



*Innovation*



# LECTURE SCHEDULE

Training Course

## FLOW CHEMISTRY

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2 days

**ENSIACET**  
**4 Allée Emile Monso**  
**31030 Toulouse**  
**France**

## Day 1

8h45-9h00	Attendees Welcome
9h00-10h30	<b>Lecture 1: Introduction</b> <ul style="list-style-type: none"><li>- Objectives of the Course</li><li>- Chemical reaction engineering fundamentals: mass and energy balances, ideal and non-ideal reactors</li><li>- Usual operating configurations: batch, semi-batch, continuous</li></ul>
10h30-10h45	Coffee break
10h45-12h15	<b>Lecture 2: flow chemistry fundamentals</b> <ul style="list-style-type: none"><li>- Batch-to-continuous</li><li>- Characteristic scales approach, the limiting steps</li><li>- Introduction to Process Intensification</li><li>- The activation techniques</li></ul>
12h15-14h00	Lunch
14h00-15h30	<b>Lecture 3: The benefit of microfluidics</b> <ul style="list-style-type: none"><li>- The microfluidics methodology</li><li>- High Throughput Experiments (HTE)</li><li>- Some practical examples of basic data acquisition (which type of data and how?)</li></ul>
15h30-15h45	Coffee break
15h45-17h15	<b>Lecture 4: Microfluidics tools</b> <ul style="list-style-type: none"><li>- Review of commercialized micro-tools: pros / cons</li><li>- The on-line analysis</li><li>- Some practical examples</li></ul>

## Day 2

9h00-10h30	<b>Lecture 5: Flow chemistry scaling-up</b> <ul style="list-style-type: none"><li>- The scaling-up principles (numbering-up, scaling-up, modular approach)</li><li>- The different reactor scales: micro, meso, macro</li><li>- Downstream processing</li></ul>
10h30-10h35	Coffee break
10h45-12h15	<b>Lecture 6: The technical issues</b> <ul style="list-style-type: none"><li>- Environment (pumps, sensors, process control)</li><li>- Some specific challenges : two-phase flow, catalyst, gas or solid phases, complex fluids, viscous fluids ...</li></ul>
12h15-14h00	Lunch
14h00-15h30	<b>Lecture 7: The methodology of Process Intensification</b> <ul style="list-style-type: none"><li>- Presentation of the global methodology</li><li>- Definition of criteria for the selection of equipment in relation to the application</li></ul>
15h30-15h45	Coffee break
15h45-17h15	<b>Lecture 8: Examples of industrial flow chemistry applications</b> <ul style="list-style-type: none"><li>- Literature review</li><li>- Our own know-how at Toulouse (LGC <a href="https://lgc.cnrs.fr/en/">https://lgc.cnrs.fr/en/</a>, CRITT <a href="http://gpte.critt.net/">http://gpte.critt.net/</a>, MEPI <a href="http://www.mepi.fr/">http://www.mepi.fr/</a>)</li></ul>