

# Biorefinery

**Calendar:** 5<sup>th</sup> day semester

**Contact Hours:** T 30,0h; TP 30,0h;

**Scientific Area:** Processes in Chemical and Biological Engineering

## **Learning outcomes of the curricular unit:**

The aim is to focus on the biorefinery concept and have a better understanding on feedstocks and conversion techniques that are used, thermochemical or biochemical paths. Different types of biorefineries will be characterised and case studies will be analysed, focusing on the whole chain from feedstock to products, characterising technologies and operating conditions. In addition, it is aimed to focus on methodologies used for process integration for optimised use of resources and the global efficiency, introducing economic and sustainability aspects.

Students should develop technical and technological competences related to biorefineries, identifying and upgrading different types of biomass, biofuels and bioliquids, and develop the capability to identify the best available techniques to be used in accordance with the type of available biomass and the selectivity required towards products.

## **Syllabus:**

1. Biomass: types of biomass and characterisation. Biomass conversion processes and technologies.
2. The concept of Biorefinery: definition; types of biorefinery and their characterisation. Principles and fundamental aspects. The biorefinery in the context of a bioeconomy: technical and economic considerations. The scope of the biorefinery in the chemical.
3. Industry-based Biorefineries. Process Integration.
4. Biofuels and biomaterials.

## **Evidence of the syllabus coherence with the curricular unit's intended learning outcomes:**

Various aspects related to the chain value are tackled, from the availability of the biomass to its conversion, with the objective to form qualified professionals with ability to critique and act strategically and focused on technology in existing installations and evaluate opportunities for

biorefinery projects. Case studies and applications will lead students to understand better basic principles and their application.

**References:**

1. "Integrated biorefineries: design, analysis and optimization". Paul R. Stuart, Mahmoud M. & Elm Halwagi. Series: Greenchemistry and Chemical Engineering. CRC Press. ISBN 9781439803462, 2012.

2. "Biorefineries – Industrial processes and products. Status Quo and future directions". John Wiley & Sons. ID: 2180097, 2010.