

TCSS5AD CONTINUUM MECHANICS SOLIDS FLUIDS

TCSS5AD Continuum mechanics for solids and fluids		Duration : 30 hours	ECTS Credits : 3.5	Semester : S5
Person in charge :				
Emmanuel Plaut, Professor, emmanuel.plaut@mines-nancy.univ-lorraine.fr				
Keywords : Vectorial analysis, multi-variables functions, general mechanics				
Prerequisites :				
The fundamentals of continuum mechanics applied to elastic solids et Newtonian fluids				
Objective:				
Program and Content :				
• Elements of tensor calculus (independent study, if lack of time): algebra and tensor analysis: intrinsic definitions: calculations in curvilinear coordinates. • Continuum model – Elementary kinematics: model boundaries: Lagrangian and Eulerian motion descriptions: characteristic lines. • Advanced kinematics: study of deformations, Lagrangian and Eulerian studies, introduction to appropriate tensors. • Balances of mass and motion – Constraints: introduction to the Cauchy stress tensor: Mohr representation. • Elastic solids: law of linear elastic isotropic: linearised elasticity problems: displacement methods: Navier equation: constraints method. • Kinetic energy balance – Elastic solids: potential elastic energy: conservative nature of the dynamics of elastic solids. • Newtonian fluids: incompressible Newtonian fluid behavior law, Navier-Stokes equation, model of perfect fluid, kinetic energy balance: viscous dissipation, charge losses. • Dimensional analysis and similarity: Vaschy – Buckingham theorem and principles: applications, especially with charge losses in pipe flow.				
Abilities:				
Levels	Description and operational verbs			
Know				
understand				
Apply				
Analyse				
Summarise				
Assess				
Evaluations :				
☒ Written test	☒ Continuous Control	☐ Oral report	☐ Project	☐ Report