INSTITUTO POLITÉCNICO DE BRAGANÇA

Course Unit	Chemistry Projet			Field of study	Chemistry		
Bachelor in	Chemical Engineering			School	School of Technology and Management		
Academic Year	2023/2024	Year of study	2	Level	1-2	ECTS credits	6.0
Type	Semestral	Semester	1	Code	9125-755-2103-00-23		

Workload (hours)	162	Contact hours	T -	TP -	PL 30	TC -	S -	E -	OT -	O -

T - Lectures; TP - Lectures and problem-solving; PL - Problem-solving, project or laboratory; TC - Fieldwork; S - Seminar; E - Placement; OT - Tutorial; O - Other

Name(s) of lecturer(s): Arantzazu Santamaria Echart, Maria Filomena Filipe Barreiro

Learning outcomes and competences

At the end of the course unit the learner is expected to be able to:
1. Plan, implement and execute laboratory works integrating background knowledge of General Chemistry, Organic Chemistry and Instrumental Methods of Analysis.
2. Develop bibliographic research skills using scientific and technological libraries.
3. Training scientific and technological reports writing concerning: Ideas presentation, state of the art, experimental data reports and Experimental protocols.
4. Acquire oral presentation skills using audiovisuals media.
5. Create a self-confident attitude helping decision-making during the course of the project.
6. Develop skills of team work, cooperation, responsibility and scientific and technological rigor.
7. Acquire background knowledge of chemistry to support future work concerning more complex chemical and biological processes to be handled in future courses and in professional life.

Prerequisites

Before the course unit the learner is expected to be able to:
Demonstrate background knowledge of General/Organic Chemistry and Instrumental Methods of Analysis.

Course contents

Integrate background knowledge of chemistry to elaborate a phased project comprising: (1) Project design and selection; (2) Implement, at a laboratory level, the project and develop the associated experimental protocols; (3) Re-design the project according to partial outputs and (4) Present the final product and associated productive process. Develop research skills: (1) Use scientific/technological libraries; (2) Write scientific/technological reports and (3) Present ideas and results.

Course contents (extended version)

1. Introduction to course contents
   - Potential evaluation of autochthonous raw-materials for cosmetic industry;
   - Terminology and product brands.
2. Introduction to bibliographic research using free access databases and IPB resources
   - B-on (scientific research);
   - Espacenet (technical research);
   - Data survey on “Autochthonous plants with potential for essential oil extraction”.
3. Essential oil extraction by hydrodistillation
   - Clevenger apparatus and procedures;
   - Laboratory setup;
   - Essential oil extraction;
   - Yield determination;
   - Data survey for experimental protocol/data report elaboration.
4. Hydrogel synthesis
   - Natural polymers and its importance in cosmetic industry;
   - Synthesis of a chitosan-based hydrogel using chemical reticulation with glutaraldehyde (or other);
   - Water retention capacity evaluation;
   - Hydrogels importance in cosmetic industry;
   - Data survey for experimental protocol/data report elaboration.
5. Chemistry of tensioactives
   - Types of tensioactives: ionic (anionic and cationic) and non-ionic;
   - Main tensioactives families and commercial brands;
   - HLB concept;
   - Tensioactives in cosmetic industry;
   - Oil-in-water (O/W) and water-in-oil (W/O) emulsions preparation.
6. Saponification process
   - Soap raw-materials;
   - Saponification index: experimental determination;
   - Saponification chemistry (NaOH versus KOH);
   - Soap formulation.
7. Product design and development
   - Product selection by students. State-of-the-art elaboration;
   - Idea presentation;
   - Implementation of the laboratory project;
   - Final report elaboration;
   - Product and process presentation.

Recommended reading

Não existe bibliografia específica. Os alunos são incentivados a selecionar a bibliografia de acordo com o tema do projeto, nomeadamente, a recorrerem a bibliotecas científicas/técnicas digitais.

Teaching and learning methods

Practical-laboratorial (PL) classes: The adopted methodology will encourage the student to have a pro-active learning attitude. At a practical level the student will design the project, practise bibliographic research, elaborate scientific/technical reports and laboratory protocols, and practise oral presentation. At laboratory level the student will implement the project/execute fixed protocols.

Assessment methods

- Alternative 1 - (Regular, Student Worker) (Final, Supplementary, Special)
  - Reports and Guides - 40% (3 reports (state of the art, intermediate and final))
  - Presentations - 20% (2 oral presentations (idea presentation and final presentation))
  - Laboratory Work - 40% (Evaluation of laboratorial performance)

Language of instruction

English

Electronic validation

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13-10-2023	25-10-2023	25-10-2023	31-10-2023