INSA INSTITUT NATIONAL DES SCIENCES APPLIQUÉES TOULOUSE

SUMMER SCHOOLS

Our spring and summer courses propose a wide variety **of scientific topics in relation with our Engineering Bachelor** and Master Programs.

Our ambition is to contribute to the major societal challenges of tomorrow (Energy transition, industrial renewal, digital transition, sustainable development, transport [aeronautics, trains, automotive], mobility and urban systems...), by adapted educational programs in relation with our associated Research Laboratories.

SUMMER SCHOOL
IN BIOCHEMICAL ENGINEERING

Enzyme, molecular biology and Microbial Engineering
3 weeks - June 17 - July 5 2019
Level : L3 - M2
ects credits : 6
Deadline registration : March 18th, 2019

The course combines grounding in the field of life sciences (molecular biology, biochemistry, enzymology and microbiology) and in engineering sciences (biochemical engineering). The objectives of the proposed courses deal with the understanding of the most modern concepts in molecular biology as well as mastering the concepts of biocatalysis (enzymatic and microbial) for industrial developments.

LEARNING OBJECTIVES :

- Course 1 : to give basic knowledge concerning the measurement of the enzymatic reaction rate and the associated mechanisms, to establish the rate equations of complex enzymatic reactions
- Course 2 : students will be able to explain the main concepts regarding nucleic acids, DNA replication, every step of the gene expression process. Students will be able to define and describe the main molecular elements allowing genome organization and gene expression regulation.
- Course 3 : overview and basic knowledge of microorganisms interests and applications.
- Course 4 : to understand and to implement biological reactions.

CONTENTS :

COURSE 1 - ENZYME KINETICS
- Enzyme classification, reaction mechanism, initial reaction rate/enzymatic activity,
- Michaelis-Menten equation, Inhibition/activation,
- Effect of temperature and pH,
- Allosteric enzymes.

COURSE 2 - GENE EXPRESSION REGULATION

The aim of this course is to provide the knowledge in molecular biology and gene regulation that is required to master biotechnology tools for optimizing and/or modifying microorganism of industrial interest.
- Nucleic acids properties, genome organization and DNA replication
- Gene transcription, RNA processing and messenger RNA translation leading from DNA to proteins.
- Proteins folding and modifications will also be briefly described and key elements of gene expression regulation will also be given

COURSE 3 - BASIS IN MICROBIOLOGY

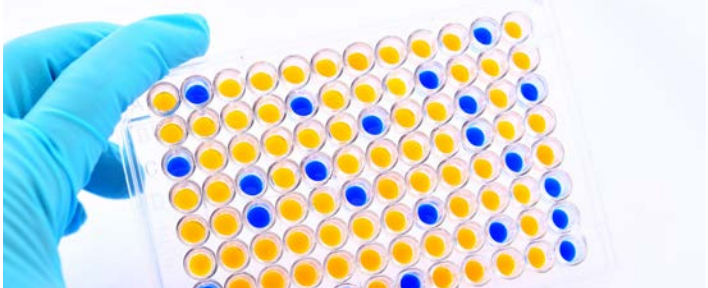
The main topics of this part are the followings:
- Description of some well-kown microorganismas
- Usual methods for microbial identification (microscopy and biochemical technics)
- Examples of applications
- Documentary project.

COURSE 4 - BIOCHEMICAL ENGINEERING

The main topics regarding these courses are :
- Metabolism of industrial microbes
- Microbial kinetics
- Biochemical engineering.

PREREQUISITES :

Structural biochemistry, general microbiology.



SUMMER SCHOOL
IN BIOREFINING

Biorefining: from raw materials to chemicals (co-organized with INP-ENSIACET)
3 weeks - July 1 - 19 2019
Level : M1 - M2 / ects credits : 6
Deadline registration : March 18th, 2019

Biorefineries and, nowadays, more broadly, the bio-economy concepts propose interesting approaches to produce commodity products by finding alternative solutions from conventional petrochemical routes. The bioeconomy has been identified as a major theme at European and International levels for the development of processes and products using less fossil carbon. The European Commission defines the bio-economy as «an economy that encompasses the production of renewable biological resources and their conversion into products for human food and animal feed, bio-based products and bioenergy through efficient and innovative technologies «(definition EFIB2017). Therefore, the value chain in bio-economy requires complementary multidisciplinary skills combining economics, biotechnology, green chemistry, and life cycle analysis, process innovation for intensive and eco-engineered bioprocesses.

LEARNING OBJECTIVES :

Students will be able to understand and to identify the challenges involved in the value chain in bio-economy.
Students can analyze and propose new developments for sustainable production routes.
Students will be able to know how to search for scientific articles.
Students will develop competencies in state-of-the-art research methodology.
Students will be able to propose a personal research project (for a PhD application for example).

CONTENTS :

COURSE 1 - GENERAL KNOWLEDGE
- Enzymatic reactions for biomass deconstruction
- Microbial engineering to produce synthons
- Green chemistry
- Bioproducts and separation techniques
- Life cycle analysis.

COURSE 2 - INITIATION TO DOCUMENTARY RESEARCH (BIBLIOGRAPHY)
- Scientific databases (Web of Sciences...) and Tools (zotero...)
- Structuration of a bibliography
- Synthesis of articles regarding a topic

COURSE 3 - DEVELOPMENT OF A PERSONAL RESEARCH PROJECT (PRP)

Green chemistry workshop deals with small framed projects regarding bioenergy production, bioplastics, biosolvents etc ... These workshops and practical works lead to oral presentation to evaluate the training.
These PRP will be evaluated at the end of the school by a Jury, in conditions close to the doctoral scholarship competition.

PREREQUISITES :

Bachelor in biochemical engineering or chemical engineering.

SUMMER SCHOOL
IN APPLIED MATHEMATICS

Optimization for Machine Learning
2 weeks - June 3 - 14 2019
Level : M1 - M2
ects credits : 4
Deadline registration : March 18th, 2019

The aim of this series of Lectures is to provide the basic background for dealing with Optimization issues in deterministic and stochastic environment. More specifically, we address the main features of smooth optimization algorithms with and without constraints: in addition to the theoretical material, we describe deterministic and stochastic gradient algorithms, Newton-type algorithms, least square algorithms. This part will be completed by an introduction to nonsmooth optimization algorithms (sub gradient algorithms and proximal algorithms). All these optimization algorithms will be implemented during practice classes with application to image processing. The second part of the Lectures will be devoted to actual Statistical issues related to Machine Learning.

LEARNING OBJECTIVES :

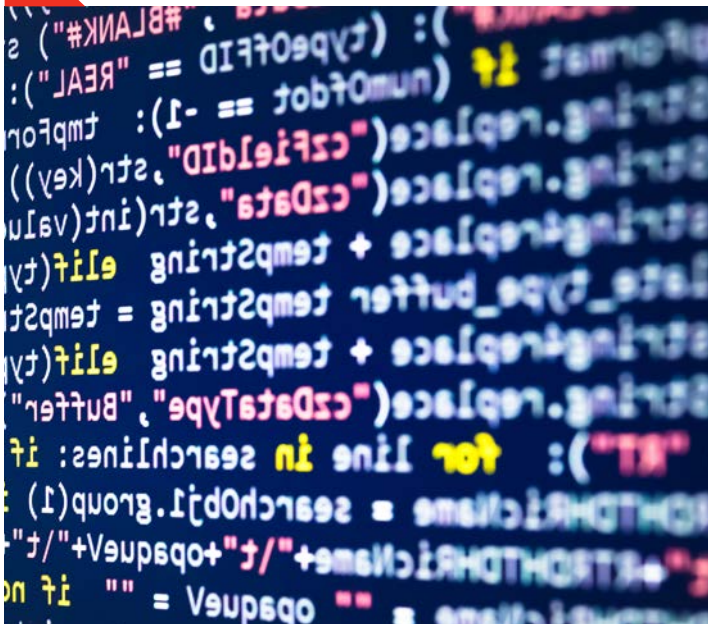
• To be able to choose and implement a suitable algorithm for solving a given optimization problem, especially in the context of machine learning.

CONTENTS :

• Optimality conditions
• Algorithms for differentiable optimization without constraints
  a.Gradient algorithms
  b.Stochastic gradient algorithm
  c.Newton-type algorithms
  d. Least squares issues
• First algorithms for nondifferentiable optimization
  a. LASSO, proximal algorithm.
• Introduction to Statistical Learning: Ridge Regression, Lasso, Support Vector Machines
• Imaging applications: image registration, compressive sampling, dictionary training
• Project in autonomy.

PREREQUISITES :

Differential calculus, basics in statistics.



SUMMER SCHOOL
IN APPLIED PHYSICS

Initiation to computer based instrumentation
3 weeks - June 17 - July 5 2019
Level : L3 - M2
ects credits : 6
Deadline registration : March 18th, 2019

The general objectives are to acquire knowledge in the field of the measurement and data acquisition using computers and to determine the important parameters of a measurement chain. This training is mainly focused on practical work.

LEARNING OBJECTIVES :

• How to choose the sensor, equipment, method adapted to solve a measurement problem.
• To Develop software under LabVIEW environment
• To Communicate with a data acquisition card or an instrument using RS-232 and GPIB buses.
• To Understand and use the main parameters during the use of data acquisition cards.
• To Develop data acquisition system with open source hardware

CONTENTS :

• LabVIEW Initiation
(4h course ; 8h labworks)
• Sensors
(3h course)
• Stand-alone instrument
(2h course ; 5h labworks)
• Open-source instrumentation
(4h course ; 6h labworks)
• Data acquisition
(2h course ; 6h labworks)
• *Project in autonomy (30h).*

PREREQUISITES :

Basics in algorithmic.

TOUL'BOX

The essential set to ease your installation in Toulouse !

Settling down in a new city to study or complete a research program is an extremely enriching experience that can also be stressful and complicated when we don't have a single clue about the area, the mandatory formalities, the habits or the customs.

In order to ease your arrival and make your installation stress free, the University of Toulouse provides you with a personalized reception service, very complete and specifically created to allow you to easily get acquainted with your new environment and anticipate your steps at the very most. Several packages available for international students and researchers: a welcome pack, a housing pack, a language courses pack, an airport / train station pack.

A complete set of tools for the students and researchers who are looking to easily settle in Toulouse!
toulbox.univ-toulouse.fr/

INSA TOULOUSE :

A STATE-FUNDED INSTITUTION OF SCIENCE AND ENGINEERING

With over 16,000 engineering graduates working in all sectors of the economy, the Institut National des Sciences Appliquées of Toulouse, an international and multidisciplinary state-funded engineering school, is recognized for the excellence of its five-year education curriculum which attracts students of a high academic level.

In addition to initial engineering education, INSA Toulouse's missions include continuing education for engineers, scientific research and its valorization. It also offers Research Masters which give access to PhD studies.

INSA Toulouse is part of the INSA Group with six other institutes : Centre Val de Loire, Lyon, Rennes, Rouen Normandie, Strasbourg and Fes.

Location :
Campus of INSA Toulouse
(www.insa-toulouse.fr)

Registration fees : 400€ / week
Contact : summer-school@insa-toulouse.fr

Students from partner universities have to contact summer-school@insa-toulouse.fr before registration

Registration link : https://goo.gl/forms/XQDvjilJoL0IGXzj2
For Accommodation,
Rooms can be proposed on demand if available.
Contact us for information.
You can also use Toul'BOX.

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Université Fédérale
Toulouse Midi-Pyrénées

Liberté • Égalité • Fraternité
RÉPUBLIQUE FRANÇAISE
MINISTÈRE DE L'ENSEIGNEMENT SUPÉRIEUR, DE LA RECHERCHE ET DE L'INNOVATION

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