COURSE DATA

DATA SUBJECT

Code: 34105
Name: Clinical Biochemistry and Molecular Pathology
Cycle: Undergraduate Studies
ECTS Credits: 4.5
Academic year: 2025-26

STUDY (S)

Degree	Center	Acad. year	Period
1201 - Degree in Pharmacy	Facultat de Farmácia i Ciències de L'alimentació	5	First quarter

SUBJECT-MATTER

Degree	Subject-matter	Character
1201 - Degree in Pharmacy	Clinical biochemistry and molecular pathology	ELECTIVES

COORDINATION

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SUMMARY

Clinical Biochemistry and Molecular Pathology is one of the optional subjects that conform the intensification in "Clinical Training" of the degree in Pharmacy of the University of Valencia. From an essentially molecular perspective, this subject proposes an integral and updated approach to the comprehensive understanding of (i) the causes and mechanisms that trigger human disease and explain their clinical signs (the rational basis for its diagnosis and treatment), (ii) the biochemical changes that the disease causes in our organism, and, (iii) the different biochemical markers and the functional tests currently used in clinical practice and their application to the diagnosis, prognosis, control of evolution, therapeutic monitoring, prevention, and research of disease.

The programme, that is particularly focused on developing practical skills, presents an integrated view of the molecular basis and the clinical biochemistry of the endocrine-metabolic syndromes and the organic-functional pathologies of greater prevalence in the human population, in which the clinical biochemistry laboratory plays a particularly relevant role, emphasizing the importance of these knowledge in the professional activity of the pharmacist.

PREVIOUS KNOWLEDGE

RELATIONSHIP TO OTHER SUBJECTS OF THE SAME DEGREE

There are no specified enrollment restrictions with other subjects of the curriculum.

OTHER REQUIREMENTS

It is recommended:
- Basic knowledge of Physiology, Physiopathology, Biochemistry and Molecular Biology
- Students must have completed the subject Clinical Biochemistry and Haematology (4th year)
- English language (scientific, at translation level)

COMPETENCES / LEARNING OUTCOMES

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Act with autonomy in learning, making informed decisions in different contexts, issuing judgements based on experimentation and analysis, and transferring knowledge to new situations.

Collaborate effectively in work teams, assuming responsibilities and leadership roles and contributing to collective improvement and development.

Contribute to the design, development and implementation of solutions that respond to social demands, taking into account the Sustainable Development Goals as a reference.

Demonstrate critical and self-critical thinking in the field of the degree programme, considering aspects such as professional ethics, moral values and the social implications of the different activities carried out.

Develop the ability for well-founded scientific argumentation, and the habit of using clinical terminology as a natural means of communication with other professionals in the field of health.

Develop the necessary skills to communicate and inform the patient and/or user about the content and implications of laboratory reports in appropriate terms.

Identify and know how to apply specific biochemical markers appropriate for assessing health status in the population (individual and collective), and for disease prevention in primary and secondary care.

Interpret, in a global and integrated manner, a patient's overall analytics and understand the appropriate analytical strategy for the differential diagnosis of the various conditions.

Know and understand, within the field of the degree programme, gender inequalities in society; integrate different needs and preferences based on sex and gender into the design of solutions and problem solving.

Know and understand the mechanisms responsible for the genetic variability that characterises humans, and its relationship and implications in human pathology and response to pharmacological therapy.

Know how to communicate effectively, both orally and in writing, adapting to the characteristics of the situation and the audience.

Know the analytical techniques of the clinical biochemistry laboratory, and be able to assimilate and incorporate future innovations both in technical aspects and in relation to the clinical usefulness of each new parameter.

Know the molecular bases and biochemical mechanisms (genetic, structural and/or functional alterations) of disease, as a rational approach to its diagnosis, treatment and prevention, to the identification of new therapeutic targets, and to the selection a

Propose creative and innovative solutions to complex situations or problems within the field of knowledge, to respond to diverse professional and social needs.

Reinforce the acquisition of the general competences of the curriculum.

Understand the basis and usefulness of the different biochemical markers and functional tests currently applicable to clinical diagnosis, prognosis, disease progression and therapeutic monitoring.

DESCRIPTION OF CONTENTS

1. Introduction to Clinical Biochemistry and Molecular Pathology

This unit will introduce the discipline, and will cover the definition and scope of study of Clinical Biochemistry and Molecular Pathology, its integration into the Pharmacy degree, the general learning objectives pursued, and the character of Clinical biochemistry as a biomedical specialty. We will consider the relationship between genes, environment and disease, the current concept of genetic and acquired disease, and the general molecular mechanisms involved in the pathogenesis of human disease.

2. Molecular basis of human disease

The unit features functional and methodological aspects of human genome, the genetic basis of the disease (causal genes vs. susceptibility genes), and the application of these concepts to the molecular description and diagnosis of the disease. We will review the general sources of variation in the human genome, the polymorphisms with greater clinical interest, the different types of genetic disease and its inheritance pattern, and the general methods applied for the study and diagnosis of genetic disease.

3. Clinical Biochemistry and Molecular Pathology of endocrine-metabolic diseases

The unit will develop an integrated view of the molecular basis and current laboratory testing of the endocrine-metabolic syndromes more commonly found in clinical practice in our environment, including clinical and research aspects, with special attention to the latest developments in the field. Topics will include metabolic fuel homeostasis in humans, etiopathogenesis and differential diagnosis of hypoglycemia, molecular pathology of diabetes mellitus, insulin resistance and metabolic syndrome, molecular pathology and clinical biochemistry of ethanol consumption, etiopathogenesis and differential diagnosis of metabolic commas, and molecular basis of iron homeostasis and haemochromatosis.

4. Clinical Biochemistry and Molecular Pathology of organ systems

The unit will introduce the course on biochemical aspects and molecular basis of the major disorders that involve organ systems. Topics will cover the revision of common renal tubular disorders, biochemical investigation of blood gases and acid-base disorders, and the molecular pathology and laboratory role in the acute coronary syndrome

5. Clinical endocrinology

This module will introduce students to the essential role of the laboratory in the investigation, diagnosis and management of endocrine diseases. Considering that some issues have already been addressed in the previous units (3 and 4), the program will focus specifically on the study of the major endocrine axes. Topics will cover hypothalamic-pituitary function (including growth disorders), thyroid function, and adrenocortical function.

6. Special topics

This section includes some of the questions/topics (complementary to subjects covered in the previous units) which optionally could be developed in the seminars of the course:
Recent advances in biochemical markers, Analytical artifacts or interferences, Oxidative stress and disease, Differential diagnosis of NASH-ASH, Aldosterone resistance, Diabetes insipidus and SIADH, Porphyrias, Hyperkalemia, Newborn screening, Inheredited dyslipidemia, Inborn metabolic disorders ...

WORKLOAD

PRESENCIAL ACTIVITIES

Activity	Hours
Tutorials	4,00
Theory	38,00
Seminar	3,00
Total hours	**45,00**

NON PRESENCIAL ACTIVITIES

Activity	Hours
Attendance at other activities	0,00
Individual or group project	6,00
Independent study and work	56,50
Preparation of lessons	0,00
Preparation for assessment activities	1,00
Resolution of case studies	4,00
Total hours	**67,50**

TEACHING METHODOLOGY

Instruction will be class-based, supported by *online* material prepared by the professor. The course combines lectures with practical exercises and activities that will be developed by the students (individual / group).

Lectures: it is conceived as the best way to transmit a large amount of information (of good quality, and in our case, particularly complex) quickly and effectively, to a large number of students, and should also arouse an active interest in the matter. The learning objectives for each specific topic will be clearly defined, and the concepts and essential content as well as the integration of these knowledge in the context of other matters of the degree, will be fully covered. Attendance if not mandatory, is highly recommended.

Individual/group assignments: during the course the teacher may propose additional issues and activities of various kinds, which, depending on its complexity, will be developed individually or in group (1-4 students); its objective is to promote independent learning, efficiency in the search of the literature and adequate online resources, progress in the use of language and terminology, and where appropriate, the ability to work in teams. Written work must be submitted at the deadline, and their credits will be taken into account in the ongoing assessment of the matter. Some of the proposed activities will be selected for oral presentation.

Tutorials: conceived as interactive workshops (groups of 4-5 students), attendance is mandatory. Oriented to problem-based learning, workshops are designed to develop competence and confidence in interpreting laboratory tests and in practical resolution of clinical cases. Each session will present short case studies relevant to each unit that the students should discuss, solve and present, in a cooperative and shared responsibility. Likewise, the tutorials will serve to answer questions and respond to the needs raised by the student throughout the course.

Seminars: designed to deepen in more specific aspects of the subject, they will include the students' oral presentations of the topics selected by the teacher for this purpose. Their goal: to complement the training acquired in the lectures, to develop the ability / clarity in the public presentation of ideas or information, encouraging critical thinking, creativity and interactivity with students. Attendance at the seminars is also mandatory.

EVALUATION

Assessment of the subject, with an indication of their weighting towards the final grade, will be performed according to the following (described for a final grade = 100 points):

1) Final written examination: mandatory, to be done by the end of the semester, where theoretical knowledge will be assessed (80 points): the test will combine both multiple-choice questions and short-answer questions.

2) Continuous assessment (20 points): consisting of two different parts:

- Assessment of compulsory seminars (10 points).

- Assessment of competences and practical skills based on the resolution of clinical cases in tutorials, active participation in tutorials, the student's involvement and interest in the subject throughout the semester, as well as their contribution to any of the evaluable tasks/activities proposed by the lecturer (10 points).

To pass the course it will be necessary to achieve a minimum score of 40 points on the final examination, and an overall total score equal or above 50 points.

The student who fails to attend the final examination will be graded as "*Not examined*". The credits obtained on the assessable tasks during the course will be retained only for the current academic year (1st and 2nd call).

Evidence of copying or plagiarism in any of the assessable tasks will result in failure to pass the subject and in appropriate disciplinary action being taken. Please note that, in accordance with article 13. d) of the Statute of the University Student (RD 1791/2010, of 30 December), it is the duty of students to refrain from using or participating in dishonest means in assessment tests, assignments or university official documents. In the event of fraudulent practices, the "Action Protocol for fraudulent practices at the University of Valencia" will be applied (ACGUV 123/2020): https://www.uv.es/sgeneral/Protocols/C83sp.pdf

REFERENCES

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- Diversos recursos de consulta online, específics per a cada tema, indicats en el seu moment pel professor