

Academic Year/course: 2022/23

60647 - Renewable Raw Materials

Syllabus Information

Academic Year: 2022/23

Subject: 60647 - Renewable Raw Materials

Faculty / School: 100 - Facultad de Ciencias

Degree: 540 - Master's in Industrial Chemistry

ECTS: 3.0

Year: 1

Semester: Second semester

Subject Type: Optional

Module:

1. General information

1.1. Aims of the course

The course, and its expected results, respond to the following approaches and objectives:

Deep knowledge of the physical-chemistry of the studied industrial processes.

Describe and propose applications of various advanced methodologies in the chemical industry.

Recognize the impact of chemical products and processes on the environment and to propose methods to evaluate and reduce this impact.

Properly use the specific vocabulary and terminology of the chemical valorization of renewable raw materials

Assess the ability to use renewable raw material to obtain useful chemical products.

1.2. Context and importance of this course in the degree

The subject Renewable Raw Materials is an optional subject of the second semester of the Master in Industrial Chemistry.

The subject is directly connected to the contents and competences of the compulsory Industrial Chemistry and the elective of Applied Organic Chemistry.

The course seeks to describe the main sources of renewable raw materials and their transformation into products of greater added value, covering fields such as biofuels, biopolymers, etc. and addressing these concepts within the framework of the concept of the biorefinery, highlighting the interest and importance of this knowledge in the context of the development of local and national economies today.

1.3. Recommendations to take this course

It is recommended to be a graduate in Chemistry, Biochemistry, Biotechnology, Chemical Engineering or other studies related to Chemistry.

2. Learning goals

3. Assessment (1st and 2nd call)

3.1. Assessment tasks (description of tasks, marking system and assessment criteria)

The students must demonstrate that they have achieved the expected learning outcomes through the following evaluation activities:

The knowledge and skills acquired will be evaluated by taking a final written test and a presentation about a subject related to the course.

Activity 1: written exam

The written exam will consist of a series of theoretical and practical exercises of application on the different concepts learned during the course. The questions and exercises will deal with the topics of the subject indicated in the "Syllabus" section, including the contents not only of the lectures but also from seminars.

This written test will be graded from 0 to 10 and will account for 50% of the course grade.

This exam will be held with books and class notes.

Activity 2: Paper/Project, Presentation

The work will deal with a topic related to the subject.

The written work will be graded from 0 to 10 points.

The work will be presented in class through a presentation that will last a maximum of 15 minutes, followed by a debate between teachers and students about the subject.

The work and its class presentation will not take place later than April 30 of the corresponding course.

This work will account for 50% of the course grade.

In order to pass the subject it will be necessary to obtain a minimum of 5 points. A minimum grade of 4 points is compulsory in each evaluation activity.

The number of official exam calls to which enrollment entitles (2 per enrollment) as well as the consumption of those calls will adjust to the regulations of the University of Zaragoza (Reglamento de permanencia en títulos oficiales adaptados al Espacio Europeo de Educación Superior en la Universidad de Zaragoza and the Reglamento de Normas de Evaluación del Aprendizaje de la Universidad de Zaragoza.)

The general criteria for the design of the tests and the grading system will also be adjusted to this last regulation and, according to it, the time, place and date on which the review will be held will be made public when the grades are published.

According to the regulation I Reglamento de Normas de Evaluación del Aprendizaje de la Universidad de Zaragoza, The student will be entitled to a global test in which the skills developed in the subject will be evaluated. This global test will be held on the date established by the Faculty of Science in its examination calendar.

4. Methodology, learning tasks, syllabus and resources

4.1. Methodological overview

The methodology followed in this course is oriented towards achievement of the learning objectives. It favors the knowledge of the main renewable raw materials sources and their transformation in higher added value products. A wide range of teaching and learning tasks are implemented, such as lectures and seminars.

Students are expected to participate actively in the class throughout the semester.

Classroom materials will be available via Moodle. These include a repository of the lecture notes used in class, the course syllabus, as well as other course-specific learning materials.

Further information regarding the course will be provided on the first day of class.

4.2. Learning tasks

The course includes 3 ECTS organized according to:

- Lectures (2.5 ECTS): 25 hours. Lecture presentations will be available for the students previous to the classes
- Seminars (0.5 ECTS): 5 hours. They will be offered by external experts on subjects related to biorefinery and green chemistry .
- Assignments: 42 hours.
- Evaluation activities: 3 hours.

The learning and evaluation activities will be carried out in person unless, due to the sanitary situation, the provisions issued by the competent authorities and by the University of Zaragoza require them to be carried out electronically or semi-electronically with rotating reduced capacity.

4.3. Syllabus

The course will address the following topics:

Topic 1. Basic concepts of biorefinery.

Topic 2. Study of different raw materials: features and availability.

Topic 3. Pretreatment and treatment of the different renewable raw materials.

Topic 4. Interesting Products from renewable raw materials:

- Biofuels (biogas, bioethanol, biodiesel, biooil).
- Terpenes.
- Proteins and other non-carbohydrated biopolymers.
- Lipids and oils: fatty acids and glycerol.
- Carbohydrates.
- Lignins.

4.4. Course planning and calendar

Further information concerning the timetable, classroom, assessment dates and other details regarding this course, will be provided on the first day of class or please refer to the "Facultad de Ciencias" website <http://ciencias.unizar.es/web/horarios.do>

4.5. Bibliography and recommended resources

- Ulber, R. **Renewable Raw Materials**. Wiley-Blackwell. 2010 ?
- **Biorefineries-industrial processes and products: status quo and future directions**. Birgit Kamm, Patrick ?R. Gruber, and Michael Kamm Weinheim, Eds. Wiley-VCH, 2006. ?
- **Feedstocks for the future: renewables for the production of chemicals and materials**. Joseph J. Bozell, editor, ?Martin K. Patel, editors ; sponsored by the ACS Division, Cellulose and Renewable Materials. Washington, DC : ?American Chemical Society , cop. 2006 ?
- **Introduction to chemicals from biomass** / editors, James H. Clark with Fabien E. I. Deswarte Chichester : Wiley, cop. ?2008 ?
- **Renewable bioresources : scope and modification for non- food applications** / editors, Christian V. Stevens with ?Roland Verhé Chichester: John Wiley & Sons, 2004 cop. 2004 ?
- **Catalysis for renewables: from feedstock to energy production** / edited by Gabriele Centi and Rutger A. van Santen ?. - 1st ed., 1st rep. Weinheim : Wiley-VCH, 2008 ?
- **Polymers from agricultural coproducts** / Marshall L. Fishman, Robert B. Friedman, Samuel J. Huang, [editors] Washington, DC : American Chemical Society, 1994 ?
- Goettemoeller, Jeffrey. **Sustainable ethanol: biofuels, biorefineries, cellulosic biomass, flex-fuel vehicles, and sustainable farming for energy independence** / Jeffrey Goettemoeller and Adrian Goettemoeller Maryville, Missouri : Prairie Oak, cop. 2007 ?
- **Thermoplastic starch : A green material for various industries** / edited by Leon P.B.M. Janssen and Leszek Moscicki Weinheim : Wiley-VCH, cop. 2009 ?
- **Biopolymers from renewable resources** / D. L. Kaplan (ed.) Berlin [etc.] : Springer, cop. 1998?
- **Surfactants from renewable resources** / edited by Mikael Kjellin, Ingegärd Johansson Chichester : Wiley, 2010 ?
- Pagliaro, Mario. **The future of glycerol : new usages for a versatil raw material** / Mario Pagliaro, Michele Rossi ?Cambridge : RSC Publishing, cop. 2008 ?
- Pahl, Greg. **Biodiesel : growing a new energy economy** / Greg Pahl ; foreword by Bill McKibben . - 2nd ed. White ?River Junction, Vermont : Chelsea Green, cop. 200 ?
- **Handbook of plant-based biofuels** / edited by Ashok Pandey Boca Raton : CRC Press, cop. 2008 ?
- Lin, C.A.. **Renewable Resources for Biorefineries**. Royal Society of Chemistry. 2014 ?
- Wertz, J.L.. **Lignocellulosic Biorefineries**. PU POLYTECHNIQU. 2013