COURSE GUIDE
SUBJECT

1. DETAILS OF THE COURSE		
1.1. Name: Physical Chemistry Lab Course		
1.2 Code: 50903214	**1.3 .Plan:** Grade in Chemistry (2009 Program)	**1.4.Level:** Undergraduate
1.5 Course: 3rd	**1.6. Type:** Mandatory	**1.7. Semester:** Second
1.9. ECTS: 6	**1.9.1.Theoretical:** 0	**1.9.2.Practical:** 6
1.10. Descriptors: Practical training in the Physical Chemistry Lab		

2. LECTURER		
2.1. Name: Ramiro Téllez Sanz		
2.2. Department: Chemistry and Physics		
2.3. Field of Knowledge: Physical Chemistry		
2.4. Office: 2.18 Chemistry building		
2.6. Mentoring: Time and place will be set at the beginning of the term		
2.6.1. 1st Semester:	**2.6.2. 2nd Semester:**	
2.7. Phone: 950 015 616	**2.8. E-Mail:** rtellez@ual.es	**2.9. Virtual platform WEB CT:** Yes
2.10. Personal Webpage:		

3. DATA OF THE DEPARTMENT			
3.1. Name: Chemistry and Physics			
3.2. Fields of Knowledge of the Department: Physical Chemistry, Organic Chemistry, Inorganic Chemistry, Analytical Chemistry, Biochemistry and Molecular Biology, Applied Physics, Material Sciences and Metallurgical Engineering, Prospecting and Mining Research.			
3.3. Director: Amadeo Rodríguez Fernández-Alba			
3.3.1. Office: 1.020 Chemistry building	**3.3.2.Phone:** 950 015 034	**3.3.3.E-Mail:** amadeo@ual.es	
3. 4. Head of Administration: Francisco Luzón Martínez			
3.4.1. Office: 2.08 CITE II building	**3.4.2. Phone:** 950 015 106	**3.4.3 Fax:** 950 015 008	**3.4.4.E-Mail:** fluzon@ual.es

4. CONTEXT

4.1. Main objective of the course:

This is a lab-only course, and the only chance Grade students will have of experimenting the theoretical concepts studied in the theories in other courses. Thus, this lab-course gathers a series of representative lab scripts covering most of them. They will work in the lab with thermodynamic, kinetic, spectroscopic and electrochemical concepts.

The students will learn and apply different experimental techniques and analysis procedures, helping them to secure the theoretical knowledge from other courses through its direct application.

4.2 Previous knowledge:

It is advisable the student had made the most of the Physical Chemistry II course during the previous semester.

4.3. Prior conditions:

It is mandatory to have passed the Physical Chemistry II course, as indicated by the Program for the Grade in Chemistry.

5. COMPETENCIES AND OBJECTIVES

5.1 GENERAL COMPETENCIES

University of Almería's:

- Capability to resolve troubles.
- Team work.

Other:

- Knowledge application

5.2 SPECIFIC COMPETENCIES

Grade in Chemistry's cross competencies

- B1. Analysis and synthesis capabilities.

Objective: To be able to identify and quantify the relationships appearing in the experimental data.

- B2: Organization and planning capabilities.

Objective: To be able to anticipate and follow the steps necessary to successfully carry out every lab session, as well as to coordinate both the action and the methodology with mates.

Cognitive competencies related to Chemistry

- Q3. Competence for evaluating, interpreting and synthesizing chemistry data.

Objective: To be able to extract useful chemical information from experimental data, such as determining the mechanism a process has followed, fitting the data to a model, providing a result and interpreting it critically.

- Q4. Ability to follow and recognize good scientific practices when working.

Objective: To get the best quality experimental data possible by avoiding systemic errors, the contamination of reactants and lab equipment and using the right tools. Also, to avoid risk situations for both people and equipment.

- Q6: Skills in chemical data processing.

Objective: To be able to use specialized scientific software to process the experimental data obtained in the lab.

Chemistry-related practices

- P3. Ability to observe, monitor and measure properties, events or chemical changes, as well as their systematic and reliable logging.

Objective: The precise record and pursuit of the experimental conditions and data leading to reliable data analysis and interpretation.

- P5. Data interpretation and meaning according to the theories behind them.

Objective: To be able to choose the most suitable model to fit the experimental data in view of the results obtained through a reasoned decision, as well as being able to interpret the parameters in a physical-chemical manner.

6.CONTENTS

6.1. PRACTICAL CONTENTS:

The students will carry out different experimental scripts, on several general physical chemical topics, to cover the main theoretical concepts studied in the theoretical courses. The list of scripts is as follows:

- Determination of the water enthalpies for fusion and vaporization.
- Kinetics of saccharose inversion.
- Spectrophotometric determination of the pKa of a chemical indicator.
- Determination of the surface tension by the pendant drop method.
- Kinetics of aniline iodation.
- Conductimetric acid-base titrations.
- Potentiometric determination of the solubility products of two silver halides and of the complex stability constant of [Ag(NH3)n]+
- Testing the Boyle-Mariotte Law.
- Cryoscopic determination of molecular weights.
- Obtaining the adsorption isotherm of acetic acid on charcoal.
- Conductimetric determination of the activation energy and frequency factor for a chemical reaction.
- Determination of the diffusion coefficient of a solute by viscosity.
- Spectroscopic identification of aromatic compounds and polyethylene conjugates.

7. METHODOLOGY

7.1 Methodology for the treatment of practical content:

Experimental scripts, as well as electronic resources related to the topics of the practical classes and specialized free software will be available on WebCT.

At the beginning of this lab course a four hour seminar session will take place. The lecturer will explain the security measures in the lab, will inform about general rules to follow, will talk about the criterions for scoring the students' work and will teach them to analyze the experimental data with the supplied software.

There are thirteen scripts to carry out. The students will be divided in pairs and, through a rotating system, all pairs will perform every script at different sessions.

Before every lab session the students must have read in advance the script they are going to carry out and must have done every calculation needed for preparing the solutions they need. The development of each experimental script will extend for one or two lab sessions, after which a report must be presented with the procedure followed, the experimental results obtained and the corresponding data analysis performed, as well as the corresponding chemical conclusions to extract.

7.2 Workload of the student (calculated by number of hours)

WORKING HOURS OF THE STUDENT

7.2.1. IN-CLASS HOURS (with professor)

TEACHING ACTIVITY		NO. HOURS	NO. OF GROUPS	TEACHING HOURS (in ECTS)
CLASS of theory (THEORY GROUP ACCORDING TO OD)				
CLASS OF PRACTICAL TRAINING (PRACTICE GROUPS ACCORDING TO OD)	Laboratory	41	1	5.5
	Problems			
	Informatics			
	Field			
	Other			
OTHER TEACHING ACTIVITIES	Seminars	4	1	0.5
	Group Tutoring			
	Other			
SUBTOTAL IN-CLASS HOURS				
HOURS FOR TESTS AND EXAMS		3		

7.2.2 . AUTONOMOUS WORKING HOURS (not in-class, estimated)

HOURS OF PREPARATION FOR ACTIVITIES AND WORK (theory)		
HOURS OF PREPARATION FOR ACTIVITIES AND WORK (practice)	102	
HOURS OF STUDY FOR TESTS AND EXAMS		
OTHER		
SUBTOTAL AUTONOMOUS WORKING HOURS		

TOTAL WORKING HOURS	***STUDENT***	***TEACHER***
	150	*45*

7.3 Temporary Sequencing of the Course

WEEK	THEORETICAL CONTENTS	PRACTICAL CONTENTS	HOURS (anticipation)	
			THEORY GROUP OD	PRACTICE GROUP OD
1	Seminar on several topics, from data analysis to security measures	Security measures in the lab. Criterions for scoring the students. General rules to follow. Instructions on how to use the provided software for analysing the experimental data.	4	
2		Determination of the water enthalpies for fusion and vaporization.		3
3		Kinetics of saccharose inversion.		3
4		Spectrophotometric determination of the pKa of a chemical indicator.		3
5		Determination of the surface tension by the pendant drop method.		3
6		Kinetics of aniline iodations.		3
7		Conductimetric acid-base titrations.		3
8		Potentiometric determination of the solubility products of two silver halides and of the complex stability constant of [Ag(NH3)n]+		3
9		Testing the Boyle-Mariotte Law.		3
10		Cryoscopic determination of molecular weights.		3
11		Obtaining the adsorption isotherm of acetic acid on charcoal.		4
12		Conductimetric determination of the activation energy and frequency factor for a chemical reaction		3
13		Determination of the diffusion coefficient of a solute by viscosity.		4
14		Spectroscopic identification of aromatic compounds and polyethylene conjugates.		3

8. BIBLIOGRAPHY OF THE COURSE

Recommended Reading:

Fisicoquímica (by Ira N. Levine)
Química física (by Peter Atkins & Julio de Paula)

Web addresses:

http://almirez.ual.es/search/x?SEARCH=50903214

9 EVALUATION SYSTEM

9.1 Aspects and/or criteria:

It is absolutely mandatory to attend the lab sessions and perform all the scripts to pass the course, as well as to present the report of every script no later than the week after the corresponding session.

The different competencies enumerated above will be evaluated either during the lab sessions or in the presented reports, as appropriate.

The scores for the lab work and presented reports to pass the course are independent of each other. A minimum of 5 out of 10 is to be achieved for each one. If this is not the case, the student will have to pass a final examination, consisting of a problem lab session.

9.2 Modalities and instruments:

Seminar attendance.
Participation in WebCT.
Delivery of reports.
Lab sessions attendance.
Impressions and notes taken during the lab sessions.
Evaluation of reports.
Final lab examination (as appropriate)

9.3 Scoring system:

The attendance to the initial seminars and lab sessions is mandatory. Unexcused absences will decrease the final score by the non-attendance percentage, but a 20% of unexcused absenteeism prevents from passing this course.

The score reached during the lab sessions will account for half the final score. The other half will come from the evaluation of reports.