

3rd YEAR ICBE GPE SPECIALITY SEMESTER 6

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

Analytical methods II

Introducing

Description

1. formulate a scientific problem related to analysis methods in order to illustrate it by manipulations.
2. Make a bibliography with the aim of proposing, adapting or creating experiments which will illustrate the chosen issue.
3. Gather its theoretical and practical knowledge of the previous years and implement them to solve the chosen problem.
4. Plan the experimental work of the group and organize the interactions with the other groups.
5. Explain the principle and learn how to implement the experimental techniques for the analysis.
6. teach yourself on the new analysis techniques necessary to undertake the project when this methods haven't been taught previously.
7. carry out an experiment at the laboratory
8. Analyze the experimental results.
9. Share and debate the results in the scientific point of view with both your teachers and inside your students group. Suggest improvements or work lead.
10. Verbally explain the objectives desired, the chosen scientific approach, and the results of the debate during an oral presentation.
11. Give explanation on the scientific approach followed and the results reached in a written scientific report.

Objectives

Learning by experimental project: illustrate a scientific problem using various experiments involving analytical techniques.

Forcing students to use all of their scientific knowledge in order to analyze the experimental results of their experiments and if necessary modify the protocols

Necessary prerequisites

- Molecular structure and reactivity.
- Thermodynamics, chemistry, electrochemistry.
- Techniques of separation, extraction.
- Analytical methods: chromatographic, UV-visible, electrochemical.

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Practical info

Location(s)

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Mass transfer

Introducing

Description

Thermodynamic properties of gas/liquid equilibria in the perfect gas state, concepts of fugacity and Henry's equilibrium. Transfer properties (viscosity, thermal conductivity, diffusivity) and phase equilibria of multi-constituent real fluids.

Introduction to matter transfer: establishment of the continuity equation, resolution of this equation in a few special cases. Introduction to the notion of transfer coefficient, dimensional analysis, transfer models (film and double film), experimental determination of transfer coefficient, concept of Height of Transfer Unit (HUT) and Number of Transfer Unit (NUT). Introduction to basic sizing of some G/L exchangers (packed column, bubble column, spray column).

Objectives

At the end of this module, the student will be familiar with the equations needed to determine the thermodynamic equilibrium properties (fugacity) of real fluids in multiphase systems. This knowledge will be applied to the determination of exchange potentials and transfer properties (viscosity, diffusivity, etc.).

Students will master the notion of transfer coefficient and be able to estimate it in a given operation.

Students will be able to apply these quantities to the generalized material balance equation applied to multiphase contactors, and will be able to dimension industrial installations such as bubble, packed and spray columns.

The student should be able to: size industrial installations such as bubble, packing and spray columns.

Necessary prerequisites

Advanced thermodynamics and application to physicochemical systems: I2BETH11

Roustan M., Transferts gaz-liquide dans les procédés de traitement des eaux et d'effluents gazeux, Editions TEC & DOC, 2003

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Chemical reaction engineering 2

Introducing

Description

Material balances in ideal reactors: general form of the balance, application to different ideal reactors, application to complex reaction schemes, yields and selectivities. Combining ideal reactors to optimize conversion and yield.

Influence of temperature on reactor performance. Notion of Optimal Temperature Progression (OTP). Energy balances for ideal reactors.

Description of real reactor flows. Residence time distribution. Hydrodynamic interpretation and modeling. Application to a packed reactor.

Mixing/reaction interactions: mixing mechanisms, methodology for identifying and solving a mixing/reaction problem, analysis and calculation of characteristic times, probability density function, micromixing models. Modeling/simulation of a case study.

Objectives

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

- reactors with variable volume / flow rates
- yield and selectivity in multiple stoichiometry reaction systems
- reactor arrangements (series, parallel, plug flow with recycling)

- mixing mechanisms and their relationship to reaction progress
- influence of reactor non-ideality on conversion: residence time distribution (transfer function concept) and concentration distribution (mixing)
- the influence of temperature on reactor performance, notion of Optimal Temperature Progression
- the general equation for energy conservation in a reactor.

The student should be able to :

- calculate ideal open reactors under variable flow conditions
- calculate the size or yield or selectivity of ideal open reactors for multiple stoichiometry systems, and the conversion rate that can be achieved by arranging the reactors
- determine the DTS of a reactor
- apply a mixing or flow model to predict conversion in a non-uniform reactor
- calculate the POT for a given system
- establish and solve enthalpy balances for reactional and non-reactional systems.

Necessary prerequisites

Ideal reactors, reaction rates and reaction progress parameters

Linear differential equations

Basis of Laplace transforms

Basis of transport phenomena

Basis of thermodynamics

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Thermodynamics and energy

Introducing

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Practical info

Location(s)

 Toulouse

Water, Environment and Risks

Introducing

Description

1- Environmental legislation and regulation
Basics of law and regulatory instruments (TD)
Design office project: Water in a region: from use to discharge

2- Environment
- Pollutant dispersion (mechanisms, consequences)
- Characterisation and typology of waste, waste management (treatment and storage methods), ordinary and radioactive waste, environmental impact of waste.

3- Process safety
Definitions of the main types of risk in the field of processes: calculation of the probability of human impact, toxicity, different types of explosion, thermal runaway. Protection methods and devices.

4- Water: issues for actors and industries
Environmental and health issues, indicators of pollution
Main treatment stages and processes

Objectives

- Explain the principles of environmental law in France and be familiar with legal and regulatory information tools.
- Describe the main environmental problems, the principles of water and waste management and the main treatment processes.

- Know the main risks in the process industry and the mechanisms of accidents.

Necessary prerequisites

Chemistry for solutions / Unit operations . Mass and Energy balances / kinetics and thermodynamics

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Location(s)

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Careers in Chemical Engineering (1)

Introducing

Description

presentation of various possible careers in process engineering: design office engineer (preparing calls for tender, responding to calls for tender, business management, contracts and public finance, etc.), project manager, R&D engineer, teacher-researcher, consulting and environmental management engineer, regional engineer.... . The tools specific to these professions (which form part of their knowledge and skills), the ways of accessing them and career paths are discussed.

Objectives

At the end of this CE, students will be able to:

- Identify the sectors of activity of GP3E engineers; the different possible professions (design office, territorial engineer, environmental management, research and development, production, consulting, business engineer, etc.), their specific features and the conditions for accessing them.
- build a professional network based on meetings and information provided by speakers

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Location(s)

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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)

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Business Game

Introducing

Description

Simulation of 5 years of company life (decision making in production, finance, marketing) using the SIMGEST business game.

Objectives

The student must have understood and be able to explain the interdependence of the company's functions (production, commercial, financial, human resources) through decision-making and analysis of the company's economic and financial results. He will have to understand how a company operates, construct financial statements, calculate costs, create simple management tools, optimize resources to make the company profitable, present an oral report of activities (in English)

Necessary prerequisites

financial management cours in 3A

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Practical info

Location(s)

 Toulouse

Company Finance

Introducing

Location(s)

 Toulouse

Description

Income statement, Cash flow, Balance sheet. Elements on costs. The break-even point. Taking inventory into account in financial statements. Debt financing. Company profitability.

Objectives

The student must have understood and be able to explain the company's financial summary documents as well as the basics of cost calculation in the industrial company.

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Practical info

Business Communication

Introducing

None

Description

Students will create a fictitious start-up in a market of their choice, conducting market analysis and identifying competitors. They will produce a GoFUND Me video and practice holding meetings and solving business challenges in English. The final presentation will be a "Shark Tank"-style competition, where students pitch their business idea to a panel of investors.

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Practical info

Location(s)

 Toulouse

Objectives

This course aims to equip students with essential business communication skills. Students will learn to understand a simple business plan and market research, conduct meetings, and use key business vocabulary. They will develop skills to describe graphs and create high-impact presentations. Students will also practice pitching to investors, introducing a company, and discussing social and environmental responsibility in the workplace.

Necessary prerequisites

Physical Education

Introducing

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Professional Path Initiative 3rd Year

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Societal Openness Modules

Introducing

Description

- Openness to societal issues (Energy transition, Ecological transition, Digital society, Health global, Mobility and infrastructure)
- Themes with interdisciplinary approaches, mixing Sciences & Techniques and Human Sciences and Social or Thematic in SHS complementary to the base proposed by INSA Toulouse.

Each year, the Opening Modules Commission draws up the list of MOs which will be offered in the 2nd semester. Students then choose the MO they wish to experience via a wish phase on a dedicated application. Students are informed of the MO they will follow during the month of January.

- Offered in the 2nd semester of 3A, Monday afternoon from 2 p.m. to 4:45 p.m.
- Open to all specialty pre-orientations (PO)
- Duration: 30 hours student (NB: additional personal work of around 30 hours is expected)

Educational format:

- Active pedagogies
 - Face-to-face, hybrid or fully remote
 - ECIU+ Challenge Based Learning possibility
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Objectives

The Societal Openness Modules are courses open to the 5 societal issues addressed by INSA Toulouse, allowing complex situations to be understood and covering themes not covered in INSA courses.

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