



DURABILITÉ DES MATÉRIAUX ET DES STRUCTURES

DURABILITY OF MATERIALS AND STRUCTURES

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| Lecturers : 16.0 | TC : 0.0 | PW : 8.0 | Autonomy : 0.0 | Study : 4.0 | Project : 0.0 | Language : AN

Objectives

In order to develop efficient, reliable and safe products, it is necessary to take into account the damage mechanisms of materials and parts. The topic of this course is how to predict the failure of materials under mechanical loading, taking into account the surrounding, in the field of carriage. Each class of materials having different failure process, damage mechanisms of each one are studied and formalized. This course contains theoretical lectures (fracture mechanics, fatigue,...) and practical works (fractography, acoustic emission,..).

Keywords : Fatigue, Fracture mechanics, Finite element method, Fractography, Acoustic emission.

Programme

Fracture mechanics: material features, stress singularities and energetic criteria.
Fatigue of materials: fatigue and endurance domains, factors affecting fatigue life, design against fatigue and crack growth rate laws.
Multiaxial fatigue: definition and criteria.
Specificity of polymer and composite materials
Practical work on fractography: study of the fracture surfaces of parts and determination of the cause of failure.
Practical work on the interest of the acoustic emission in the field of structural health monitoring

Learning outcomes

- Identify the different modes of damage and failure of materials used in the field of transportation and know how to analyze a fracture surface.
- Master the basics of fracture mechanics and material fatigue. Know how to use predictive tools for multiaxial fatigue life.
- To know the specificities of composite materials and to have notions on the monitoring of the state of structures (in particular acoustic emission).
- Use acquired knowledge to analyze a research problem and make a critical analysis.

Independent study

Objectifs : Assignments consist of preparing practical works, writing reports and analyzing a scientific article. All these activities are teamwork.

Méthodes :

Core texts

Dietmar Gross and Thomas Seelig, *FRACTURE MECHANICS*, Springer, Berlin, Heidelberg, 2011
Jaap Schijve *FATIGUE OF STRUCTURES AND MATERIALS*, KLUWER ACADEMIC PUBLISHERS, 2004
D. Hull and T. W. Clyne *AN INTRODUCTION TO COMPOSITE MATERIALS*, Cambridge University Press, 1996

Assessment

Final mark = 50% "Knowledge" + 50% "Know-how"

"Knowledge" = 100% oral presentation