Non linear modeling of materials and structures

Lecturer
Thierry MASSART (Coordinator)

Course mnemonic
CNST-H418

ECTS credits
4 credits

Language(s) of instruction
English

Course period
Second term

Campus
Solbosch

Course content

Non linear solution methods (Incremental-iterative methods). Sources of non-linearities. Stress and Strain measures. Non linear constitutive laws (Damage Mechanics, Plasticity, Visco-plasticity). Co-rotational formulations. Failure and fracture.

Objectives (and/or specific learning outcomes)

To be able to use computational tools to solve a nonlinear mechanical problem. Detect whether a mechanical problem is nonlinear. Select properly the method to solve it. Control the assumptions underlying a non linear solver. Properly formulate simplifying assumptions for material behaviour. Properly formulate simplifying assumptions for structural behaviour.

Pre-requisits and co-requisits

Course having this one as pre-requisit

MEMO-H501 | Master thesis civil engineering | 24 crédits

Teaching method and learning activities

2ECTS Regular Teaching, 2 ECTS Exercises (programming for basic model problems, use of an existing finite element code for advanced problems).

The written reports to be delivered for the exercise sessions are individual reports.

Contribution to the teaching profile

This teaching unit contributes to the following competences:

- 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)
- Think critically about and evaluate projects, systems and processes, particularly when based on incomplete, contradictory and/or redundant information
- The flexibility and adaptability to work in an international and/or intercultural context
- Combine computational modelling methods and experimental techniques to tackle complex structural and material analysis problems
- Integrate advanced modelling tools for the design of complex structures in civil engineering

Course notes

Syllabus

Other information

Place(s) of teaching

Solbosch

Contact(s)

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Evaluation method(s)

written examination and Written report

Evaluation method(s) (additional information)

Written examination at the end of the course, Assessment of the exercises through written reports in the course of the year

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

The final grade is calculated as follows: If the written examination grade is equal to or above 8/20: 60% of the mark is given for the written examination grade, and 40% is given for the project/exercises grade (in both sessions). If the written examination grade is below 8/20: the final grade is the written examination grade.

Main language(s) of evaluation

English

Programmes

Programmes proposing this course at the Brussels School of Engineering

MA-IRCN | Master of science in Civil Engineering | finalité Professional/unit 1