COURSE GUIDE FOR

PRINCIPLES OF INSTRUMENTAL TECHNIQUES IN NUTRITION

Academic year 2020-21

(Date last update: 08/07/2020)

MODULE	SUBJECT MATTER	YEAR	SEMESTER	CREDITS	TYPE
Complements of Formation	Chemistry	3rd	2nd	6 ECTS	Optative

TEACHING STAFF[1]	ADDRESS, TELEPHONE NUMBER, EMAIL, ETC.
• **María José Rueda Rama (MJRR)** • **Emilio García Fernández (EGF)**	Dpto. Fisicoquímica, Facultad de Farmacia. Campus Universitario de Cartuja, s/n. 18071 – Granada. • MJRR: Despacho nº 197. Teléfono: 958247887 Correo electrónico: mjruedas@ugr.es • EFG: Despacho nº 202. Teléfono: 958243829 Correo electrónico: emilio@ugr.es
	TIMETABLE FOR TUTORIALS OR LINK TO WEBSITE
	• MJRR ○ Tuesday, 11:30h - 13:30h ○ Thursday, 11:30h - 13:30h ○ Friday, 10:30 - 12:30 • EGF ○ Monday, Tuesday and Wednesday, 12:00h - 14:00h http://fisicoquimica.ugr.es/pages/docencia/curso_2021/_doc/horariotutorias2021

BELONGS TO UNDERGRADUATE DEGREE PROGRAMME	AND ALSO TO OTHER UNDERGRADUATE DEGREE PROGRAMMES
Degree in Human Nutritional and Dietetics	

[1] Consult any updates in Acceso Identificado > Aplicaciones > Ordenación Docente

(∞) This course guide should be filled in according to UGR regulations on assessment of student learning: (http://secretariageneral.ugr.es/pages/normativa/fichasugr/ncg7121/!)

PREREQUISITES OR RECOMMENDATIONS (where applicable)

Proper knowledge about:

- Mathematics.
- General Chemistry.
- Physics

BRIEF DESCRIPTION OF CONTENT (ACCORDING TO OFFICIAL VALIDATION REPORT)

Learn the most commonly used techniques in the preparation and analysis of food components, contaminants and food waste. Understand the future trends of food analysis.

GENERAL AND SPECIFIC COMPETENCES

Basic and general:

• CG3 - Recognize the need to maintain and update professional competence, giving special importance to learning, autonomously and continuously, new knowledge, products and techniques in nutrition and food, as well as motivation for quality.
• CG8 - Identify and classify food and food products. To be able to analyze and determine its composition, its properties, its nutritional value, the bioavailability of its nutrients, organoleptic characteristics and the modifications that takes place as a result of technological and culinary processes.
• CB1 - That students have demonstrated to possess and understand knowledge in an area of study that starts from the basis of general secondary education, and is often found at a level that, while supported by advanced textbooks, also includes some aspects that involve knowledge from the cutting edge of their field of study.
• CB2 - That students know how to apply their knowledge to their work or vocation in a professional way and possess the skills that are usually demonstrated through the elaboration and defense of arguments and the resolution of problems within their area of study.
• CB3 - That students have the ability to collect and interpret relevant data (usually within their area of study) to make judgments that include a reflection on relevant topics of a social, scientific or ethical nature.
• CB4 - That students can transmit information, ideas, problems and solutions to a specialized and non-specialized audience.
• CB5 - That students have developed the learning skills necessary to undertake further studies with a high degree of autonomy.

Transversal

• CT.2 - Ability to use TICs with unwrapping.

Specific

• CE1 - Know the chemical, biochemical and biological fundamentals of application in human nutrition and dietetics.
• CE7 - Acquire teamwork skills as a unit in which professionals and other staff related to diagnostic assessment and treatment of dietetics and nutrition are structured in a uni or multidisciplinary way and interdisciplinary.
• CE11 - Know its chemical composition, its physical-chemical properties, its nutritional value, its bioavailability, its organoleptic characteristics and the modifications that suffer as a result of technological and culinary processes.
• CE22 - Scientific and technical advice on foodstuffs and their development. Evaluate compliance with such advice.
• CE46: Being able to substantiate the scientific principles that underpin the intervention of the dietitian-nutritionist, making his professional performance subject to scientific evidence

OBJECTIVES (EXPRESSED AS EXPECTED LEARNING OUTCOMES)

• Select the most suitable technique for food analysis and control.

• Knowledge and application of the main instrumental techniques used for food analysis and control, both from the point of view of theoretical basis and the instrumentation used.

DETAILED SYLLABUS

THEORETICAL SYLLABUS

- UNIT 1. Introduction to Instrumental Analysis in Foods.
  Introduction. Classification. Applications. Quantification. Phases and criteria of an analytical method.
- UNIT 2. Chromatographic techniques.
  Concept and classification. Chromatography theories. Chromatographic parameters.
- UNIT 3. Principles of UV-Vis spectroscopy.
  Electro-magnetic radiation. Spectroscopy of UV-Vis light. Lambert-Beer Law. Calibration curves. Application to the quantitative determination of substances in foods.
- UNIT 4. Principles of fluorescence spectroscopy.
  Fluorescence. Kavanagh law. Quenching. Stern-Volmer equation. Application in foods.
- UNIT 5. Principles of atomic spectroscopy.
  Absorption atomic spectroscopy. Emission atomic spectroscopy. Application in foods.
- UNIT 6. Electrochemical techniques and other non-spectroscopic techniques.
  Physicochemical parameters of interest in foods. Conductimetry. Potenciometry. Refractometry. Polarimetry. Application in foods.
- UNIT 7. Calorimetry
  Thermochemistry. Calorimeter. Caloric contents in foods.
- UNIT 8. Monitoring foods through Instrumental techniques.
  Practical cases.

LABORATORY SESSIONS AND SEMINARS:
Seminars

- Problems solving

Laboratory sessions

- **Session 1. *Extraction and identification of food dyes in commercial candies*.**
- **Session 2. *Determination of Brilliant Blue FCF by UV spectroscopy*.**
- **Session 3. Determination of curcumin by fluorescence spectroscopy**
- **Session 4. *Determination of heat of combustion of food samples***

BIBLIOGRAPHY

- BASIC READINGS:

- Principios de Análisis Instrumental. (5ª Edición) Skoog-Holler-Nieman. Editorial Mc Graw Hill.
- Introducción al análisis instrumental. Lucas Hernández Hernández y Claudio González Pérez. Editorial Ariel.
- Análisis Instrumental. K.A. Rubinson- J.F. Rubinson. Editorial Prentice Hall.
- Métodos Instrumentales de Análisis. H.H. Willard y col. Grupo Editorial Iberoamérica.

COMPLEMENTARY READINGS:

- Procesado de cítricos. Dan A. Kimball. Editorial Acribia.
- Análisis de alimentos. Nielsen. Editorial Acribia.

- Análisis de los alimentos: fundamentos, métodos, aplicaciones. Mattisek y col. Editorial Acribia.
- Ingeniería de alimentos: operaciones unitarias y prácticas de laboratorio. Sharma. Editorial Limusa.
- Técnicas espectroscópicas en química analítica. Ríos Castro y col. Editorial Síntesis.
- Química Física (Vol. 1). M. Díaz Peña, A. Roig Muntaner. Editorial Alhambra.
- Química Física. P. Atkins. (8ª Ed). Editorial Médica Panamericana.
- Química Física. A. Requena. Prentice Hall. Prentice Hall.
- Fisicoquímica: Problemas y Soluciones. L. Lakowitz. Editorial Paraninfo.
- Fisicoquímica. (Vol. 2). Ira N. Levine. 5ª Ed. Editorial Mc. Graw Hill.
- Química Física. J. Morcillo Rubio. 2ª Ed. Publicaciones UNED.

RECOMMENDED LINKS

- UC Davis Chem LibreText: http://chem.libretexts.org
- William Reusch Virtual Textbook of Organic Chemistry http://www2.chemistry.msu.edu/faculty/reusch/VirtTxtJml/intro1.htm
- Organic compounds structures by instrumental techniques: http://www3.nd.edu/~smithgrp/structure/workbook.html
- Beer's law: http://www.chm.davidson.edu/ChemistryApplets/spectrophotometry/BeersLaw.html
- Molecular spectrophotometry: http://teaching.shu.ac.uk/hwb/chemistry/tutorials/
- (In English) Free-access to Chemistry subjects. Universidad de California - Davis: *https://chem.libretexts.org/*
- (on-line) Fisicoquímica. I.N Levine: https://granatensis.ugr.es/permalink/34CBUA_UGR/qmbd75/alma991007296109704990
- (In English) Apps and simulations about chemical and physical issues. PhET. Universidad de Colorado:
- Royal Society of Chemistry – Learn Chemistry : http://www.rsc.org/learn-chemistry
- American Chemical Society: http://www.acs.org/education
- On-line resources at UGR library: https://granatensis.ugr.es/
- Journal of Chemical Education: http://www.physics.org/food-physics/

TEACHING METHODOLOGY

- Lectures for theroy contents
- Practical seminars regarding application problems of each lesson
- Practical lessons in the laboratory
- Quiz and test from online platforms for continuous evaluation

ASSESSMENT (ASSESSMENT INSTRUMENTS, CRITERIA AND PERCENTAGE VALUEOF FINAL OVERALL MARK, ETC.)

All the evaluation processes will be carried out according to the normative of the University of Granada.

1. Ordinary call

- Written exams about theoretical concepts. Percentage of the final mark: 40-60%.
  There will be a mid-course exam and a final exam.

The qualification considered in this section will be the mark obtained in the final exam. If the subject has been passed by overcoming both mid-course and final exam, the qualification will be the average between them.

- Written exams about mathematic resolution of application problems. Percentage of the final mark: 20-0%.
  There will be a mid-course exam and a final exam.
  The qualification considered in this section will be the mark obtained in the final exam. If the subject has been passed by overcoming both mid-course and final exam, the qualification will be the average between them.

- Practical lessons. Percentage of the final mark: 10%.
  It is compulsory to attend to all practical lessons. The global mark is divided in two tasks:
  - Laboratory book 30%
  - Exam about practical contents : 70%

- Continuous evaluation and attending to theoretical classes. 30%.

2. Extraordinary call and single final evaluation

- Written exams about theoretical concepts. Percentage of the final mark: 50-60%.
  There will be a mid-course exam and a final exam.
  The qualification considered in this section will be the mark obtained in the final exam. If the subject has been passed by overcoming both mid-course and final exam, the qualification will be the average between them.

- Written exams about mathematic resolution of application problems. Percentage of the final mark: 40-30%.
  There will be a mid-course exam and a final exam.
  The qualification considered in this section will be the mark obtained in the final exam. If the subject has been passed by overcoming both mid-course and final exam, the qualification will be the average between them.
- Practical lessons. Percentage of the final mark: 10%.

DESCRIPTION OF THE EXERCISES WHICH WILL CONSTITUTE SINGLE FINAL ASSESSMENT AS ESTABLISHED IN UGR REGULATIONS

- This description is reported in the assessment section

SCENARIO A (ON-CAMPUS AND REMOTE TEACHING AND LEARNING COMBINED)

TUTORIALS

TIMETABLE (According to Official Academic Organization Plan)	**TOOLS FOR TUTORIALS** (Indicate which digital tools will be used for tutorials)
https://fisicoquimica.ugr.es/pages/docencia/curso_2021/_doc/horariotutorias2021	There will be both on-site and virtual tutorials. Proposed telematic media are: Forums in virtual platform (PRADO) e-mail

MEASURES TAKEN TO ADAPT TEACHING METHODOLOGY

- **Theory lessons**: Teaching methodology will be the same proposed in the previous section about "teaching methodology". In this case, the master classes will be broadcasted in real time to those students that can not attend if the number of people in the classes is limited by the health situation.
- **Practical lessons**: Due to the limited capacity of the facilities of the faculty there will be two days of practical lessons in the lab and two days of virtual lessons, concerning to the theoretical aspects of the two on-site tasks.
- **Continuous evaluation** .In these cases methodology will be the same proposed in the previous section about "teaching methodology" and there will be preferentially developed on-site. In case there will be capacity limitation virtual media will be used (Google Meet, PRADO Kahoot, etc).

MEDIDAS DE ADAPTACIÓN DE LA EVALUACIÓN (Instrumentos, criterios y porcentajes sobre la calificación final)

Ordinary assessment session

- Adaptative measures have only been proposed for the practical lessons. The written exams of this section will be in virtual through the PRADO platform. The percentages are those described in the assesment section

Extraordinary assessment session

- Adaptative measures have only been proposed for the practical lessons. The written examns of this section will be in virtual through the PRADO platform. The percentages are those described in the assesment section.

  For those students that have attended to the practical lessons and have not passed the exam there will be a virutal written exam in the PRADO platform.

  Those students that have not atended to the practical lessons will have to pass a practical exam in the laboratory. The evaluation will be carried out by the teachers in charge of the practical lessons.

Single final assessment

- There is no adaptative measures in this type of assessment

SCENARIO B (ONCAMPUS ACTIVITY SUSPENDED)

TUTORIALS

TIMETABLE (According to Official Academic Organization Plan)	**TOOLS FOR TUTORIALS** (Indicate which digital tools will be used for tutorials)
https://fisicoquimica.ugr.es/pages/docencia/curso_2021/_doc/horariotutorias2021	There will exclusively virtual tutorials. Proposed telematic media are: Forums in virtual platform (PRADO) -Google meet -email communication

MEASURES TAKEN TO ADAPT TEACHING METHODOLOGY

- Theory:

- Synchrony classes through Google-Meet
- Recorded videos of the theoretical lessons.

- Practial lessons:
  - All the practical lessons will be virtual and attending is compulsory by Google-Meet videoconference.
- Seminars:
  - The seminars related with the application problems will be taught by Google Meet. Students will provide the solutions by PRADO or email.
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- Continuous assessment:
  - Quiz, test and games through PRADO, SWAD and Kahoot.

MEASURES TAKEN TO ADAPT ASSESSMENT (Instruments, criteria and percentage of final overall mark)

Ordinary assessment session

- Written exams about theoretical concepts. . Percentage of the final mark: 40-60%.
  Individual exams by PRADO platform.

- Written exams about theoretical concepts. . Percentage of the final mark: 20 - 0%.
  Individual exams by PRADO platform

- Practical lessons assessment. Percentage of the final mark: 10%, divided in two tasks:
  Laboratory book 30%
  Exam about practical contents : 70%

- Continuous assessment. Percentage of the final mark: 30%.

Extraordinary assessment session

- Written exams about theoretical concepts. . Percentage of the final mark: 50-60%.
  - Individual exams by PRADO platform.
- Written exams about theoretical concepts. . Percentage of the final mark: 40 - 30%.
  Individual exams by PRADO platform

- Practical lessons assessment. Percentage of the final mark: 10%,

Single final assessment

- Written exams about theoretical concepts. . Percentage of the final mark: 50-60%.
  Individual exams by PRADO platform.

- Written exams about theoretical concepts. . Percentage of the final mark: 40 - 30%.
  Individual exams by PRADO platform

- Practical lessons assessment. Percentage of the final mark: 10%,
  For those students that have attended to the practical lessons and have not passed the exam there will be

a virutal written exam in the PRADO platform. Those students that have not atended to the practical lessons will have to pass a practical exam in the laboratory. The evaluation will be carried out by the teachers in charge of the practical lessons
ADDITIONAL INFORMATION (if necessary)
The move to scenario A to scenario B will be impossed by the health authorities determination due to the evolution of the pandemic caused by COVID-19.