

MATS8AA DIELECTRIC PROPERTIES of MATERIALS

MATS8AA		ECTS Credits : 2		Semester : S8	
Dielectric properties of materials		Duration : 21 hours			
Person(s) in charge:					
Emilie GAUDRY, Associate Professor, emilie.gaudry@mines-nancy.univ-lorraine.fr					
Keywords:					
Dielectric materials, properties, applications					
Prerequisites:					
Atomic and molecular arrangements, structures and defects Electric and thermal properties of materials					
General objective :					
Learn the necessary basic knowledge of physics to follow the technological innovations in the field of dielectric materials					
Program and Contents:					
<p>Dielectric materials are experiencing a considerable development, especially due to the growing impact of technology related to electronics: a mobile phone can hold up to several hundred capacitors! In addition to their applications in the field of electronics (high performance capacitors, insulators), these materials are used for their piezoelectric properties (shock and acceleration detector, sonar, loudspeaker, etc.), for their pyroelectric properties (fire detector, infrared imaging), or for their applications in optics (optic fibers, birefringent materials).</p> <p>This course is divided into 6 chapters:</p> <ul style="list-style-type: none">• Polarized materials• Polarization mechanisms.• Frequency dependence of polarization, relaxation and resonance phenomena.• Real dielectric materials, losses, breakdown.• Ferroelectric piezoelectric, pyroelectric materials.• Optical properties of dielectric materials.					
Abilities:					
Level		Description and operational verbs			
Know		Name and describe the different types of dielectric materials.			
Understand		Link the macroscopic properties of dielectric materials with polarization mechanisms in order to explain dependences (temperature, frequency) of dielectric macroscopic quantities.			
Apply		Describe the main technological applications of dielectric materials.			
Analyse		The first test, quite short, is to evaluate students' knowledge and understanding of the course and their capacity to use little and easy reasoning. The second test will be a longer problem in order to test analytical insight of students and their capacity to deal with a complex system.			
Summarise		The oral talk test both abilities to analyse and to summarize on a determined subject. Their oral abilities to communicate on a scientific subject will also be tested. The subjects will be chosen among dielectric applications.			
Assess		The course assessment will consist of a midterm, a longer final test and an oral presentation by the students on a subject selected from applications of dielectric materials.			
Assessment:					
<input checked="" type="checkbox"/> Written Test		<input checked="" type="checkbox"/> Continuous Control		<input checked="" type="checkbox"/> Oral Report	
				<input type="checkbox"/> Project	
				<input type="checkbox"/> Written Report	