students are able to understand, recognise and apply the special 'vibration and fatigue' loads to a beam subjected to bending forces.
- Students are able to calculate and detail composite floors. Students are able to convert all calculated structural elements into a steel layout drawing in AutoCAD.
- Students are able to calculate and draw the forces involved as well as the required reinforcement for floors with linear and tapered supports.
- Students are able to recognise the phenomenon of punching shear, calculate the required forces and reinforcement to prevent punching shear, and draw them in a reinforcement drawing.
- Students are able to calculate the forces involved for footing and brackets, and convert them into the required reinforcement depicted in a reinforcement drawing.
- Students are able to calculate the forces involved for wall beams and convert them into the required reinforcement depicted in a reinforcement drawing.
- Students are able to name the various foundation systems, and determine their application in various surfaces and building systems.
- Students are able to calculate the load-bearing capacity and determine the stability of a foundation on steel and on piles.

- Students are able to structurally design, calculate and draw a simple basement and building pit. Students are able to draw a calculated strip or pile foundation in a foundation plan.

Programme

Minor Structural Engineering	**credits**
Structural Engineering	30
▯ BVVH17SESD - Structural Design	*3*
▯ BVVH17SESS - Steel Structures	*3*
▯ BVVH21SETIM - Timber Engineering	*3*
▯ BVVH17SEPORT - Structural Engineering Portfolio, Society 2.0	*3*
▯ BVVH17SERCS - Reinforced Concrete Structures	*3*
▯ BVVH17SEFM - Foundation Methods	*3*
▯ BVVH17SELAB - SE Innovation Lab	*12*