

# 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-requisites and co-requisites

### 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)

T.J. Massart - Thierry.J.Massart@ulb.be - BATir CP 194/2

## 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

