

# PEES8AE NUCLEAR REACTORS FUELS ENVIRONMENTAL IMPACT CONTROL

PEES8AE		ECTS Credits : 2	Semester : S8	
Nuclear reactors, nuclear fuels and environmental impact control		Duration : 21 hours		
Person in charge :				
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Keywords : Nuclear ; reactor ; energy production ; nuclear fuel cycle ; reprocessing				
Prerequisites : S7 course department are useful but not necessary ; initial thermodynamics and chemical kinetics concepts				
Objective : Understand the nature and stakes of the civil nuclear industry.				
<p>The nuclear industry generates 75% of the electricity in France and 13% in the world. Despite very interesting accessible power rates and low glasshouse gas emissions, the growing concern for serious accidents and the future of the waste put nuclear energy in a tight spot. This course aims at giving to the engineering students the scientific and technical background essential to a holistic understanding of the complete nuclear industry , as well as the main associated societal and environmental elements. The different aspects of the nuclear industry are presented : actual and future electricity generating reactors, nuclear fuel cycle, installation sizing, waste processing, safety concerns... Teaching-wise, a balanced is reached between speakers from organisms (CEA) or partner corporations (EDF, AREVA) and more traditional classes including application exercises solved by students. The systemic approach broached in SP143 is used, amongst other things, to size installations.</p> <p>Program :</p> <ul style="list-style-type: none"><li>• The cycle of nuclear fuel. Study of a conversion reactor</li><li>• Thermodynamic cycle of a nuclear power plant</li><li>• Nuclear reactor piloting : theory and simulation.</li><li>• Inter-phase matter exchange. Application to the U/Pu separation during reprocessing.</li><li>• Linked matter and heat transfers. Application to a cooling tower.</li><li>• Serious accidents scenarios in a nuclear reactor ; role of modelling and experimenting</li><li>• Nuclear waste storage and treatment ; state of the art and projects</li></ul>				
Abilities :				
Level		Description and operational vocabulary		
Know		Become familiar with the different aspects of the nuclear industry. Enumerate the different types of reactors. Define the nuclear fuel cycle. Categorise waste reprocessing solutions		
Understand		Explain the way a nuclear reactor works. Interpret the thermodynamic cycle of a power plant. Describe the transport phenomena involved in the process. Redefine the societal stakes of nuclear energy.		
Apply		Apply known concepts (thermodynamics, transport phenomena) to a specific application. Resolve illustrative academical exercises.		
Analyse		Go through the nuclear fuel cycle. Separately examine a power plant's circuits. Detail the energetic and electric mixes.		
Summarise		Written reports of class activities.		
Assess		Measure France's previous energetic choices. Judge today's energetic choices of the different countries. Rank the nuclear industry's pros and cons.		
Evaluation :				
<input checked="" type="checkbox"/> Written test		<input checked="" type="checkbox"/> Continuous Control	<input type="checkbox"/> Oral report	<input type="checkbox"/> Project
		<input checked="" type="checkbox"/> Written report		