

MATS8AF STRUCTURE PHYSICS AND MECHANICAL PROPERTIES

MATS8AF Structure physics and mechanical properties		ECTS Credits : 2 Duration : 21 hours	Semester : S8
Person(s) in charge: Sébastien ALLAIN, Professor, sebastien.allain@mines-nancy.univ-lorraine.fr			
Keywords: crystalline plasticity, dislocations, hardening, thermal activation, recrystallisation			
Prerequisites: macroscopic mechanical properties, linear elasticity, crystalline structures, defects			
General objective : Presentation of physical mechanisms of plastic deformation			
Programme and Contents: <ul style="list-style-type: none"> Dislocations: characteristics, properties, displacement, observation methods, force, lattice friction, thermally activated glide, elementary mechanisms Deformation of single crystals: comparison of the different crystalline structures, slip systems, resolved shear stress Twinning, martensitic transformations, shape memory effect Influence of the microstructure in pure materials : effective and internal stress, strain hardening, influence of grain size Hardening processes in alloys: solid solution strengthening, precipitation hardening Influence of temperature and strain rate: dynamic recovery and recrystallisation, creep, brittle-to-ductile transition <p>Case studies:</p> <ul style="list-style-type: none"> elastic interactions between dislocations, subgrain characterisation of dislocations in Silicon by X-ray diffraction defects in compact structures: sphere model strain hardening model: forest model crossing of point and extended obstacles plastic deformation by thermal shock in a Silicon wafer 			
Abilities:			
Level	Description and operational verbs		
Know			
Understand			
Apply			
Analyse			
Summarise			
Assess			
Assessment:			
<input checked="" type="checkbox"/> Written Test	<input type="checkbox"/> Continuous report	<input type="checkbox"/> Oral report	<input type="checkbox"/> Project
		<input type="checkbox"/> Written Report	