UNIVERSITÀ DEGLI STUDI DI MILANO

# E-SENSING TECHNOLOGIES AND CHEMOMETRICS

**26 January – 4 February 2022**
**25-hour course**

## *Modulus I – E-sensing technologies*

- Introduction to e-sensing technologies
- Basic principles, instrumentation and data acquisition

## *Modulus I – Practices on data acquisition*

- Laboratory experience on the use of NIR, MIR and imaging instrumentations

## *Modulus II – Basic principles of chemometrics*

- Introduction to chemometrics
- Data pre-treatments
- Unsupervised and supervised modelling

## *Modulus II – Practices on chemometrics**

- Practices on data pre-treatments and PCA
- Practices on qualitative and quantitative models
- Practices on image analysis

## *Modulus III – E-sensing technologies' applications*

- The diversity of NIRS and MIRS applications in the agro-food sector
- Image Analysis for the agro-food sector

## LECTURERS:

**Prof. Cristina ALAMPRESE** (cristina.alamprese@unimi.it)
**Dr. Silvia GRASSI** (silvia.grassi@unimi.it)
**Prof. Ernestina CASIRAGHI** (ernestina.casiraghi@unimi.it)

* Open-source software will be used; further information will be given at the beginning of the lectures. Students are invited to use their own laptop and experimental databases. Please contact the lecturers in advance to discuss about available data.

UNIVERSITÀ DEGLI STUDI DI MILANO

FOOD SYSTEMS PhD

# E-SENSING TECHNOLOGIES AND CHEMOMETRICS

**26 January – 4 February 2022**
**25-hour course**

## Wednesday, January 26th, h. 14-18

***Modulus I – E-sensing technologies***

Introduction to e-sensing technologies (1.5 h; prof. Alamprese).
Basic principles of Near and Mid Infrared Spectroscopy (NIRS-MIRS) (1.5 h; prof. Alamprese).
NIRS and MIRS instrumentation and sample presentation forms (1 h; prof. Alamprese).

## Thursday, January 27th, h. 11-13

***Modulus I – E-sensing technologies***

Glossary and basic principles of image analysis (0.5 h; dr. Grassi).
Image acquisition and pre-processing (low-level processing) (1 h; dr. Grassi).
Image segmentation and object measurement (intermediate-level processing) (0.5 h; dr. Grassi).

## Thursday, January 27th, h. 14-17

***Modulus I – Practices on data acquisition***

NIR and MIR spectra acquisition of liquid and solid samples (2 h; prof. Alamprese)
Image acquisition by scanner and photo-camera (1 h; dr. Grassi)

## Friday, January 28th, h. 9-13

***Modulus II – Basic principles of chemometrics***

Introduction to chemometrics (1 h; prof. Alamprese).
Mathematical pre-treatment of data (1.5 h; prof. Alamprese).
Unsupervised modelling – concepts & common approaches (1.5 h; prof. Alamprese).

## Wednesday, February 2nd, h. 14-18

***Modulus II – Basic principles of chemometrics***

Practices on data pre-treatments and PCA (2 h; prof. Alamprese).
Supervised modeling – concepts & common approaches (2 h; dr. Grassi).

## Thursday, February 3rd, h. 14-18

***Modulus II – Basic principles of chemometrics***

Supervised modeling – concepts & common approaches (1 h; dr. Grassi).

***Modulus III – E-sensing technologies' applications***

The diversity of NIRS and MIRS applications in the agro-food sector (3 h; prof. Casiraghi).

## Friday, February 4th, h. 9-13

***Modulus II – Basic principles of chemometrics***

Practices on quantitative models (1.5 h; dr. Grassi).

***Modulus III – E-sensing technologies' applications***

Examples of Image Analysis in the agro-food sector (1.5 h; dr. Grassi)
Practices with real images (1 h; dr. Grassi).