

CHEMISTRY AND BIOPHYSICS FIELD_10 ECTS

Introducing

Description

Évaluation

L'évaluation des acquis d'apprentissage est réalisée en continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

Practical info

Location(s)

 Toulouse

Numerical culture and skills 2

Introducing

Description

The flow of Machine Learning
Data preparation
Machine Learning Terminology
Data types
Data visualization, quality and size
Reliability
Some activation functions
Model performance
Environmental impact

Objectives

At the end of this module, which follows the 2A module, the student will have consolidated his knowledge of the field of AI: accuracy, loss function, overfitting, batch size, visualization techniques... He will also have prepared and passed a PIX certification.

Necessary prerequisites

Basics of Python programming

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Practical info

Location(s)

 Toulouse

Biophysics

Introducing

Description

Programme (detailed contents):

- Introduction to Biophysics
- Protein structure
- Ion channels and electrophysiology
- Random walk in biology
- Organisation and dynamics of membranes
- Fluorescence microscopy and spectroscopy
- Stochasticity in gene expression
- Cell signalling

Objectives

At the end of this module, the student will have understood and be able to explain:

Advanced methods in molecular and cellular biophysics:

- Fluorescence microscopy and correlation spectroscopy
- Flow cytometry, imaging flow cytometry, fluorescence/image-activated cell sorting
- Electrophysiology, nanopore sensing and sequencing
- PyMol to visualize protein structures
- Surface-sensitive techniques

Main concepts in molecular and cellular biophysics:

- Macromolecular crowding
- Noise as a general principle underlying biological organisation and functions (stochasticity in gene expression, random walk, protein conformational changes)
- Cell signalling in space and time

The student will be able to:

- Interpret data from biophysical experiments and link the results to the studied concepts
- Apply biophysical insights to solve new problems in biology and bioengineering.

Necessary prerequisites

Has already followed a general biology course at university level

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Practical info

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Organic chemistry

Introducing

Description

Stereochemistry: prochirality, synthesis of enantiomerically pure compounds.

The carbonyl function (related organic and enzymatic reactions).

- Nucleophilic addition: main reaction of aldehydes and ketones
- Nucleophilic substitution on C sp²: main reaction of the derivatives

Multidisciplinary experimental project at the interface of chemistry and biology.

Objectives

At the end of this module, the student will have understood and will be able to explain:

- reaction mechanisms encountered in chemistry and biology.

The student must be able to:

- Understand and explain the reaction mechanisms.
- Carry out a multidisciplinary experimental mini-project in a group (design an experiment based on bibliographic research, propose an analytical monitoring approach, implement an experimental approach and analytical techniques, generate data, interpret, criticize and promote the experimental results, communicate orally).

Necessary prerequisites

I1ANETCH Chimie

I2BECH10 Chimie organique

I2BEBS10 Biochimie Structurale

I2BEAN20 Méthodes d'analyse I

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Practical info

Location(s)

 Toulouse

Structural chemistry

Introducing

I2BEBS10 Biochemistry
I2BEAN20 Analysis methods

Description

Training at spectroscopic methods applied to a rational approach of the structural determinations in deepening and broadening the theoretical basis of Nuclear Magnetic Resonance, Infra Red spectroscopy Ultra Violet and the Mass Spectrometry. Use of the complementarity of these different techniques for the determination of structure of molecules.

Principle and application of analytical methods, (NMR, MS, IR, UV) in Chemistry/Biochemistry. Spectroscopy NMR 1D and 2D: ^1H , ^{13}C . Mass spectrometry: EI, CI, Electrospray, MALDI, SIMS,

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Practical info

Location(s)

 Toulouse

Objectives

At the end of this module, the student will have understood and be able to explain (main concepts):

- the theory and practice of the main analytical techniques used in chemistry and biochemistry.

The student must be able to:

- solving structure of chemical compounds and simple biochemistry molecule using analytical methods: NMR, Mass Spectrometry, IR, UV.

Necessary prerequisites

I1ANETCH Chemistry
I2BECH10 Organic chemistry