



## ENDOMMAGEMENT ET RUINE DES MATÉRIAUX

### DAMAGE AND RUIN OF MATERIALS

Lecturers: Vincent FRIDRICI, Bruno BERTHEL

| Lecturers : 22 | TC : 14 | PW : 0.0 | Autonomy : 12.0 | Study : 0.0 | Project : 0.0 | Language : FR

#### Objectives

Structural safety, the new approach related to cindynics (risk science) and circular economy concepts (taking into account sustainable development) keep the requirements related to the durability of structures at the highest level. The essential functions of the structure must be taken into account from the first steps of the design. The engineer must be able to take a step back in order to perform appropriate selection of materials, based on the loading conditions. The objectives of this module are therefore to give, in the continuity of the common core modules of the UE IDM (and partly of the UE GM and MSS), in-depth knowledge of the damage of materials in mechanical structures.

**Keywords :** Materials damage, fracture mechanics, fatigue, corrosion, tribology

#### Programme

- The main steps in the life of a structure (2h).
- Plastic deformation and damage (2h).
- Fracture mechanics (4h).
- Fatigue damage (6h).
- Elements of expertise of ruptures (2h).
- Tribology and wear (4h).
- Corrosion (4h).
- Elements of non-destructive testing (2h).
- Industrial conferences (nuclear, transport, etc.) (4h).

#### Learning outcomes

- Understand major industrial issues related to the risk of structural ruin.
- Understand the different damage mechanisms of materials.
- Formalize predictive tools and implement palliative solutions.

#### Independent study

**Objectifs :** This work aims to understand the different types of damage and to understand the issues in a specific industrial sector or for a given material.

**Méthodes :** Bibliographic study in groups of 2 students and if possible application of the concepts seen in class on the studied topic. This work is accompanied by a presentation of the selection of topic at the beginning and a mid-term review with a teacher.

#### Core texts

JP. BAILON, JM DORLOT, *DES MATÉRIAUX*, Presses internationales Polytechnique, 2000  
C. BATHIAS, J.-P. BAILON *LA FATIGUE DES MATÉRIAUX ET DES STRUCTURES*, Hermès - Lavoisier, 1997  
J.-M. GEORGESFROTTEMENT, *USURE ET LUBRIFICATION*, Eyrolles, 2000

#### Assessment

Final mark = 50% Knowledge + 50% Know-how  
Knowledge = 100% final exam  
Know-how = 100% continuous assessment