

MATS7AB MECHANICAL BEHAVIOUR OF MATERIALS

MATS7AB Mechanical behaviour of materials	ECTS Credits : 2 Duration : 21 hours	Semester : S7
Person(s) in charge: Mohammed NOUARI, Professor, mohammed.nouari@mines-nancy.univ-lorraine.fr		
Keywords: Mechanical properties, characterization, mechanic of solids, elasticity, plasticity, break		
Prerequisites: Basics in mathematics and physics (tensors, primitives, energy, work).		
Objectives: Presentation of mechanical properties, principle of structures calculation.		
Program and Contents: <ul style="list-style-type: none"> Mechanical properties of the main classes of materials, depending on the atomic bonding Elastic behaviour: stress and strain tensors, Hooke's law, Mohr representation Mechanical testing methods: tensile test, hardness, creep, fatigue, impact test Plastic behaviour: elastic limit, plasticity criteria, law for plastic flow, necking Introduction to the finite element method in elasticity, concept of thermal stress Failure: basics of fracture mechanics, fracture toughness, fatigue, stress corrosion cracking Case studies: <ul style="list-style-type: none"> bending of a beam, influence of the shape of the cross section proportioning of a propeller shaft analysis of a tensile test curve contact mechanics, hardness test elasto-plastic behaviour of a pressure vessel stress concentrations at cavities, bi-material contactor (finite elements) in service behaviour of a vapour generator, safety control 		
Abilities:		
Level	Description et operational verbs	
Know	Every object used for structural or functional applications undergoes forces. It must have the dimensions required to withstand these forces without yielding. Its lifetime in service depends on the type of material used, on the nature of the mechanical loading (bending, twisting - monotonic or cyclic - shocks) and on the environmental conditions (temperature, corrosion). Engineers must anticipate the behaviour of a mechanical part under these diverse solicitations to determine its dimensions, estimate its lifetime and chose the appropriate material.	
Understand		
Apply	- know the differences in mechanical behaviour of materials in relation with their structure, - know the behaviour laws and the usual experimental methods to measure them, - have good grounding in structure calculation (modelling, solving, analysing the results).	
Analyse		
Summarise		
Assess		

Assessment:

☒ Written Test

☒ Continuous Control

☐ Oral report

☐ Project

☒ Written Report