

## Solid Mechanics

Advanced mechanics for the prediction of use properties

### IDENTIFICATION

CODE : GM-5-S1-EC-PCMAV  
ECTS : 3.0

### HOURS

Lectures : 0.0 h  
Seminars : 37.0 h  
Laboratory : 4.0 h  
Project : 0.0 h  
Teacher-student  
contact : 41.0 h  
Personal work : 15.0 h  
Total : 56.0 h

### ASSESSMENT METHOD

Reports on the studies that are done.

### TEACHING AIDS

Manuscripts of lessons, exercise lessons and practical works

### TEACHING LANGUAGE

French

### CONTACT

M. RINALDI Renaud  
renaud.rinaldi@insa-lyon.fr  
Phone : 0472436209

### AIMS

To understand the links between the microstructural characteristics of polymer and composite parts and their physical and mechanical properties as well as their damage and fracture properties

### CONTENT

Part A - From the microstructure to the effective properties of parts  
- Basis of upscaling (homogenisation) theories (micro-macro upscaling techniques)  
- Applications : use of Digimat code or Geodict or Abaqus or Ansys for the calculation of effective properties

Part B - Damage and fracture of polymer and composite parts  
- Basis of the damage and fracture mechanics  
- Application and extension to polymer materials  
- Application and extension to composite materials (cases of laminates and short-fibre composites)

Part C - Finishing processes and assembly processes  
- General introduction to the finishing and assembly processes of polymer (thermoset and thermoplastic) and composite parts  
- Principle of decoration processes and painting: related physico-chemical, physical and mechanical properties

### BIBLIOGRAPHY

- [1] Damage Mechanics of Composite Materials, Volume 9, 1st Edition, Editor: R. Talreja, Elsevier, Amsterdam, Pays-Bas, 1994.  
[2] Application of Fracture Mechanics to Composite Materials, Volume 6, 1st Edition, Editor: K. Friedrich, Elsevier, Amsterdam, Pays-Bas, 1989.

### PRE-REQUISITE

GM-4-PCPRA-S1, GM-4-PCPMF-S1, GM-4-PCPMF-S2, GM-4-PCSIM-S2, GM-4-PRM-S2