CH-400

Automated and data-driven laboratories

Miéville Pascal

Cursus	Sem.	Type
Chimiste	MA1, MA3	Opt.
Ing.-chim.	MA1, MA3	Opt.

Language of teaching	English
Credits	2
Session	Winter
Semester	Fall
Exam	During the semester
Workload	60h
Weeks	14
Hours	**2 weekly**
Courses	2 weekly
Number of positions	

Summary

In this course, taught by experts from the Swiss CAT+ West Hub, students will be introduced to key concepts in automation and data-driven chemistry. Using real-world cases, students will learn the theoretical skills and practical tools needed to automate a laboratory.

Content

1 Key aspects of automation in chemistry
1.1 Overview of the different approaches existing in the field of lab automation 1.2 Study of existing and currently developed equipment
2 The automation tools
2.1 The workflow analysis (+ practical session)
2.2 Elements of robotics (+ practical session)
2.3 Interfacing equipment (+ practical session)
2.4 IT structure of an automated laboratory
3 Data management
3.1 Data ontology and data treatment
3.2 Closing the loop (use of algorithms to accelerate research)
3.3. Toward a self driving lab

Keywords

Labautomation, HTE, HTS, high-troughput, data-driven

Learning Prerequisites

Required courses

Bachelor level in chemistry or chemical engineering.

Learning Outcomes

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

- Analyze a chemistry automation project in terms of feasibility, main features and equipment requirements.
- Design an automated chemical laboratory process and convert it into a logical workflow.
- Demonstrate a good level of understanding of data management, data chaining and data processing in the context of an automated laboratory.
- Explain an automated chemical workflow in clear terms to a microtechnic engineers and IT-developers.
- Analyze a chemistry automation project in terms of feasibility, main features and equipment requirements.

- Design an automated chemical laboratory process and convert it into a logical workflow.
- Demonstrate a good level of understanding of data management, data chaining and data processing in the context of an automated laboratory.
- Explain an automated chemical workflow in clear terms to a microtechnic engineers and IT-developers.

Transversal skills

- Access and evaluate appropriate sources of information.
- Make an oral presentation.
- Write a scientific or technical report.
- Communicate effectively with professionals from other disciplines.

Teaching methods

power point presentation + practical sessions + continuous small group projects

Expected student activities

active participation to the lecture, active participation to practical sessions (organized in groups) and project follow-up throughout the semester (same group as for the practical sessions)

Assessment methods

Oral presentation of the project (25%)
Written project report (75%)

Supervision

Office hours	No
Assistant.e.s	No
Forum	Yes

Resources

Bibliography

Power point presentations + extra material depending on the program

Moodle Link

- https://go.epfl.ch/CH-400