

# PRINCIPLES OF INSTRUMENTAL TECHNIQUES IN NUTRITION

Academic year: 2017-2018

(Last actualisation 21/07/2017)

MODULE	CONTENT	YEAR	TERM	CREDITS	TYPE
Complements of Formation	Principles of Instrumental Techniques in Nutrition	3 <sup>rd</sup>	2 <sup>nd</sup>	6 ECTS	Optative
<b>LECTURER</b>			<b>CONTACT INFORMATION</b>		
José Manuel Paredes Martínez			Department of Physical Chemistry. Faculty of Pharmacy. Campus Universitario de Cartuja. 18071 – Granada. Telephone: 958243829 Email: jmparedes@ugr.es		
			<b>TUTORSHIPS</b>		
			Paredes Martínez, José M. (Room 198) Monday: 9:00–11:00 Wednesday: 12:00–14:00 Friday: 9:00–11:00		
<b>DEGREE WITHIN THE SUBJECT IS TAUGHT</b>					
Human Nutritional and Dietetics					
<b>PRERREQUISITES and/or RECOMMENDATIONS</b>					
Proper knowledge about: <ul style="list-style-type: none"> <li>• Mathematics.</li> <li>• General Chemistry.</li> <li>• Physics.</li> </ul>					
<b>DETAILED SUBJECT SYLLABUS</b>					
<b>THEORETICAL SYLLABUS</b> <ul style="list-style-type: none"> <li>• <b>UNIT 1.</b> Introduction to Instrumental Analysis in Foods. Introduction. Classification. Applications. Quantification. Phases and criteria of an analytical method.</li> <li>• <b>UNIT 2.</b> Analysis in citrus juices. Spanish law of juices. Acidity determination. Potentiometry. Degrees Brix. Refractometry. Index of maturity. Adulterations. Introduction to chromatography.</li> </ul>					



- **UNIT 3.** Analysis of milk.  
Conductivity. pH. Density. Crioscopia and determination of adulterations.
- **UNIT 4.** Introduction to 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 5.** Introduction to atomic spectroscopy.  
Absorption atomic spectroscopy. Emission atomic spectroscopy. Application in foods.
- **UNIT 6.** Introduction to fluorescence spectroscopy.  
Fluorescence. Kavanagh law. Quenching. Stern-Volmer equation. Application in foods.
- **UNIT 7.** Sucrose analysis. Polarimetry.  
Definition. General principles. Application in food.
- **UNIT 8.** Analysis of wine.  
Alcoholic degree determination. Sulphate determination. Polyphenol determination. Chromatic characteristics determination.
- **UNIT 9.** Calories of foods.  
Calorimetry. Analysis of bread, cookies. Determination of contaminants in tinned-tomate
- **UNIT 10.** Ohmic heater in the food preservation.  
Conductivity. Application in citric and meats.
- **UNIT 11.** Monitoring foods.  
Bibliographical Research. Validation methods and adulteration detection. Design of an instrumental method. Report elaboration.

#### LABORATORY SESSIONS AND SEMINARS

##### Seminars

- Problems solving.

##### Laboratory sessions:

- Determination of caffeine in beverages by UV-Vis Spectrometry using the Beer 's law.
- Determination of quinine in tonic water by fluorimetry.
- Determination of chloride in water by fluorescence quenching.
- Determination of Brix grade in orange juices using refractometry.
- Acidity measurements in orange juices.
- Analysis of wine. Determination of sulphate, polyphenols and alcoholic grade.
- Analysis of milk. Determination of adulterations by measuring the lowering of the freezing point (Crioscopia)

#### BIBLIOGRAPHY

##### Basic bibliography:

- Principios de Análisis Instrumental. (5ª Edición) Skoog-Holler-Nieman. Editorial Mc Graw Hill.
- Análisis Instrumental. K.A. Rubinson- J.F. Rubinson. Editorial Prentice Hall.
- Métodos Instrumentales de Análisis. H.H. Willard y col. Grupo Editorial Iberoamérica.

##### Complementary bibliography:

- 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.
- Físicoquímica: Problemas y Soluciones. L. Lakowitz. Editorial Paraninfo.



- Físicoquímica. (Vol. 2). Ira N. Levine. 5ª Ed. Editorial Mc. Graw Hill.
- Química Física. J. Morcillo Rubio. 2ª Ed. Publicaciones UNED.

Reference books:

- ALEIXANDRE, J.L. "Prácticas de procesos de elaboración y conservación de alimentos". Ed. Universidad Politécnica Valencia, 1996
- BRENNAN, J.G. y col. "Las operaciones de la ingeniería de los alimentos". Ed. Acribia. Zaragoza, 1998.
- BRENNAN, J.G. "Manual del procesado de los alimentos". Ed. Acribia. Zaragoza (2007).
- CENZANO, I. y col. "Nuevo manual de industrias alimentarias". Ed. AMV. Madrid, 1993.
- CHARLEY, H. "Tecnología de alimentos: procesos químicos y físicos en la preparación de alimentos". Ed. Limusa. México, 1989. 5
- CHEFTEL, J.C. y col. "Introducción a la bioquímica y tecnología de los alimentos". Vols. I y II. Ed. Acribia. Zaragoza, 1989.
- EARLE, R.L. "Ingeniería de los alimentos". Ed. Acribia. Zaragoza, 1987.
- FELLOWS, P. "Tecnología del procesado de los alimentos: principios y prácticas". Ed. Acribia. Zaragoza, 2007.
- JEANTET, R. y col. "Ciencia de los alimentos: Bioquímica-Microbiología-Procesos-Productos. Volumen1:
- Estabilización biológica y físicoquímica. Volumen 2: Tecnología de los productos alimentarios. Ed. Acribia, Zaragoza (2010).
- LAMUA, M. "Aplicación del frío a los alimentos". Ed. AMV. Madrid, 2000.
- MESAS, J.M. y VAZQUEZ, M. "Laboratorio de Industrias Fermentativas". Ed. Anubis, Sevilla, 2011.
- POTTER, N.N. y HOTCHKISS, J.H. "Ciencia de los alimentos". Ed. Acribia. Zaragoza, 1999.
- SATIN, M. "La irradiación de alimentos". Ed. Acribia. Zaragoza, 2000.
- SHARMA, S.K. "Ingeniería de alimentos: operaciones unitarias y prácticas de laboratorio" Ed. Limusa, 2003.

**RECOMMENDED WEBSITES**

Journal of Chemical Education  
<http://www.physics.org/food-physics/text-only/>

**ASSESSMENT. ASSESSMENT CRITERIA, CONTRIBUTION OF THE DIFFERENT ACTIVITIES ON THE FINAL MARK, ETC.)**

Two different types of assessments will be considered:

A) Continuous assessment. The final mark for those students included in this assessment, will comprises three parts:

1. Written exam about the contents of the subject programme.

It will consists of answering questions (types: tests, applications, theoretical...) (30%) and solving numerical (20%) problems. To pass this exam it will be mandatory to demonstrate a homogeneous knowledge of the subject. The contribution of this part to the final mark will be 50 %

2. To obtain a positive evaluation is necessary to assist to all practice sessions and present a lab-report with the description and resolution of the experiments realized, and to pass the practical exam carried out by a written and/or oral exercise.

Complete practice sessions and pass the exam will be prerequisites for approve the subject. The contribution of practical work to the final mark will be 20%

3. Other activities: oral presentation, lectures attendance, general attitude during the course and participation in



class and/or laboratory, will be evaluated and will contribute with 30% to the final mark.

B) One examination. The students who fulfil the requirements specified by the University of Granada and presented in time the corresponding solicitude (two weeks after their registration), shall have the right to make this class of examination. It consists of a just one exam. Exam will consists of answering all questions necessities (types: tests, applications, theoretical, lab sessions,...) and solving numerical problems. To pass this exam it will be mandatory to demonstrate a homogeneous and unambiguous knowledge of the subject.

#### **FURTHER INFORMATION**

- The teaching will be made exclusively in Spanish
- The attendance to practical sessions in laboratory is obligatory.
- The attendance to the lectures is highly recommended.

