

Planning Course CH-419: Protein mass spectrometry and proteomics

Week 1-Week 4

- **1. Introduction on proteomics and mass spectrometry**

Introduction to protein analysis and proteomics; Reminders in mass spectrometry; Why proteomics and mass spectrometry?; Ionization sources, analysers, and detectors used in proteomics; **NEW**: latest generation of mass spectrometers used in proteomics

+ exercise session

Week 4-Week 5

- **2. Proteomic strategy and workflows**

Bottom-up versus top-down strategies; **NEW**: data-dependent acquisition (DDA) and data-independent acquisition (DIA) approaches; Sample preparation

+ exercise session

Week 6-Week 10 (including Lab visit on Weeks 6-7)

- **4. Quantitative proteomic workflows**

Label-free methods; Labelling-based techniques; Other quantitative techniques

+ exercise session

Week 10-11

- **5. Proteomic bioinformatics**

Databases; Identification of protein; Quantification of proteins; Bioinformatics tools; Practical examples

+ exercise session

Week 12 (Electrophoresis part; LC part is studied by the students on their own (recording is available) when off of the Lab visit)

- **3. Separations techniques in proteomics**

Gel electrophoresis; Isoelectric focusing; Liquid chromatography (RP, IEX)

+ exercise session

Week 13-Week 14

- **6. Applications to biology and clinical research**

What strategy?; Experimental design & randomization; Biomarker discovery; Industrialized and population proteomics; Forensics; Targeted mass spectrometry-based approaches; Other biological applications of mass spectrometry; **NEW**: advanced innovations (single-cells, 4D proteomics, multi-omics) and emerging technologies; **NEW**: Limitations and ethical consideration