



1. General information

Course: CLINICAL BIOCHEMISTRY

Type: CORE COURSE

Degree: 341 - UNDERGRADUATE DEGREE PROGRAMME IN BIOCHEMISTRY

Center: 501 - FACULTY OF ENVIRONMENTAL SCIENCES AND BIOCHEMISTRY

Year: 3

Main language: Spanish

Use of additional
languages:

Web site:

Code: 13323

ECTS credits: 6

Academic year: 2023-24

Group(s): 40

Duration: C2

Second language:

English Friendly: Y

Bilingual: N

Lecturer: YOLANDA CAMPOS MARTIN - Group(s): 40				
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Edificio 6/10	QUÍMICA INORG., ORG., Y BIOQ.		Yolanda.Campos@uclm.es	
Lecturer: MARIA JIMENEZ MORENO - Group(s): 40				
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Sabatini/0.8	Q. ANALÍTICA Y TGIA. ALIMENTOS	926051710	maria.jimenez@uclm.es	Tuesday, Wednesday and Thursday from 12 p.m. to 2 p.m. Arrange an appointment by e-mail.
Lecturer: ÁNGELA MARQUINA RODRÍGUEZ - Group(s): 40				
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2. Pre-Requisites

It is recommended to have a previous knowledge about Fundamentals of Biochemistry, Methodology and Instrumentation in Biochemistry, Molecular Pathology and Human Physiology.

3. Justification in the curriculum, relation to other subjects and to the profession

This is a mandatory subject focused on two main aspects, the analytical methodology that is usually employed for the determination of main metabolites in clinical analysis and the study of the potential metabolic alterations of these analytes and their clinical implications.

This subject also presents the role of a biochemist in a clinical laboratory mainly related to the interpretation of clinical analysis and the detection of potential pathologies.

4. Degree competences achieved in this course

Course competences

Code	Description
E01	Express themselves correctly in basic biological, physical, chemical, mathematical and computer terms.
E02	Work properly and quality driven in a chemical, biological and biochemical laboratory, including safety, handling and disposal of waste and keeping a record of activities.
E03	Understand and know how to explain the physical and chemical bases of biochemical processes and the techniques used to investigate them
E04	To know the principles and applications of the methods and instrumentation used in bioanalytical determinations.
E12	Have the numerical and computational skills to apply mathematical procedures for data analysis.
E13	Correct handling of different computer tools
E28	Calculate well the sensitivity, specificity, predictive value and efficiency of an analytical test and interpret the results obtained, with respect to the reference intervals.
E29	To interpret the results of the biochemical parameters of a blood and urine analysis, among others, suggesting the orientation of the possible underlying pathologies of the alterations found.
G01	To possess and understand the knowledge in the area of Biochemistry and Molecular Biology at a level that, based on advanced textbooks, also includes cutting-edge aspects of relevance in the discipline
G03	Be able to collect and interpret relevant data, information and results, draw conclusions and issue reasoned reports on relevant social, scientific or ethical issues in connection with advances in Biochemistry and Molecular Biology.
T01	Proficiency in a second foreign language, preferably English, at level B1 of the Common European Framework of Reference for Languages
T03	A correct oral and written communication
T05	Organizational and planning skills
T06	Capacity for design, analysis and synthesis

5. Objectives or Learning Outcomes**Course learning outcomes**

Description

Know how to evaluate and interpret the results of the analytical parameters.

To apply and know the quality control methods in clinical analysis laboratories, understanding the concepts of reference interval and variation of results by analytical and biological cause.

Learn how to handle biological samples in the appropriate conditions and considering the factors that could affect the specific analysis.

Understand the use of molecular biology tools to determine analytical parameters.

Interpreting the results of biochemical and cellular parameters of an analysis and suggesting possible pathologies according to the alterations found.

To know the basic applications of analytical biochemistry.

Perform the most common determinations in clinical analysis laboratories.

6. Units / Contents**Unit 1: Introduction to clinical biochemistry.**

Unit 1.1 Introduction to clinical analysis.

Unit 1.2 Pre-analytical phase.

Unit 1.3 Analytical phase.

Unit 1.4 Post-analytical phase.

Unit 2: Analytes and metabolic pathways.

Unit 2.1 Hydroelectrolitic balance and its alterations. Blood gases.

Unit 2.2 Acid-base balance and its alterations. Biological buffer systems.

Unit 2.3 Study of alterations of plasma, urine and cerebrospinal fluid proteins.

Unit 2.4 Biochemical diagnosis and follow-up of patients with alterations in carbohydrate metabolism. Diabetes and Hypoglycemia.

Unit 2.5 Study of the biochemical alterations involved in the study of dyslipidemias.

Unit 2.6 Biochemical diagnosis of iron-related disorders.

Unit 3: Biochemical analysis of the function of organs and tissues.

Unit 3.1 Cardiac markers related to the diagnosis of acute coronary syndrome and heart failure.

Unit 3.2 Biochemical alterations of liver function.

Unit 3.3 Biochemical alterations related to gastrointestinal function.

Unit 3.4 Biochemical magnitudes involved in the study of renal function.

Unit 3.5 Hormones regulating homeostasis of calcium and phosphorus.

Unit 3.6 Endocrine and biochemical alterations of the hypothalamic-hypophyseal axis and hypothalamic-hypophyseal- thyroid axis.

Unit 3.7 Endocrine and biochemical alterations of the hypothalamic-hypophyseal-adrenal and hypothalamic-hypophyseal-gonadal axis.

Unit 3.8 Tumor markers used in clinical practice.

ADDITIONAL COMMENTS, REMARKS

Laboratory sessions:

- Determination of metabolites of clinical interest in biological matrices (urine and/or blood).

- Interpretation of experimental results and clinical case studies.

7. Activities, Units/Modules and Methodology

Training Activity	Methodology	Related Competences (only degrees before RD 822/2021)	ECTS	Hours	As	Com	Description
Class Attendance (theory) [ON-SITE]	Lectures	E01 E03 E12 T01	1.5	37.5	N		The presentations to follow the teaching classes will be available at the Moodle virtual platform for download. Each presentation will indicate the objectives and the contents of each topic. Teaching classes will be developed in an interactive way with the students including open discussion.
Study and Exam Preparation [OFF-SITE]	Self-study		3.2	80	N		
Class Attendance (practical) [ON-SITE]	Practical or hands-on activities	E02 E04 E12 E13 E28 E29 G03 T05 T06 T08	0.72	18	Y	Y	The subject will include experimental work in the laboratory, where the students will have to apply and test the theoretical concepts. Moreover, the students will develop the skills for manipulating biological samples and chemical according to safety and waste disposal standards. This activity will be compulsory but unrecoverable. The evaluation of this activity will be recoverable, either in the extraordinary or special call for completion.

Practicum and practical activities report writing or preparation [OFF-SITE]	Group Work	E12 E13 E28 E29 G01 G03 T01 T03 T05 T06 T08	0.4	10	Y	Y	The students will deliver a practical note book with their results of lab sessions 1 & 2. This activity will be compulsory and unrecoverable.
Other on-site activities [ON-SITE]	Assessment tests	E01 E03 E29 T03	0.04	1	Y	Y	There will be a written test in which laboratory practices sessions will be evaluated. This activity will be mandatory and recoverable, either in the extraordinary or special call for completion.
Final test [ON-SITE]	Assessment tests	E01 E03 E04 E12 E28 G01 G03 T03	0.1	2.5	Y	Y	A final written test will evaluate the theoretical concepts of the subject. This activity will be mandatory and recoverable in the extraordinary call.
Mid-term test [ON-SITE]	Assessment tests	E01 E03 E04 E12 E28 T03	0.04	1	Y	Y	The evaluation will include a mid- term test for Unit 1 and topics 2.1 and 2.2 of Unit 2. This activity will be mandatory and recoverable in the extraordinary call.
Total:			6	150			
Total credits of in-class work: 2.4				Total class time hours: 60			
Total credits of out of class work: 3.6				Total hours of out of class work: 90			

As: Assessable training activity

Com: Training activity of compulsory overcoming (It will be essential to overcome both continuous and non-continuous assessment).

8. Evaluation criteria and Grading System			
Evaluation System	Continuous assessment	Non-continuous evaluation*	Description
Test	22.50%	22.50%	This test will evaluate the laboratory sessions. This activity will be mandatory and recoverable. A minimum score of 4 points out of 10 in this test is required to make average with the rest of the marks.
Practicum and practical activities reports assessment	2.50%	2.50%	A lab-book report of lab sessions 1 & 2 will be delivered within the indicated period of time. The delivery of this report is mandatory to pass the subject.
Final test	50.00%	75.00%	Final written test to assess theoretical knowledge. For continuous assessment, it will encompass topics 2.3-2.6 of Unit 2 and Unit 3. For non-continuous evaluation, it will consist of two parts, one of the first 6 topics and another of the rest of the topics. The final test will be compulsory and recoverable. To apply the grades obtained in the other activities and pass the subject, it will be necessary to obtain a minimum grade of 4 out of 10 in the final test (continuous or non-continuous evaluation).
Mid-term tests	25.00%	0.00%	A partial test of Unit 1 and topics 2.1 and 2.2 of Unit 2 will be carried out. This activity will be compulsory and recoverable in the extraordinary call. In order to pass this activity it will be necessary to obtain a minimum grade of 4 points out of 10.
Total:	100.00%	100.00%	

According to art. 4 of the UCLM Student Evaluation Regulations, it must be provided to students who cannot regularly attend face-to-face training activities the passing of the subject, having the right (art. 12.2) to be globally graded, in 2 annual calls per subject, an ordinary and an extraordinary one (evaluating 100% of the competences).

Evaluation criteria for the final exam:

Continuous assessment:

The evaluation assigned by default to the student will be the continuous evaluation. Any student may request the change to the non-continuous evaluation modality (before the end of the classes period) by sending an email to the professors if they have not completed the 50% of the evaluable activities.

In order to pass the subject it will be necessary to obtain a minimum grade of 4 in the final test, in the partial test and in the laboratory practice exam, as well as the delivery of the lab-book report of lab sessions 1 and 2. Any of these 3 exams of the subject (mid-term, final or laboratory tests) may be recovered in the extraordinary call. The final grade for the course will be calculated taking into account the percentages in the table above. The subject will only be considered passed if the set of all evaluable activities results in a grade of 5 or higher (out of 10).

Non-continuous evaluation:

In order to pass the subject it will be necessary to obtain a minimum grade of 4 in the final test and a minimum of 4 in the laboratory practice exam, as well as the delivery of the lab-book report of lab sessions 1 and 2. The final grade for the course will be calculated taking into account the percentages in the table above. The subject will only be considered passed if the set of all evaluable activities results in a grade of 5 or higher (out of 10).

Specifications for the resit/retake exam:

Students who have not passed the mid-term test will be examined of the entire syllabus in the final test. Therefore, the assessment of this test will correspond to 75% of the final grade. Those students who only have to recover a part of the subject will be examined only of those contents with the corresponding weight (25% or 50%). In order to pass the subject it will be necessary to obtain a minimum grade of 4 in the theory exam and a minimum of 4 in the laboratory exam. The final grade for the course will be calculated taking into account the percentages in the table above. The subject will only be considered passed if the set of all evaluable activities results in a grade of 5 or higher (out of 10).

Specifications for the second resit / retake exam:

The assessment of the final test is 75% and of the practice exam 25% in the special call for completion. In order to pass the subject it will be necessary to obtain a minimum grade of 4 in the final test and a minimum of 4 in the lab exam.

9. Assignments, course calendar and important dates**Not related to the syllabus/contents****Hours** **hours****10. Bibliography and Sources**

Author(s)	Title/Link	Publishing house	Citv	ISBN	Year	Description
Castañó López, Miguel Ángel	Bioquímica clínica: de la patología al laboratorio			978-84-8473-617-2	2007	
David Holme	Analytical Biochemistry	Prentice Hall		9780582294387	1998	
Delvin Thomas	Bioquímica: libro de texto con aplicaciones clínicas	Reverté		9788429172089	2008	
Bishop, M.L.	Clinical chemistry : principles, techniques, and correlation	Lippincott Williams & Wilkins,		978-1-4511-1869-8	2013	
García Espinosa, Benjamín	Fundamentos y técnicas de análisis bioquímicos	Algaída		978-84-7647-932-2	2009	
García Segura, Juan Manuel	Técnicas instrumentales de análisis en bioquímica	Síntesis		978-84-7738-429-8	2008	
Gaw, A.	Bioquímica clínica : texto y atlas en color /	Elsevier		978-84-9022-786-2	2014	
González Hernández, Álvaro	Principios de bioquímica clínica y patología molecular /	Elsevier España		9788491133896	2019	
González de Buitrago, José Manuel	Técnicas y métodos de laboratorio clínico	Elsevier-Masson		978-84-458-2029-2	2010	
J. W. Baynes y M. H. Dominiczak	Bioquímica médica	Elsevier		978-84-8086-730-6	2011	
Jesús Prieto Valtueña; José Ramón Yuste	Interpretación de análisis y pruebas funcionales.	Elsevier España		9788445820308	2015	
Kathleen Deska Pagana; Timothy J. Pagana	Guía de pruebas diagnosticas y de laboratorio	Elsevier España		9788480863582	2008	
Marshall, William J.	Bioquímica clínica	Elsevier		978-84-9022-115-0	2013	
Ocon Navaza, M ^a Carmen D'	Fundamentos y técnicas de análisis bioquímico: principios de análisis instrumental	Paraninfo		84-9732-159-6	2002	
Pilar Roca	Bioquímica, técnicas y métodos	Hélice		84-921124-8-4	2003	
Fuentes Arderiu, X.	Bioquímica clínica y patología molecular	Reverté		84-291-1856-X	1998	