

CIVIL-704

Fracture Mechanics and Fatigue of Structures

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| Cursus | Sem. | Type |
|-----------------------------------|------|------|
| Civil & Environmental Engineering | | Opt. |
| Mechanics | | Opt. |

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|----------------------------|-----------|
| Language of teaching | English |
| Credits | 2 |
| Session | |
| Exam | Oral |
| Workload | 60h |
| Hours | 28 |
| Courses | 20 |
| TP | 8 |
| Number of positions | |

Frequency

Every 2 years

Remark

Next time: oct/nov 2021 Block course Minimum 5 inscrits

Summary

Determination of stress intensity factors and application of fracture mechanics to structures made of different materials. Ability to apply fracture mechanics to predict brittle fracture+ compute fatigue life of structural elements. Understanding of the influencing parameters+ methods to determine them

Content

Fracture micromechanisms in steels, Griffith and Irwin theories, concept of stress intensity factor, fracture toughness and its determination

- Plated steel structures : Fatigue strength of welded steel elements, size effect, residual stresses influence, application of fracture mechanics to fatigue
- Tubular steel structures : Hot spot stress method for fatigue design, welded vs cast steel joints
- Structural glass: Subcritical crack growth, predicting time to failure
- Reinforced concrete structures : Fracture mechanics, fracture of concrete, size effect, brittle failure, fatigue of reinforced concrete elements, evaluation of fatigue safety of bridge decks, fracture due to dynamic effects.
- R-UHPFRC structures: fracture and fatigue properties of Ultra-High Performance Fiber Reinforced Composites, structural implications, design provisions.

Keywords

Fracture mechanics, fatigue, steel structures, concrete structures, structural safety

Learning Prerequisites**Required courses**

Mechanics of structures and materials

Teaching methods

Ex-cathedra lectures and exercises

Assessment methods

Oral exam