

Programme des cours de renforcement des formations doctorale de la Faculté de Technologie

Civil Engineering Materials

1. Nonlinear modeling of structures

- I. Nonlinear modeling of materials (steel and concrete)
- II. Nonlinear calculation of reinforced and prestressed concrete structures
- III. External prestressing, implementation and calculation elements
- III. Modeling and experimentation of steel fiber concrete
- IV. Modeling of circular sections and resistance curves
- V. Dynamic analysis of continuous systems
- VII. Application of finite elements to the dynamic calculation of structures

2. Rheology

- I. Behavioral laws and the problem of anisotropy
- II. Plasticity
- III. Thermomechanics
- IV. Elastoplastic and viscoplastic formulations
- V. The mechanics of damage
- VI. The mechanics of fracture
- VI. The mechanics of contact

3. III. Materials Durability

- I. Technical and economic consequences of damage to concrete structures
- II. Brief history of sustainability issues
- III. The main causes of the deterioration of concrete
- IV. Action of sulphates and sea water
- V. Corrosion

4. Building thermal modeling

- I. Reminder on heat transfers
- II. Thermal modeling of buildings
 - Heat balance of a wall
 - Fundamental relationships of heat transfer
 - Models and calculation methods
 - Finite difference method -Nodal method
 - Response factor method -Relaxation method
 - Matrix method
 - Iterative Gauss-Seidel method

5. Material characterization

- I. Sampling techniques
- II. Mechanical Tests
- III. Physico-chemical characterization
- VI. Thermal Analysis
- V. Microstructural characterization of materials