

# CES7AE INDUSTRIAL ECOLOGY SUSTAINABLE DEVELOPMENT

<b>CES7AE</b> <b>Industrial ecology and sustainable development</b>		<b>ECTS Credits : 4</b> <b>Duration : 36 hours</b>	<b>Semester : S7</b>
<b>Person(s) in charge :</b> Philippe SESSIECQ, Associate professor, <a href="mailto:philippe.sessiecq@mines-nancy.univ-lorraine.fr">philippe.sessiecq@mines-nancy.univ-lorraine.fr</a>			
<b>Keywords :</b> Industrial ecology, sustainable development, life cycle analysis, waste recycling and recovery			
<b>Prerequisites :</b> first year course			
<b>Objectives :</b> Process engineering for industrial ecology			
<b>Program and content :</b> <p><b>The “end of pipe” approach or pollution transfer approach :</b></p> <ul style="list-style-type: none"> <li>- concepts of process engineering: mass balance, energy balance, reactors</li> <li>- application to effluents treatment processes (liquid, solid and gaseous ones)</li> <li>- limits of these approaches</li> </ul> <p><b>From Sustainable Development to Regulated Adaptive Development</b></p> <ul style="list-style-type: none"> <li>- Conceptual framework of Industrial Ecology</li> <li>- Combination of systemic analysis and Life Cycle Analysis: “Overall Process” approach</li> <li>- Best available technologies: concept and limits - Ecodesign</li> <li>- Recycling: advantages and limits</li> <li>- Concept of secondary raw materials and new energetic vectors</li> </ul> <p><b>Case studies</b></p> <p>Multi-energy platform</p> <p>Energy recovery of biomass and CO2</p>			
<b>Abilities:</b>			
<b>Levels</b>	<b>Description and operational vocabulary</b>		
<b>Know</b>	the equations describing global and local mass, energy and momentum balances. Conceptual framework of industrial ecology.		
<b>Understand</b>	The concepts driving process engineering and industrial ecology. The principle of pollution transfer		
<b>Apply</b>	Size industrial units for effluents treatment. Be able to use the principles of industrial ecology.		
<b>Analyse</b>	Evaluate environmental impacts and calculate sustainable development indicators leading to process and political choices.		
<b>Summarise</b>	Total redesign of industrial processes (energy, raw materials and products flows) towards a rational use of energy and effluents		
<b>Assess</b>			

Evaluation :

☒ Written test

☒ Continuous  
Control

☐ Oral report

☒ Project

☒ Written report