COURSE INFORMATION

ORGANIC CHEMISTRY LABORATORY

Code number: 757509215
Degree in Chemistry
Academic Year: 2015-2016
Foundational course. 3rd year
First semester:6 ECTS credits (one hour theory per week, laboratory block of 40 hours in two weeks)

TEACHING STAFF

Professor: Uwe Pischel
Department: Chemical Engineering, Physical Chemistry, and Organic Chemistry
Office: P4-N5-07
Phone: +34 959 21 99 82
E-mail: uwe.pischel@diq.uhu.es
Office hours: First Semester: Monday 16-19 h, Tuesday 16-19 h

SYLLABUS

1. DESCRIPTION

Integration in the Study Plan
The course "Organic Chemistry Laboratory" is taught in the first semester of the 3rd year of the Chemistry Degree studies. The student starts this course after having enrolled in the basic courses "Introduction to the Chemical Laboratory II", "Basic Concepts of Organic Chemistry", and "Organic Chemistry". This has provided the student with the necessary basic knowledge about the work in a chemistry laboratory.

Impact on the Professional Profile
This course allows the student to broaden and extend his knowledge about basic reactions and organic synthesis and offers the opportunity to familiarize with basic experimental techniques in organic synthesis, frequently encountered in research laboratories of companies or public institutions.

2. PREREQUISITES

Having studied previously the courses "Basic Concepts of Organic Chemistry" and "Organic Chemistry" (second year).

3. OBJECTIVES/LEARNING OUTCOMES

General Objectives of the Course
Study of theoretical problems in organic synthesis, complemented by synthetic techniques/methods and the characterization of organic compounds.

Basic or Transversal Competences
B1. Capacity of analysis and synthesis
B2. Capacity of organization and planning

B4. Knowledge of a foreign language
B6. Problem solving
B8. Team work

Specific Competences
C2. Know the main types of chemical reactions and the main characteristics associated with each one of them
C4. Know the main techniques of structural research, including spectroscopy
C11. Know the properties of aliphatic, aromatic, heterocyclic, and organometallic compounds
C12. Know the nature and behavior of functional groups in organic molecules
Q3. Competence to evaluate, interpret, and synthesize chemical facts and information
Q4. Capacity to recognize and implement good practices of professional and scientific work
Q5. Competence to present, both written and orally, scientific material and argumentation in front of an expert audience
P1. Capacity to handle chemical material securely, taking into account its physical and chemical properties, including any specific danger associated to its use
P2. Capacity to carry out standard laboratory procedures implied in analytical and synthetic work with organic and inorganic systems
P4. Capacity to handle standard chemical instrumentation as used in structural studies and separations
P6. Capacity to carry out risk evaluations related to the use of chemical substances and laboratory procedures

4. TEACHING METHODOLOGY

Theory lectures
Meant to structure the contents and to clarify concepts. They are realized in the classroom and serve to treat the contents from a communicative perspective, encouraging the participation of the students and the realization of exercises as instruments for improving the significance of the transmitted knowledge. The activities that are realized in the classroom will be supported with diverse educative resources such as presentations in powerpoint, molecular models, etc.

Practical sessions
These sessions will be realized in the laboratory. The students will be teamed up in pairs and these will perform reactions that were studied in the theory lectures as well as the separation and purification of the obtained compounds.

Tutorial sessions
Here the student proposes and clarifies doubts related to any aspect of the taught matter.

5. CONTENTS

Theory contents
Topic 1. Formation and reactivity of enoles and enolate ions. Enolization catalyzed by acids and bases. Enolate equivalents: enamines. (3.5 hours)
Topic 2. Alkylation of enolates and enamines. Alkylation of 1,3-dicarbonyl compounds. Intra- and intermolecular aldol condensations. Cross aldol condensations. Claisen condensation. Dieckmann condensation. Mannich reaction. (4.5 hours)
Topic 3. Oxidation reactions. (4.0 hours)
Topic 4. Reductions of carbonyl groups. Reductions of other functions. (3.0 hours)

Practical contents
Experiment 1. Condensation of benzaldehyde and acetone. The Claisen-Schmidt reaction.

Experiment 2. Enamines. Acetylation of cyclohexanone.
Experiment 3. Synthesis of cinnamic acid by the Knoevenagel condensation.
Experiment 4. Mannich reaction with indole.
Experiment 5. Synthesis and determination of the stereochemistry of 1,2-diphenyl-1,2-ethandiol.
Experiment 6. Optical resolution of 1,1'-bi-2-naphthol.

Tentative chronogram
Thematic Units:
Topic 1. Formation and reactivity of enoles and enolate ions (T1)
Topic 2. Alkylation of enolates and enamines (T2)
Topic 3.Oxidation reactions (T3)
Topic 4. Reduction reactions (T4)

Week	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12	S13	S14	S15
Theory	T1	T1	T1	T2	T2	T2	T2	T2	T3	T3	T3	T3	T4	T4	T4
Lab					P	P									
Other Activities				GA1				GA1				GA2			GA2

T- Theory topic, P - Practical training in laboratory, GA - Guided activity

6. BIBLIOGRAPHY

Basic:
Experimental Organic Chemistry. L. M. Harwood, C. J. Moody, J. M. Percy, ed. Blackwell

Specific:
Organic Chemistry. J. Clayden, N. Greeves, S. Warren, P. Wothers, ed. Oxford Univ. Press
Organic Chemistry. L. G. Wade, ed. Prentice Hall

7. ASSESSMENT

For the final qualification the **basic norms of behavior and working**, which should be respected by the University community of the Faculty of Experimental Sciences and which were approved by the Faculty Council, will be taken into account.

The competences acquired in each thematic unit will be evaluated jointly by taking into account the different activities of the course; i.e., exam, laboratory report, guided activities.

Final exam/quiz: The mark obtained in the **final exam counts 60% of the final assessment** of the course. The exam/quiz will consist of theoretical and practical questions.

40% of the final assessment will be obtained by **continuous evaluation schemes** such as the solving of in-class quizzes (two guided activities), the elaboration of the laboratory report, and the attitude of the student in the laboratory.

In order to approve the course a **minimum mark of 4.0 in the final exam/quiz** is required. Furthermore, the global mark (consisting of the weighted contributions of exam and continuous evaluation) has to be **5.0 or higher** (on a scale from 0 to 10) in order to receive approval.