GENERAL OUTLINE
PHYSICAL ASPECTS OF FRACTURE

1. Introduction
2. Characterization of order/disorder in materials
   • Basic notions of probability theory
   • Characterization of order/disorder on atomic scales: waves scattering
     ➢ Scattering by perfect crystals
     ➢ Scattering by liquids or amorphous structures
3. Fracture mechanisms in heterogeneous materials
   • Defects and fracture mechanisms in metals
   • Brittle and quasi-brittle fracture
4. Fracture paths and fracture surfaces
   • Random walks; rough surfaces; self-similarity; self-affinity
   • Experimental characterization of rough fracture surfaces
   • A brief introduction to equilibrium statistical physics
   • Fluctuations of an elastic manifold at equilibrium
5. Models for fracture of heterogeneous media
   • An introduction to phase transitions
   • The example of percolation
   • “Fibre bundle” and “random fuse” models
   • Kinetic roughening models
6. Fracture of glasses
   • Atomistic simulations
   • Classical models of stress corrosion
   • Damage formation in glasses
   • Plasticity of amorphous systems