Integrated structural design

Lecturers
Thierry MASSART (Coordinator) and Matthieu MALLIE

Course mnemonic
CNST-H530

ECTS credits
6 credits

Language(s) of instruction
English

Course period
Second term

Campus
Solbosch

Course content

The course consists in an integration of a design methodology with modelling tools. The students are taught to design a structure (typically a footbridge) from scratch, for given a context and set of constraints related to the construction process (urban aspects, transitory building phases, bill of quantities, ...). Modelling aspects related to specific structural components (shells) are introduced to allow a full integration between the design process and the underlying modelling tools.

Objectives (and/or specific learning outcomes)

Approach a design process from its early stage based on a given context and set of constraints

Apply computational methods for structural mechanics problems in a design context

Translate a structural mechanics problem into a computational model by formulating adapted hypotheses.

Select a computational approach relevant to the problem at hand

Use a commercially available finite element package to solve structural mechanics problems

Teaching method and learning activities

The course starts with a few lectures on structural design of complex structures (typically case studies of bridge and footbridge design) and the theoretical bases for computational modelling of such structures (shells, ...).

The practical part, that represents 70% of the allocated hours consists of a project in which groups of students are asked to design a structure 'from scratch' for a given context and set of constraints. The work consists of designing the structure, with the help of modelling tools, and to provide a structural model supporting their decisions and choices.

Contribution to the teaching profile

This teaching unit contributes to the following competences:

- In-depth knowledge and understanding of integrated structural design methods in the framework of a global design strategy
- In-depth knowledge and understanding of the advanced methods and theories to schematize and model complex problems or processes
- Reformulate complex engineering problems in order to solve them (simplifying assumptions, reducing complexity)
- Correctly report on research or design results in the form of a technical report or in the form of a scientific paper
- Present and defend results in a scientifically sound way, using contemporary communication tools, for a national as well as for an international professional or lay audience
- Think critically about and evaluate projects, systems and processes, particularly when based on incomplete, contradictory and/or redundant information
- A critical attitude towards one's own results and those of others
- The flexibility and adaptability to work in an international and/or intercultural context
- Integrate advanced modelling tools for the design of complex structures in civil engineering

Course notes

Université virtuelle

Other information

Place(s) of teaching

Solbosch

Contact(s)

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Evaluation method(s)

Oral presentation and Written report

Evaluation method(s) (additional information)

The evaluation is based on two elements: (1) a report detailing the project results obtained by groups of students, (2) an individual oral defense of the project.

Determination of the mark (including the weighting of partial marks)

The assessment is based on the report defense, including the ability to justify the design and modelling choices based on the information provided in the course sessions. The oral defense is also used to assess that a proper sharing of the workload was organized between students of a group.

The final grade is calculated as follows: If the oral defense grade is equal to or above 8/20: 50% of the mark is given for the oral examination grade , 50% is given for the project grade. If the oral examination grade is below 8/20: the final grade is the oral examination grade.

Main language(s) of evaluation

English

Programmes

Programmes proposing this course at the Brussels School of Engineering

MA-IRAR | Master of science in Architecture and Engineering | finalité Professional/unit 2 and MA-IRCN | Master of science in Civil Engineering | finalité Professional/unit 2