CH-480

Sustainable chemicals manufacture: concepts/tools

Wang Zhanyun

Cursus	Sem.	Type
Chimiste	MA2, MA4	Obl.
Ing.-chim.	MA2, MA4	Opt.

Language of teaching	English
Credits	4
Session	Summer
Semester	Spring
Exam	During the semester
Workload	120h
Weeks	14
Hours	**4 weekly**
Courses	2 weekly
TP	2 weekly
Number of positions	

Summary

This course introduces the foundational concepts and tools of Safe and Sustainable by Design (SSbD), a forward-looking framework for the development of future chemicals and materials. It also offers insights into relevant regulatory and industry frameworks at the Swiss, EU, and global levels.

Content

This course will provide:

• **Background knowledge** on chemical-related pollution in air, water, and soil, as well as its presence in products and waste (including recycled materials), human exposure, and its impact on ecosystems and health, highlighting the need for safe and sustainable design.

• **Key concepts, approaches, and tools** for safe and sustainable design, including hazard assessment, occupational exposure assessment, risk assessment, and environmental, social, and economic sustainability. The course will also cover common challenges, pitfalls, and the latest developments in the field.

• An introduction to the **regulatory and industry perspective**, covering Swiss, EU, and global regulatory frameworks.

Keywords

Sustainable Chemistry
Sustainability metrics
Alternative carbon sources
Recycling
Chemical manufacture
Safe and sustainable by design

Learning Prerequisites

Required courses

No special knowledge beyond the undergraduate curriculum in Chemistry or Chemical Engineering. Students wishing to attend the course from other backgrounds should contact the lecturers to discuss the

fit.

Learning Outcomes

By the end of the course, the student must be able to:

- Integrate the fundamentals of sustainable chemistry in process design
- Assess / Evaluate sustainable routes for chemicals and materials manufacture
- Analyze approaches to process design and optimization, from the molecular to the planet level
- Integrate the fundamentals of safe and sustainable by design into molecular and process design
- Assess / Evaluate safety and sustainability of chemicals and materials along their life cycle
- Analyze approaches to molecular and process design and optimization

Assessment methods

There will be complementary exercises going along with some of the lectures, focusing on hands-on practice of hazard assessment, exposure and risk assessment, and environmental sustainability assessment. The mark of the course will consist of the following two components: the exercises (80%; which will be submitted as a written report at the end of the semester), and the group presentation (20%).

Resources

Bibliography

Klöpffer, W., Grahl, B. Life Cycle Assessment (LCA): A Guide to Best Practice, Wiley (2014)

Ressources en bibliothèque

- Find the reference at the Library

Notes/Handbook

Course content based on slides

Moodle Link

- https://go.epfl.ch/CH-480