Universidad del País Vasco Euskal Herriko Unibertsitatea

ENGLISH FRIENDLY COURSES (EFC) 2023-2024
CAMPUS OF ARABA

Link to website: https://www.ehu.eus/en/web/farmazia-fakultatea/kanpoko-ikaslego
Contact: farmacia.internacional@ehu.eus

In addition to the general offer of courses taught in English, some Centers offer for incoming students English Friendly Courses (EFC): subjects taught in Spanish or Basque, in which the syllabus summary; lecturer tutoring, examinations and/or papers are available in English.

English Friendly Courses taught in SPANISH:

FACULTY OF PHARMACY (125)

	COURSE	SEMESTER[1]	CREDITS	SCHEDULE[2]	LINK TO SYLLABUS
Bachelor`s Degree in Human Nutrition and Diet					
25192	Epidemiología Nutricional	1st	6	M	
25190	Química y Bioquímica de los Alimentos	2nd	6	M	→
25194	Bioquímica	2nd	6	M	→
25203	Expresión Génica y Control Metabólico	2nd	6	M	→
Bachelor`s Degree in Pharmacy					
25259	Física	1st	6	M	→
25264	Biología Molecular	1st	6	M	
25282	Dermofarmacia	1st	6	M	→
25288	Determinación estructural de fármacos	1st			→
25289	Farmacovigilancia	1st	6	M	
25194	Bioquímica	2nd	6	M	→
25265	Bioquímica Clínica	2nd	6	M	→
25272	Farmacia Galénica	2nd	9	M	→
Bachelor`s Degree in Environmental Sciences					
25227	Geología	1st	6	A	→
25238	Meteorología y Oceanografía	1st	6	A	→

[1] SEMESTER: 1st: September 2023 to January 2024
2nd : January 2024 to May 2024

[2] SCHEDULE: Morning (M)/ Afternoon (A): begins at 13.30

Universidad del País Vasco Euskal Herriko Unibertsitatea

FACULTY OF PHARMACY (125)					
	COURSE	SEMESTER[1]	CREDITS	SCHEDULE[2]	LINK TO SYLLABUS
25108	Física	2nd	6	A	
Bachelor`s Degree in Food Science and Techonology					
25112	Bioquímica	1st	9	A	
25108	Física	2nd	6	A	
25124	Tecnología de los Alimentos	2nd	6	A	

Universidad del País Vasco Euskal Herriko Unibertsitatea

English Friendly Courses taught in BASQUE:

FACULTY OF PHARMACY (125)					
	COURSE	SEMESTER[3]	CREDITS	SCHEDULE[4]	LINK TO SYLLABUS
Bachelor`s Degree in Human Nutrition and Diet					
25192	Nutrizioari lotutako epidemiologia	1st	6	M	
25190	Elikagaien Kimika eta Biokimika	2nd	6	M	
25194	Biokimika	2nd	6	M	
25203	Gene espresioa eta kontrol metabolikoa	2nd	6	M	
Bachelor`s Degree in Pharmacy					
25264	Biologia Molekularra	1st	6	M	
25265	Biokimika Klinikoa	2nd	6	M	
Bachelor`s Degree in Environmental					
25238	Meteorologia eta Ozeanografia	1st	6	A	
25108	Fisika	2nd	6	A	
25235	Ingurumen Kutsaduraren Tratamendua	2nd	9	A	
Bachelor`s Degree in Food Science and Techonology					
25112	Biokimika	1st	9	A	
25130	Haragiaren, arrainaren eta produktu eratorrien zientzia eta teknologia	1st	9	A	
25108	Fisika	2nd	6	A	
25115	Ingeniaritza Kimikoa	2nd	6	A	

[3] SEMESTER: 1st: September 2023 to January 2024
2nd : January 2024 to May 2024

[4] SCHEDULE: Morning (M)/ Afternoon (A): begins at 13.30.

COURSE GUIDE 2023/24

Faculty 125 - Faculty of Pharmacy **Cycle** .

Degree GCAMBI10 - Bachelor`s Degree in Environmental Sciences **Year** First year

COURSE

25108 - Physics **Credits, ECTS:** 6

COURSE DESCRIPTION

Physics is one of the basic courses of the first year of the Degree in Environmental Sciences and the Degree in Food Science and Technology.

This course offers a overall view of Physics, aimed towards basic concepts such as magnitudes and units, laws of motion, work and energy, and gravitational and electric forces.

COMPETENCIES/LEARNING RESULTS FOR THE SUBJECT

- Accurately use the international system of magnitudes and units.
- Analyzes and explains the different concepts of Physics in the context of the degree.
- Reduces and simplifies problems to their most essential aspects, solving them by means of analysis, hypothesis emission, elaboration of strategies and analysis of results.
- Uses measuring instruments typical of a Physics laboratory, interpreting data and graphs accurately and evaluates experimental errors appropriately.
- Solve practical exercises applying the general principles and laws of Physics, justifying the method of resolution adopted.

Common competences
Is able to use information from various sources on an applied topic, interpret it appropriately, draw meaningful conclusions and present them publicly.

CONTENIDOS TEÓRICO-PRÁCTICOS

THEORETICAL CONTENTS:

Unit 1.- Observables, magnitudes, units. Significant figures.

Unit 2.- Laws of motion. Inertia, equilibrium, acceleration. Motion in a straight line, circular and parabolic. Inertial and non inertial frames of reference. Relative motion. Energy and work. Conservative and non conservative forces.

Unit 3.- Gravitational field. Force and potential fields. Gradient. Gravitational force and field. Gravitational potential energy and gravitational potential.

Unit 4.- Electric field. Electrostatic force and field. Coulomb’s Law. Electric potential energy and electric potential. Ohm’s Law. Electrical circuits. Electric power and Joule effect power losses.

Unit 5.- Magnetic field. Magnetism and magnets. Magnetic field and Lorentz force. Magnetic field created by and electric current. Electromagnetic Induction: Faraday’s Law.

Unit 6.- Thermodynamics. The three laws of Thermodynamics. Conservation of total energy. Entropy. Applications.

LABORATORY:

1.- Computer spreadsheet basics

2.- Mechanics

3.- Electromagnetic Induction

4.- Ohm's law

TEACHING METHODS

- Lectures: classes in which the teacher will explain the contents of the course. Low/medium difficulty problems may be proposed and solved during the class, in order to help settle the newly learned concepts. Student participation is encouraged.

- Class practices: the teacher and/or designated students will solve medium/high difficulty problems from a list assigned at the start of each unit.

- Jigsaw: this group activity forms part of the i3KD Educative Project of the degree of Food Science and Technology. The project consists on working on the Sustainable Development Goals in different subjects along the whole degree.

- Computer/laboratory practices: the students will perform experiments and computer calculations on matters closely related to the contents of the course. Student attendance is mandatory.

TYPES OF TEACHING

Types of teaching	M	S	GA	GL	GO	GCL	TA	TI	GCA
Hours of face-to-face teaching	36		12	9	3				
Horas de Actividad No Presencial del Alumno/a	54		18	13,5	4,5				

Legend:
M: Lecture-based | S: Seminar | GA: Applied classroom-based groups
GL: Applied laboratory-based groups | GO: Applied computer-based groups | GCL: Applied clinical-based groups
TA: Workshop | TI: Industrial workshop | GCA: Applied fieldwork groups

Evaluation methods

- Continuous evaluation
- End-of-course evaluation

Evaluation tools and percentages of final mark

- Written test, open questions 60%
- Teamwork assignments (problem solving, Project design) 20%
- Midterms 20%

ORDINARY EXAMINATION PERIOD: GUIDELINES AND OPTING OUT

Students will be able to choose between "continuous assessment" and "final assessment" modalities:

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Continuous assessment

The exams and their weights break down as follows:
- 20%: Deliverable tasks
- 20%: Mid term exams
- 60%: Final exam of the grade. 20% will count for the practices exam, it will be necessary to obtain a 4 out of 10 in this part in order to pass the course. 40% will count for the course contents exam, it will be necessary to obtain a 5 out of 10 in this part in order to pass the course.

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Final assessment

A single final examination will be taken at the end of the term, weighting 100% of the grade (20% for the practices exam, 80% for the course contents exam).

EXTRAORDINARY EXAMINATION PERIOD: GUIDELINES AND OPTING OUT

The July examination will be graded following the final assessment modality, therefore a single final examination will be taken, weighting 100% of the grade (20% for the practices exam, 80% for the course contents exam).

MANDATORY MATERIALS

BIBLIOGRAFÍA

Basic bibliography

- Fishbane PM et al. Physics: for Scientists and Engineers with Modern Physics. Prentice Hall, 1996.

- Tipler PA. Physics for Scientists and Engineers. 6th edition. Freeman & Company, W. H.; 2007.

- Kane JW, Sternheim MM. Physics. 3rd ed. Wiley; 1998.

Detailed bibliography

- Boeker E, Van Grodelle R. Environmental Physics. John Wiley & Sons, 2nd ed., 1999.

- Mason N, Hughes P. Introduction To Environmental Physics. Taylor & Francis, 2001.

Journals

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Web sites of interest

- http://www.sc.ehu.es/sbweb/fisica/
- http://lectureonline.cl.msu.edu/~mmp/applist/applets.htm
- http://phet.colorado.edu/index.php

OBSERVATIONS

COURSE GUIDE 2023/24

Faculty 125 - Faculty of Pharmacy **Cycle** .

Degree GCTALI10 - Bachelor`s Degree in Food Science and Techonology **Year** Second year

COURSE

25112 - Biochemistry **Credits, ECTS:** 9

COURSE DESCRIPTION

The course describes the biomolecules that are part of the human organism, both from the structural point of view, and the metabolic transformations that take place within the cells. To this end, the reaction mechanisms carried out by enzymes, which are mainly proteins that function as biological catalysts, are detailed.
The second part of the course contains the description and analysis of the main metabolic pathways that occur in the organism to obtain the metabolic energy necessary for the synthesis of the macromolecules that keep the human organism alive. In order to reach this objective, it is necessary to ingest food, with different degrees of elaboration, which will generate the appropriate substrates so that these reactions can take place.
The third part explains how genetic information is transmitted so that the various proteins necessary for the maintenance of the metabolism and structures of living organisms can be expressed.

COMPETENCIES/LEARNING RESULTS FOR THE SUBJECT

1.-To know the structures, properties and biochemical functions of biomolecules.
2.-To understand, correlate and be able to explain the general chemical processes that living beings carry out and that are governed by enzymes.
3.-To identify and understand the chemical processes to obtain metabolic energy by the cell and those that consume that energy in the synthesis of biomolecules themselves.
4.-To know the pathways of expression, repair and transmission of the genetic message.
5.-To perform chemical and/or biochemical analysis and to interpret the results.

CONTENIDOS TEÓRICO-PRÁCTICOS

TOPIC 1. PRESENTATION. Introduction to the biological molecules.

TOPIC 2. AMINO ACIDS. Chemical-biological characteristics of amino acids. Properties and classification of proteinogenic amino acids. Non-proteinogenic amino acids.
TOPIC 3.-PROTEINS. Concept, generalities and classification. Peptide bond. Primary structure.
TOPIC 4.-THREE-DIMENSIONAL STRUCTURE OF PROTEINS. Secondary structure of proteins. Fibrous and globular proteins. Tertiary structure. Quaternary structure. Conjugated proteins. Protein denaturation.

TOPIC 5.-ENZYMES AS BIOLOGICAL CATALYSTS. Chemical nature of enzymes. Cofactors. Nomenclature and classification of enzymes. Mechanisms of enzymatic reactions: active center, binding and catalysis.
TOPIC 6. KINETICS OF ENZYMATIC REACTIONS. Michaelis-Menten equation. Meaning of the kinetic constants. Representations. Enzymatic activity: factors that modify it. Enzymatic inhibition.
TOPIC 7.- REGULATION OF ENZYMATIC ACTIVITY. Allosteric enzymes: concept and characteristics. Regulation of activity by covalent modification. Isoenzymes.

TOPIC 8.-CARBOHYDRATES. Structure. Classification and biological interest.
TOPIC 9.-NUCLEOTIDES. Structure and function.
TOPIC 10.-LIPIDS.- Structure. Classification and biological interest. Biological membranes.

TOPIC 11.-INTRODUCTION TO INTERMEDIARY METABOLISM. Concept of metabolic pathway. Irreversible reactions. Energy-rich compounds. Regulation of metabolism.

TOPIC 12.-BIOLOGICAL OXIDATIONS. Respiratory chain: location, components and control. Oxidative phosphorylation: Definition, mechanism and respiratory control.

TOPIC 13.-CYCLE OF TRICARBOXYLIC ACIDS. Sequence, balance and functions.
TOPIC 14.-GLUCOSE METABOLISM (1). Digestion and absorption of carbohydrates. Glycolysis: sequence and balance. Fates of pyruvate. Shuttle systems. Energy balance of glucose oxidation.
TOPIC 15.-GLUCOSE METABOLISM (2) Gluconeogenesis: Stages and balance from pyruvate.pentose phosphate pathway.
TOPIC 16.-REGULATION OF GLUCOSE METABOLISM. Coordinated regulation of glycolysis and gluconeogenesis.
TOPIC 17. GLYCOGEN METABOLISM. Glycogenolysis. Regulation of glycogen metabolism.

TOPIC 18.-DIGESTION AND TRANSPORT OF LIPIDS. Digestion and absorption of lipids. Structure of plasma lipoproteins. mobilization of triacylglycerides from adipose tissue.

TOPIC 19.-CATABOLISM OF FATTY ACIDS. Activation of fatty acids .β-oxidation of fatty acids. Ketone bodies: biosynthesis and utilization.
TOPIC 20. FATTY ACID BIOSYNTHESIS. Malonyl-CoA formation. Fatty acid synthase complex. Elongation and unsaturation of fatty acids.
TOPIC 21.- LIPID BIOSYNTHESIS. Biosynthesis of triacylglycerides and phospholipids. Biosynthesis of cholesterol and steroid derivatives.

TOPIC 22. PROTEIN CATABOLISM AND AMINO ACID METABOLISM. Digestion and intracellular degradation of proteins. Metabolism of the alpha-amino group of amino acids, fate of ammonium, urea cycle. Metabolism of the carbon chain of amino acids. Biosynthesis of nonessential amino acids.

TOPIC 23. NUCLEOTIDES METABOLISM. De novo biosynthesis and recovery pathways of purine nucleotides. Degradation of purine nucleotides. De novo biosynthesis and recovery pathways of pyrimidine nucleotides. Biosynthesis of deoxyribonucleotides.

TOPIC 24. INTEGRATION OF METABOLISM. Tissue-specific metabolism. Fasting-feeding cycle.

TOPIC 25.- DNA STRUCTURE. Primary structure. Secondary structure. Supercoiling. Nucleosomes. Genes and genome.
TOPIC 26.- DNA REPLICATION. Properties. DNA polymerases. Stages of replication.
TOPIC 27.-DNA MUTATION AND REPAIR. Causes of mutations and repair systems.
TOPIC 28.- DNA TRANSCRIPTION. RNA structure. Properties. RNA polymerases. Stages of transcription. RNA maturation.
TOPIC 29. PROTEIN BIOSYNTHESIS. Properties. Genetic code. Amino acid activation. Stages of protein biosynthesis. maturation of proteins.
TOPIC 30.- REGULATION OF GENE EXPRESSION. Bacteria. Eukaryotes.

TEACHING METHODS

METHODOLOGY OF TEACHING MODALITIES:
- LECTURES:
They will be held in classrooms with blackboard, computer and projector (65 hours).
- LABORATORY PRACTICES:
They will be carried out in practice laboratories (4 sessions of 5 hours each).
- CLASSROOM PRACTICES:
They are carried out in classrooms with blackboard, computer and projector (2 sessions of 2.5 hours each).

TYPES OF TEACHING

Types of teaching	M	S	GA	GL	GO	GCL	TA	TI	GCA
Hours of face-to-face teaching	65		5	20					
Horas de Actividad No Presencial del Alumno/a	97,5		7,5	30					

Legend:
M: Lecture-based
S: Seminar
GA: Applied classroom-based groups
GL: Applied laboratory-based groups
GO: Applied computer-based groups
GCL: Applied clinical-based groups
TA: Workshop
TI: Industrial workshop
GCA: Applied fieldwork groups

Evaluation methods

- Continuous evaluation
- End-of-course evaluation

Evaluation tools and percentages of final mark

- Written test, open questions 15%
- Multiple choice test 50%
- Exercises, cases or problem sets 20%
- Individual assignments 10%
- Teamwork assignments (problem solving, Project design) 5%

ORDINARY EXAMINATION PERIOD: GUIDELINES AND OPTING OUT

The final exam consists of a theoretical and a practical part. The theoretical part will account for 65% of the final grade of the course, there will be a test section (50%) and questions to be developed (15%). The practical part will account for 20% of the final grade. To pass the course it is necessary to pass both parts separately. The remaining 15% of the grade is obtained through continuous assessment, through questions and exercises that the teacher will pose in class or on the eGela platform during the course and two individual tests. The realization of laboratory practices is mandatory. During the development of the practices, the attitude and skills in the laboratory work will be graded, as well as the students' capacity

of expression and teamwork.

In any case, students will have the right to be evaluated through the final evaluation system, regardless of whether or not they have participated in the continuous evaluation system. To do so, students must submit in writing to the teacher responsible for the subject the waiver of continuous assessment, for which they will have a period of 9 weeks from the beginning of the course.

Both in the case of continuous assessment and in the case of final assessment, failure to attend the test set on the official exam date will mean the automatic waiver of the call, and will result in the qualification of not presented.

EXTRAORDINARY EXAMINATION PERIOD: GUIDELINES AND OPTING OUT

The same conditions as in the ordinary exam.

However, students who pass any of the parts in the ordinary exam will not have to repeat it in the extraordinary exam, i.e., they will only have to take the exam of the failed part.

MANDATORY MATERIALS

eGEla will be essential for the proper development of the lesson.

BIBLIOGRAFÍA

Basic bibliography

1.-"Lehninger. Principles of Biochemistry", D.L. Nelson and M.M. Cox, 8th Edition. 2021.
2.- "Fundamentals of biochemistry: Life at the molecular level", D. Voet, J.G. Voet and C.W. Pratt, 5th edition. 2016
3.- "Biochemistry. Basic course.", J.L.Tymoczko , L. Stryer, J.M. Berg and, 2nd edition. 2014.
4.- "Human Molecular Genetics 3", T. Strachan & A. P. Read. 2018

Detailed bibliography

1.- "The Initiation of DNA Replication in Eukaryotes". D.L. Kaplan, 2016
2.- "The Regulation of DNA Replication and Transcription" M. Beljanski, 2013
3.- "Metabolic Regulation: A human prespective" K. N. Frayn, 3rd edition, 2019

Journals

Web sites of interest

http://highered.mheducation.com/sites/0072507470/student_view0/index.html
https://www.rcsb.org/
https://www.sciencedaily.com/news/matter_energy/biochemistry/
https://www.sebbm.es/web/en/

http://www.ehu.es/biomoleculas
http://www.biorom.uma.es/

OBSERVATIONS

Minimum knowledge of the following areas is required:

BIOLOGY
- Cell structure and organization.

CHEMISTRY
- Concentration units
- Chemical bonds and intermolecular forces
- Chemical kinetics
- Stereoisomerism

PHYSICS
- Basic thermodynamic quantities

MATHEMATICS
- Graphical representations and linear regression analysis.

COURSE GUIDE 2023/24

Faculty 125 - Faculty of Pharmacy **Cycle** .

Degree GCTALI10 - Bachelor`s Degree in Food Science and Techonology **Year** Second year

COURSE

25115 - Chemical Engineering **Credits, ECTS:** 6

COURSE DESCRIPTION

The course provides the basic principles to understand unit operations in Chemical Engineering. For this purpose, calculation methods and design equations are required. Unit operations are based on energy and mass transfer phenomena and on conservation laws. This knowledge, along with suitable mathematical development, is useful for designing processes to produce and manipulate food.
Theoretical reasoning has been minimized. In fact, the aim of the subject is not to focus on theoretical development, but to understand and be able to design the processes used in the chemical industry (mainly those related to the food industry).
This subject is an introduction to the subjects "Unit Operations I" and "Unit Operations II", that will be taught in the coming terms. This course requires the knowledge gained from several 1st year subjects, such as Physics, Chemical Physics and Mathematics.

COMPETENCIES/LEARNING RESULTS FOR THE SUBJECT

Specific competences of the course:
CE1. To understand unit systems of physical magnitudes. To become proficient in engineering calculations.
CE2. To be able to approach and solve macroscopic mass balances in simple operations.
CE3. To be able to approach and solve enthalpy balances in heat exchange systems.
CE4. To be able to approach and solve mechanical energy balances in pipelines.
CE5. To know the basic principles of chemical reaction engineering.

CONTENIDOS TEÓRICO-PRÁCTICOS

Lesson 1. Basic principles for engineering calculations
Lesson 2. General principles of Chemical Engineering
Lesson 3. Basic principles of fluid mechanics
Lesson 4. Mass balances
Lesson 5. Energy balances
Lesson 6. Introduction to chemical reaction engineering

- Laboratory practice:
Practice 1: Theoretical and real head losses in a hydraulic installation
Practice 2: Mass balance in a continuous mixing process
Practice 3: Mass and energy balances in an evaporator
Practice 4: Kinetic analysis of ethanol oxidation

TEACHING METHODS

- Lectures to explain the basic principles of each lesson
- Classroom practices to solve problems
- Laboratory practice
- Problem-solving seminars: the students, working in small groups, will solve a proposed exercise

TYPES OF TEACHING

Types of teaching	M	S	GA	GL	GO	GCL	TA	TI	GCA
Hours of face-to-face teaching	36		6	15,5	2,5				
Horas de Actividad No Presencial del Alumno/a	54		9	23,25	3,75				

Legend:
M: Lecture-based | S: Seminar | GA: Applied classroom-based groups
GL: Applied laboratory-based groups | GO: Applied computer-based groups | GCL: Applied clinical-based groups
TA: Workshop | TI: Industrial workshop | GCA: Applied fieldwork groups

Evaluation methods

- End-of-course evaluation

Evaluation tools and percentages of final mark

- Written test, open questions 65%

- Exercises, cases or problem sets 20%
- Teamwork assignments (problem solving, Project design) 15%

ORDINARY EXAMINATION PERIOD: GUIDELINES AND OPTING OUT

- Tools and percentages for grading:
Laboratory practice: 20 % (two exams in the computer room)
Final exam (theoretical-practical): 80 %
Problem-solving seminars: additional mark (maximum of 10 %)
- Opting out of the ordinary sitting
Failure to appear at the final exam on the official date of the ordinary sitting will automatically mean opting out of that sitting, which will lead to the grade of Not Sat.

EXTRAORDINARY EXAMINATION PERIOD: GUIDELINES AND OPTING OUT

In the extraordinary sitting, the only system to assess the student will be the final evaluation system. Nevertheless, if the student has a positive grade in laboratory practices or problem-solving seminars, those grades will be maintained. On the contrary, if the results are negative, the final exam will enable the student to get 100% of the final grade.

MANDATORY MATERIALS

Lesson notes, lists of exercises, tables and graphs, calculator, practice scripts.
The students must wear a laboratory coat during laboratory practice. Moreover, students must bring a laptop during laboratory practice (at least one for each group).

BIBLIOGRAFÍA

Basic bibliography

Backhurst J.R., Harker, J.H., Porter, J.E. "Problems in Heat and Mass Transfer (1st ed. corr.)" Edward Arnold, London (1980).

Felder, R.M., Rousseau, R.W. "Elementary Principles of Chemical Processes", Wiley, New York (1986).

Himmelblau, D.M., Riggs, J.B. "Basic Principles and Calculations in Chemical Engineering (7th ed.)", Prentice-Hall, New Jersey (2004).

McCabe, W.L., Smith, J.C., Harriott, P. "Unit Operations of Chemical Engineering (7th ed.)", McGraw-Hill, Boston (2005).

Reklaitis, G.V. "Introduction to Material and Energy Balances", Wiley, New York (1983).

Schmidt, A.X., List, H.L. "Material and Energy Balances", Prentice-Hall, New Jersey (1962).

Singh, R.P., Heldman, D.R. "Introduction to Food Engineering (4th ed.)", Academic Press Elsevier, Amsterdam (2009).

Wells, G., Rose, L.M. "The Art of Chemical Process Design", Elsevier, Amsterdam (1986).

Detailed bibliography

Journals

Web sites of interest

OBSERVATIONS

COURSE GUIDE 2023/24

Faculty 125 - Faculty of Pharmacy **Cycle** .

Degree GCTALI10 - Bachelor`s Degree in Food Science and Techonology **Year** Third year

COURSE

25124 - Food Technology I **Credits, ECTS:** 6

COURSE DESCRIPTION

The Food Technology discipline is made up of two subjects: Food Technology I and Food Technology II. The knowledge provided by this discipline ranges from the technological foundations of preservation and transformation processes to the changes that take place in the technological, nutritional and sensory characteristics of food during processing and storage. This knowledge is essential for the future food technologist to be able to correctly carry out their professional work in the field of food preparation and preservation.
Thus, the aim of this subject is for the student to acquire the knowledge and skills related to all the operations involved in the manufacture of food, from the raw material to the finished product that reaches the consumer. This way, the students will be able to select the most appropriate technology in each case, taking into account the limitations, advantages and disadvantages of their choice.
This guide contains information related to the subject Food Technology I, which is taught during the 2nd four-month period of the 3rd year of the Bachelor's Degree in Food Science and Technology. This subject, like Food Technology II, is part of the module called Food Technology, whose objective is that the student acquires the necessary technological basis for all the stages that affect the food, from the raw material to the finished product that reaches the consumer.
In order to be able to follow this subject properly is necessary for students to have adequate training in subjects related to: Food Chemistry and Biochemistry, Basic Operations I and Food Microbiology and Hygiene. Likewise, Food Technology I serves as a basis for Food Technology II and other optional subjects that deal with the specific technologies of the different types of food that are developed in the 4th year.

COMPETENCIES/LEARNING RESULTS FOR THE SUBJECT

DISCIPLINE-SPECIFIC COMPETENCES IN FOOD TECHNOLOGY:

C1. Accurately define the different processes involved in food manufacturing.

C2. Analyse and interpret the theoretical bases underpinning each type of operation involved in food processing.

C3. Understand the operation and design fundamentals of the different types of equipment that can be used in the food industry for each type of processing.

C4. Analyse and assess the effects that different forms of processing can cause on foodstuffs.

C5. Design and plan food manufacturing processes using different operations.

C6. Use in a practical way some equipment within a food manufacturing process and judge its effect.

TRANSVERSAL COMPETENCES OF THE DISCIPLINE FOOD TECHNOLOGY:

C7. Plan and carry out group work aimed at searching for information and obtaining, presenting and discussing results.

Theoretical and Practical Contents

THEORETICAL PROGRAMME

I INTRODUCTION
1. Introduction.

II. PRELIMINARY OPERATIONS AND OTHER OPERATIONS
2. Washing and Cleaning.
3. Sorting.
4. Size reduction in solid foods.
5. Size reduction in liquid foods.
6. Mixing and Molding.

III. SEPARATION PROCESSES
7. Centrifugation.
8. Filtration.
9. Pressure extraction.

10. Separation by Membranes.

IV. HEAT PROCESSING
11. Blanching.
12. Pasteurization.
13. Sterilization

V. WATER CONTENT REDUCTION PROCESSES
14. Concentration: Concentration by Evaporation. Freeze Concentration.
15. Dehydration: Dehydration by Evaporation. Dehydration by Sublimation (Freeze Drying).

PRACTICAL PROGRAMME

INDUSTRIAL WORKSHOPS: Several sessions will be held at a food plant scale with the aim of becoming familiar with the some of the equipment commonly used for food processing. When possible, the students will have to analyze the effect of the processing on the characteristics of the processed product. The practical sessions planned are the following:

1. Analysis and evaluation of the cold-pressing extraction operation. Assembly of the press, setting up, extraction of some oily seeds and evaluation.
2. Evaluation of the size reduction operation in liquids. Pressure homogenizer, set-up, operating conditions and evaluation.
3. Fruit juice pasteurization. Sensory and analytical evaluation of juices.
4. Operations involved in fruit preservation by heat treatment. Evaluation of the process.

CLASSROOM PRACTICES: This will consist of the selection by groups of a specific application of an industrial process and subsequent presentation and argumentation in the classroom of the selected application.

FIELD PRACTICES: A field practice consisting of visiting a food processing plant will be carried out.

TEACHING METHODS

This subject uses a variety of teaching methodologies:

•Lectures (M) will be given in which the basic contents of the subject will be presented. The active participation of the students will be encouraged.

•Classroom practice (GA) will be carried out during normal class time and will consist of a project based on Problem Based Learning (PBL) methodology.

•The Industrial Workshops (IT) will be carried out in work groups in the Food Plant of the Faculty of Pharmacy.

•Students will also carry out a field practice (GCA) which will consist of a visit to a food industry in the sector. During the visit, students will be able to check the usefulness of their theoretical knowledge as they will see in situ machinery and processes for the preparation of raw materials and their transformation, which will have been previously dealt with in class, which will facilitate their understanding and learning.

TYPES OF TEACHING

Types of teaching	M	S	GA	GL	GO	GCL	TA	TI	GCA
Hours of face-to-face teaching	36		6					12	6
Horas de Actividad No Presencial del Alumno/a	80		2					6	2

Legend:
M: Lecture-based | S: Seminar | GA: Applied classroom-based groups
GL: Applied laboratory-based groups | GO: Applied computer-based groups | GCL: Applied clinical-based groups
TA: Workshop | TI: Industrial workshop | GCA: Applied fieldwork groups

Evaluation methods

- Continuous evaluation
- End-of-course evaluation

Evaluation tools and percentages of final mark

- Written test, open questions 65%
- Exercises, cases or problem sets 15%
- Teamwork assignments (problem solving, Project design) 20%

ORDINARY EXAMINATION PERIOD: GUIDELINES AND OPTING OUT

The final mark of each student will be the result of a weighted evaluation of different tests and activities:

•Written exam (individual exam): 65% (it will be necessary to pass the exam in order to calculate the final weighted grade). This exam must be passed with a minimum score of 5 out of 10.

•Report on the results obtained in the industrial workshops (team work): 15%. It will consist of the elaboration, in groups, of a report that compiles the results, observations and conclusions obtained in the sessions of the industrial workshops. This test must be passed with a minimum score of 4 points out of 10.

•PBL-based work (team work): 20%. It will consist of carrying out a work based on PBL. This test must be passed with a minimum score of 4 out of 10 points.

Waiver of the Continuous Evaluation system (Art. 8.3 -see Normativa de Evaluación del Alumnado*):

To waiver of the continuous evaluation system, students must submit a written waiver to the lecturer responsible for the subject, for which they will have a period of 9 weeks counting from the beginning of the four-month period. Students who waive the Continuous Assessment System will have the right to be assessed through the final evaluation system, which will consist of as many exams and assessment activities as necessary to be able to evaluate and measure the defined learning outcomes, in an equivalent way to how they are assessed in the continuous evaluation system and will comprise 100% of the mark for the subject.

Waiver of the exam (Art. 12 see "Normativa de Evaluación del Alumnado"*):

The non-presentation to the written exam will imply the renounce to the call, and will result in a "Not Presented" grade.

*https://www.ehu.eus/es/web/estudiosdegrado-gradukoikasketak/ebaluaziorako-arautegia

EXTRAORDINARY EXAMINATION PERIOD: GUIDELINES AND OPTING OUT

The evaluation of the subjects in the extraordinary call will be carried out exclusively through the final evaluation system, as described for the ordinary call.

The non-presentation to the exam will imply the waiver of the call, and will result in a "Not Presented" grade.

MANDATORY MATERIALS

Para los Talleres Industriales será obligatorio el uso de bata.

En la plataforma web Moodle (eGela) se dispone de documentación sobre los objetivos, dinámica (calendario y actividades), programa de la asignatura, y recursos bibliográficos. También se dispone de los protocolos para el desarrollo de las prácticas en laboratorio. Los materiales didácticos necesarios para un adecuado seguimiento de la asignatura estarán disponibles, a lo largo del curso, en el servicio de reprografía de la Facultad de Farmacia

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-Man, C.M.D., Jones, A.A. (2000). Shelf Life Evaluation of Foods (2ª ed.). Blackie Academic & Professional, Glasgow, UK.

Journals

Critical Reviews in Food Science and Nutrition
Food Chemistry
Food Science and Technology International
Journal of Agricultural and Food Chemistry
Journal of Food Science
Trends in Food Science and Technology

Web sites of interest

Agencia Española de Seguridad Alimentaria y Nutrición: http://www.aesan.msc.es
Codex Alimentarius Commission: http://www.codexalimentarius.net/web/index_es.jsp
European Federation of Food Science and Technology (EFFoST): http://www.effost.org
European Food Information Council (EUFIC): http://www.eufic.org/sp/home/home.htm
European Food Safety Authority (EFSA): http://www.efsa.europa.eu
Food and Agriculture Organization of the United Nations (FAO): http://www.fao.org
Institute of Food Science and Technology (IFST): http://www.ifst.org
Institute of Food Technologists (IFT): http://www.ift.org
Ministerio de Asuntos Sociales y Agenda 2030: https://www.agenda2030.gob.es/

OBSERVATIONS

COURSE GUIDE 2023/24

Faculty 125 - Faculty of Pharmacy **Cycle** .

Degree GCTALI10 - Bachelor`s Degree in Food Science and Techonology **Year** Fourth year

COURSE

25130 - Science & Technology of Meat, Fish & their Derivatives **Credits, ECTS:** 9

COURSE DESCRIPTION

The subject of Science and Technology of Meat, Fish and Derived Products is taught in the 1st four-month period of the last year of the Degree in Food Science and Technology and it is part of the "Food Sector" module.
The general objective of the subject is to study in depth and from an applied perspective the composition, characteristics, preservation and transformation of meat and fish, as well as the processing technology and the properties and defects of meat and fish derivatives. Its purpose is for students to acquire the basic knowledge and skills that will enable them to select in each case the most appropriate raw materials, ingredients, additives and technologies for the preservation, transformation and elaboration of meat and fish derivatives.
Thus, the course is closely related to the Food Technology I and II subjects (taught in the 3rd and 4th years of the Degree, respectively), since both are the basis of application to the technologies of the different sectors. Likewise, it integrates knowledge and competences previously acquired from other subjects of the degree such as Food Chemistry and Biochemistry (taught in 2nd year), and Food Microbiology and Hygiene (3rd year).

COMPETENCIES/LEARNING RESULTS FOR THE SUBJECT

C1. Identify the physico-chemical and functional characteristics of meat and fish, as well as their mechanisms of spoilage.
C2. Analyze and assess the effects of the different technologies applied in meat and fish preservation and processing on the characteristics of the final product.
C3. Identify the main defects in products derived from meat and fish and propose solutions.
C4. Design, plan and carry out meat and fish manufacturing processes to obtain derived products.
C5. Plan and carry out group work aimed at searching for information and obtaining, discussing and presenting results.

Theoretical and Practical Contents

THEORETICAL PROGRAMME
GENERAL INTRODUCTION TO THE SUBJECT SCIENCE AND TECHNOLOGY OF MEAT, FISH AND DERIVED PRODUCTS

I PART. SCIENCE AND TECHNOLOGY OF MEAT AND DERIVED PRODUCTS
1. Introduction
I. MUSCLE STRUCTURE, COMPOSITION AND FUNCTION
2. Structure of skeletal muscle tissue
3. Chemical composition of muscle
4. Muscle contraction

II. TRANSFORMATION OF MUSCLE TO MEAT. MEAT QUALITY PARAMETERS
5. Development of rigor mortis
6. Anomalous developments of rigor mortis
7. Meat ageing
8. Meat color
9. Meat texture
10. Meat aroma and taste
11. Meat water holding capacity

III. INDUSTRIAL PRODUCTION OF MEAT. FRESH MEAT TECHNOLOGY
12. Livestock slaughter
13. Electrical stimulation of the carcasses. Hot processing.
14. Meat refrigeration
15. Meet freezing

IV. MEAT TRANSFORMATION. TECHNOLOGICAL PROCESSES
16. Classification of meat-derived products. General processes
17. Meat curing. Meat emulsions
18. Processing operations of meat derivatives
19. Whole cured and aged meat derivatives
20. Minced cured-aged meat derivatives
21. Whole pasteurized meat derivatives
22. Minced pasteurized meat derivatives

II PART. SCIENCE AND TECHNOLOGY OF FISH AND DERIVED PRODUCTS
1. Introduction
I. STRUCTURE AND COMPOSITION OF FISH
2. Structure and characteristics of fish muscle tissue
3. Chemical composition of fish
4. Structure and Composition variability and scientific-technical consequences

II. POST-MORTEM CHANGES IN FISH. FISH QUALITY
5. Changes in appearance, smell, taste and texture
6. Spoilage of fish
7. Shelf life and quality factors
8. Assessment of fish freshness

III. GENERAL OPERATIONS IN FISH HANDLING AND PROCESSING
9. Preliminary handling
10. Unitary technological processes
11. Refrigeration applied to fish
12. Freezing applied to fish
13. Thawing applied to fish
IV. TRANSFORMATION OF FISH. TECHNOLOGICAL PROCESSES
14. Classification of fish-derived products
15. Fish canning
16. Fish drying and salting
17. Fish Marinating
18. Fish smoking
19. Minced fish and Surimi
20. Fish gels and emulsions
21. Fish by-products

PRACTICAL PROGRAMME
Three different activities will be held: industrial practicals, workshop/exercises and field visits.

INDUSTRIAL PRACTICALS: Several sessions will be held to reproduce at a food plant scale some meat and fish manufacturing processes with the aim of elaborating certain derivatives and/or of processing different raw materials. In these sessions, students will become familiar with some equipment and processes, will be able to experiment with different variables and analyze the processing effect on the characteristics of the final product.

1. Elaboration of a cured-aged sausage and evaluation of the processes involved.
2. Elaboration of a pasteurized sausage and evaluation of the processes involved.
3. Elaboration of semi-preserved fish derivatives and evaluation of the processes involved.
4. Elaboration of smoked fish derivatives and evaluation of the processes involved.

WORKSHOPS (in classroom): Results from Industrial Practicals will be presented and defended in 2 sessions of 3 hours for each section (meat & fish).

FIELD VISITS: Visits to companies that manufacture meat and fish-derived products will be done.

TEACHING METHODS

El programa teórico se desarrollará mediante lecciones magistrales participativas.

Los Talleres Industriales se desarrollarán en pequeños grupos en la Planta Alimentaria. Estas sesiones se completarán con una sesión de exposición y discusión abierta de los resultados en aula.

Las Prácticas de Campo estarán dirigidas por un técnico de la propia empresa. Cada estudiante entregará individualmente un resumen o diagrama de flujo de los procesos observados durante la visita.

TYPES OF TEACHING

Types of teaching	M	S	GA	GL	GO	GCL	TA	TI	GCA
Hours of face-to-face teaching	57		6					18	9
Horas de Actividad No Presencial del Alumno/a	90		18					13	14

Legend:
M: Lecture-based
S: Seminar
GA: Applied classroom-based groups
GL: Applied laboratory-based groups
GO: Applied computer-based groups
GCL: Applied clinical-based groups
TA: Workshop
TI: Industrial workshop
GCA: Applied fieldwork groups

Evaluation methods

- Continuous evaluation
- End-of-course evaluation

Evaluation tools and percentages of final mark

- Written test, open questions 70%
- Exercises, cases or problem sets 20%
- Individual assignments 10%

ORDINARY EXAMINATION PERIOD: GUIDELINES AND OPTING OUT

The final grade of the student will be the result of the weighted evaluation of different tests and activities:

Written exam (70%). It will consist of an objective test on the theoretical and applied contents of the program. The student must obtain a minimum score of 5 out of 10 for each of the two parts of the course.

Exhibition and discussion of the results of the industrial workshops (20%). It will consist of the presentation and defense in group of the results, observations and conclusions obtained in the sessions of the Industrial Workshops through a PowerPoint presentation, and delivery of a final report. A session will be held for each of the parts of the subject, and they must be passed with a minimum score of 3 points out of 10.

Other activities (10%). Set of other activities carried out either individually or in small groups.

Student assessment regulations (BOPV 03-13-2017; 06-28-2019)

- Waiver of the continuous evaluation system
To renounce the continuous assessment system, students must submit in writing to the teaching staff responsible for the subject their resignation from the continuous assessment system, for which they will have a period of 9 weeks, starting from the beginning of the semester, in accordance with the academic calendar of the center.
Students who renounce the continuous assessment system will have the right to be assessed through the final assessment system.

- Waiver of the call
Failure to submit to the written exam will lead to the renouncement of the call, and will lead to the qualification of "Not Presented".

EXTRAORDINARY EXAMINATION PERIOD: GUIDELINES AND OPTING OUT

The same evaluation criteria as for the ordinary call will be followed.

MANDATORY MATERIALS

Para la realización de los Talleres Industriales es obligatorio el uso de bata.

Para apoyar las actividades presenciales se empleará la plataforma eGela, como medio de comunicación entre las profesoras y el alumnado. A través de esta plataforma se proporcionarán documentos de interés relacionados con la materia.

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Bratt, L. 2010. Fish Caning Handbook. Wiley-Blacwell, Publishing, Iowa.
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Journals

Animal
Critical Reviews in Food Science and Nutrition
Comprehensive Reviews in Food Science and Food Safety
European Food Research and Technology
Food Chemistry
Food Science and Technology International
Food Reviews International
International Journal of Food Science and Technology
Journal of Aquatic Food Product Technology
Journal of Agricultural and Food Chemistry
Journal of Animal Science
Journal of Food Science
Journal of the Science of Food and Agriculture
LWT- Food Science and Technology
Meat Science
Trends in Food Science and Technology

Web sites of interest

European Federation of Food Science and Technology (EFFoST). www.effost.org/
Institute of Food Science and Technology. www.ifst.org/
Food and Agriculture Organization of the United Nations. Torry Advisory Notes. www.fao.org/
Integrating Food Science & Engineering Knowledge into the Food Chain. www.iseki-food.net
Canadian Institute of Food Science & Technology. www.cifst.ca

OBSERVATIONS

COURSE GUIDE 2023/24

Faculty 125 - Faculty of Pharmacy **Cycle** .

Degree GNUTRI10 - Bachelor's Degree in Human Nutrition & Dietetics **Year** First year

COURSE

25190 - Chemistry and Biochemistry of Food **Credits, ECTS:** 6

COURSE DESCRIPTION

The subject of Food Chemistry and Biochemistry is taught in the 2nd four-month period of the 1st year of the Degree in Human Nutrition and Dietetics, and it is part of the Food Science module of this Degree. Foodstuffs have a complex chemical and biochemical composition, and it is in this subject where the main chemical components of food are studied (water, carbohydrates, lipids and dietary proteins, vitamins and minerals, natural pigments, and taste and flavour components), together with the main food additives. Their chemical structure, physico-chemical properties, effects and function in foods, as well as the main chemical alteration reactions in foods are subject of study.
This subject provides the basic knowledge of the chemical components of food, their chemical properties and functionality, as well as the main changes that food undergoes as a consequence of processing and preservation processes and that affect food nutritional and organoleptic properties, among others. This knowledge is fundamental for the Dietitian-Nutritionist, who, in his or her professional practice, must understand and apply the relationship between food, nutrition and health in their field of work.
In order to follow the subject correctly, it is necessary to have previous knowledge of the basic subjects taken in the first four-month period of the Degree, such as General Chemistry and Physico-chemistry, as well as to relate certain concepts of the subject Food Chemistry and Biochemistry with basic aspects explained in the subject of Organic Chemistry in this course. Likewise, this subject serves as a basis to be able to adequately develop, among others, other subjects of the degree such as Bromatology (2nd year) and Culinary Technology and Food Processing (2nd year).

COMPETENCIES/LEARNING RESULTS FOR THE SUBJECT

1. Identify and differentiate the chemical structure and properties of the main chemical and biochemical components responsible for the quality attributes of food products.
2. Relate the chemical structure of these components with their functionality in food.
3. Analyse and compare the behaviour of chemical and biochemical components under certain food processing and preservation conditions.
4. Identify the main chemical reactions that can occur during food processing and preservation and their impact on food quality.
5. Study some major and minor food components (concentration, properties) using different methodologies and interpret the results obtained.
6. Organise and plan group work for the search, selection and synthesis of information; express themselves clearly, using the correct nomenclature of Food Chemistry; understand reports on analytical procedures of food components, and interpret the results obtained.

CONTENIDOS TEÓRICO-PRÁCTICOS

THEORETICAL PROGRAMME
1. Water. Physico-chemical properties. Importance of its presence in food. Stability of food.
2. Carbohydrates in food. Definition. Classification.
3. Monosaccharides and disaccharides in food. Sucrose and invert sugar. Lactose. Structure. Properties. Reactivity. Effects of their presence in foods.
4. Polysaccharides in food. Starches and their structure. Modified starches. Functions they play in foods.
5. Celluloses. Pectins. Gums. Other hydrocolloids. Structure and effects of their presence in foods.
6. Food lipids Definition. Classification.
7. Fatty acids and triglycerides in foods. Structure. Functions in food.
8. Phospholipids in food. Structure. Functions in food.
9. Modification reactions of dietary fats: hydrogenation and interesterification. Modified fats.
10. Amino acids and peptides in food. Definition. Classification. Importance of their presence in food.
11. Food proteins. Structure and denaturation. Functional properties. Reactivity. Important enzymes in food.
12. Water-soluble and fat-soluble vitamins. Structure. Macrocomponent minerals and trace elements. Importance of their presence in food. Losses in processing.
13. Substances responsible for food colour, taste and flavour. Structure. Effects of their presence in food. Modifications in processing.
14. Main food spoilage reactions. Lipid rancidity: hydrolytic and oxidative. Browning enzymatic browning. Non-enzymatic browning. Effects on food.
15. Food additives. Types of additives. Functions in food.

PRACTICAL PROGRAMME
Laboratory practical classes on the study of some properties and behaviour of certain important components in foodstuffs:

1. Characterisation of edible oils after extraction of fatty acids. Refractive indexes of edible oils.
2. Fractionation and quantification of food proteins in egg products.
3. Thermal stability of chlorophylls in plant foods.

TEACHING METHODS

The teachers in charge of the subject belong to the Food Technology Area, and use different teaching methodologies in this subject:
• Lectures (M) in which the basic contents of the subject will be presented.
• Laboratory practical classes (GL) will be carried out in working groups and include two different and complementary tasks: (1) carrying out the practical exercises in the laboratory and subsequent discussion of the results obtained in a seminar and (2) preparation of a written report in which the most relevant results obtained and their interpretation will be included. The active participation of the students will be encouraged and evaluated.
• Classroom practice (GA) consists of two types of activities directed by the teacher: (1) resolution of exercises individually, and (2) oral presentation, after group work, on the chemistry, behaviour and functionality of a type of food additive (lesson 15), in which the active participation of the students will be encouraged and evaluated.

TYPES OF TEACHING

Types of teaching	M	S	GA	GL	GO	GCL	TA	TI	GCA
Hours of face-to-face teaching	40		5	15					
Horas de Actividad No Presencial del Alumno/a	70		5	15					

Legend:
M: Lecture-based
S: Seminar
GA: Applied classroom-based groups
GL: Applied laboratory-based groups
GO: Applied computer-based groups
GCL: Applied clinical-based groups
TA: Workshop
TI: Industrial workshop
GCA: Applied fieldwork groups

Evaluation methods

- Continuous evaluation
- End-of-course evaluation

Evaluation tools and percentages of final mark

- Written test, open questions 70%
- Exercises, cases or problem sets 18%
- Oral presentation of assigned tasks, Reading¿ 12%

ORDINARY EXAMINATION PERIOD: GUIDELINES AND OPTING OUT

Continuous Assessment System: The student's final grade will be the result of the weighted evaluation of the following tests and activities:
• Final written exam (individual): 70%. This is a test on the theoretical (and practical) contents of the programme. It must be passed with a minimum score of 5 points out of 10.
• Laboratory practice report, together with the work carried out in the laboratory and active participation in the seminar (by groups): 18%. It must be passed with a minimum score of 5 out of 10 points. If it is not passed, the student will have to do a written practical exam, where the competences and/or learning results of the laboratory practical classes will be evaluated.
• Oral presentation on food additives and active participation of students (in groups): 12%.
If the student does not pass the subject as a whole, the grade for the practical activities of the subject passed will only be kept for the following academic year, provided that the grade for these activities is at least 7 points out of 10. However, if the student takes these practical activities again, he/she will be eligible for a new grade.
Waiver of the Continuous Assessment System (Student assessment regulations BOPV 13.03.2017, Art. 8.3): Students must submit in writing to the lecturer responsible for the subject the waiver of the Continuous Assessment System, for which they will have a period of 9 weeks, starting from the beginning of the term, in accordance with the academic calendar of the centre. Students who waive the Continuous Assessment System will have the right to be assessed through the Final Assessment System, which will consist of a test consisting of one or more exams and global assessment activities of the subject, which will take place during the official exam period, and will comprise 100% of the mark for the subject. This test will cover all the theoretical and practical content worked on in the subject.
The waiver of the Exam will be in accordance with the student assessment regulations (BOPV 13.03.2017 and 28.06.2019, Art. 12.). In the case of Continuous Assessment, failure to take the final exam will result in the waiver of the exam. In the case of Final Assessment, failure to sit the final exam set on the official exam date will result in the automatic waiver of the exam. Failure to sit the final exam will result in a grade of "not presented".
Note: The "Protocol on academic ethics and prevention of dishonest or fraudulent practices in assessment tests and academic work of the UPV/EHU" will be applicable. The detection of fraud, copying or plagiarism during an assessment test will result in a failing grade and a numerical grade of "0.0"; and likewise if during the correction of a test or academic work the commission of a fraudulent practice relevant to its result becomes evident.

EXTRAORDINARY EXAMINATION PERIOD: GUIDELINES AND OPTING OUT

The same assessment criteria will be followed as in the Ordinary Call.
If students have taken the Continuous Assessment and obtained positive results, these grades may be maintained for the extraordinary exam of the same academic year.
Students have the right to take the exams and assessment activities that make up the final assessment test of the extraordinary call, which will consist of as many exams and assessment activities as necessary to evaluate and measure the defined learning outcomes, in a similar way to how they were assessed in the ordinary call. In this extraordinary call, students will be able to obtain 100% of the grade. The aforementioned protocol will apply.
Failure to take the final exam will mean that the student will be graded as a "not presented".

MANDATORY MATERIALS

El profesor pone a disposición del alumno/a el material escrito que considere oportuno para su utilización en las clases magistrales y ejercicios de aula, pautas de elaboración de la presentación, guiones de prácticas de laboratorio y cuestiones derivadas, entre otros. Como apoyo a las actividades presenciales en la plataforma eGela se pone a disposición del alumnado documentación complementaria de la guía de la asignatura, material para el seguimiento de la asignatura (listado de actividades, grupos y calendario, recursos bibliográficos, entre otros) y otros documentos de interés relacionados con la materia que se está impartiendo.

Para la realización de las prácticas de laboratorio es obligatorio el uso de bata y gafas de seguridad de laboratorio, cuaderno de laboratorio y calculadora.

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WONG, D.W.S. Food Enzymes. Structure and Mechanism (2nd ed.). Springer. Berlin (Germany), 2013.

Journals

Food Chemistry
Journal of Agricultural and Food Chemistry

Web sites of interest

Food and Agriculture Organization of the United Nations (FAO): www.fao.org
Codex Alimentarius: www.codexalimentarius.net/web/index_es.jsp
The European Federation of Food Science and Technology (EFFoST): www.effost.org
Integrating Safety and Environmental Knowledge Into Food Studies: www.esb.ucp.pt/iseki/

OBSERVATIONS

COURSE GUIDE 2023/24

Faculty 125 - Faculty of Pharmacy **Cycle** .

Degree GFARMA10 - Bachelor`s Degree in Pharmacy **Year** First year

COURSE

25194 - Biochemistry **Credits, ECTS:** 6

COURSE DESCRIPTION

Biochemistry is one of the basic subjects of the first year of three Degrees: (i) Degree in Pharmacy, (ii) Degree in Human Nutrition and Dietetics, and (iii) Double Degree in Pharmacy and Human Nutrition and Dietetics. Studying biochemistry, students acquire a basic knowledge of the structure and functions of the molecules that form living organisms. At the same time, students develop a general and integrated vision of cellular metabolism from the point of view of bioenergetics. To this end, the main metabolic pathways, both degradative and biosynthetic, are described. The course also includes an experimental section, which will contribute to the familiarization of the students with the different basic techniques in biochemistry.
It is, therefore, a subject that lays the foundations of biochemistry on which many of the subsequent subjects of the degree will be based and deepen, such as Molecular Biology, Clinical Biochemistry or Pharmacology, in the Degree in Pharmacy and in the Double Degree, and Gene Expression and Metabolic Control and Human Nutrition, for example, in the Degree in Human Nutrition and Dietetics.
On the other hand, in order to make good progress in this subject, it is required a basic knowledge of concepts of Cell and Tissue Biology, General and Inorganic Chemistry/General Chemistry and Physicochemistry/Physics, and Mathematics and Statistics, subjects that are taught in the first quarter of the first year and that help a better understanding of Biochemistry.

COMPETENCIES/LEARNING RESULTS FOR THE SUBJECT

Competencies:
- To identify the structure, know the properties and biochemical function of biomolecules.
- To understand the chemical processes by which the organism obtains metabolic energy from nutrients, as well as those that consume that energy in the synthesis of essential components.
- To understand the basic principles of enzymology, distinguishing the effects of the different types of factors that modulate enzymatic activity (inhibitors, allosterism) and their application in health sciences.
- To know and interpret the metabolic changes that occur under different nutritional and physical conditions of a healthy organism.
- To be able to understand and evaluate the impact of biochemical problems, and to know how to predict the effect of a metabolic change (defect) on human health.
- To perform biochemical analyses and interpret the results; in order to establish the basis for understanding clinical analyses.

Learning outcomes:
- Differentiates proteinogenic amino acids from other amino acids.
- Knows the properties of the peptide bond.
- Differentiates distinct structural levels of a protein.
- Differentiates enzymes from other catalysts.
- Understands Michaelis-Menten kinetics.
- Calculates the activity of Michaelis enzymes.
- Knows the different metabolic pathways and their interconnections.
- Is able to understand the general mechanisms of regulation of metabolic pathways.

CONTENIDOS TEÓRICO-PRÁCTICOS

TOPIC 1.- Biomolecules: Introduction to biological molecules.
TOPIC 2.- Amino acids, peptides and proteins.
2.1. Amino acids: General chemical-biological characteristics. Types.
2.2. Peptides: The peptide bond. Characteristics of the peptide chain. Protein conformation.
2.3. Primary structure of proteins.
TOPIC 3.- Three-dimensional structure of proteins.
3.1. Secondary structure. Alpha helix, beta-sheet, beta-turn. Fibrous and globular proteins.
3.2. Tertiary structure. Stabilizing forces. Denaturation.
3.3. Quaternary structure.
TOPIC 4.- Enzymes
4.1. Enzymes as biological catalysts: Activation energy. Models of enzymatic catalysis. Active center: substrate and reaction specificity.
4.2. Nomenclature and classification of enzymes. Coenzymes and prosthetic groups.

TOPIC 5.- Enzyme kinetics.
5.1. General concepts: Speed of enzymatic reactions. Factors that modify the enzymatic activity: pH, temperature and inhibitors.
5.2. Michaelian kinetics: Michaelis-Menten equation. Meaning of the kinetic constants. Graphical representations. Determination of Vmax and Km. Lineweaver-Burk transformation. Effect of inhibitors.
5.3. Regulatory enzymes: Generalities. Allosteric enzymes: concept and characteristics. Regulation by covalent modification.
TOPIC 6.- Bioenergetics and metabolism.
6.1. Introduction to intermediary metabolism: Concept of metabolic pathway. Anabolism and catabolism. Regulation of metabolism.
6.2. Energetics of metabolism: Bioenergetics. Coupled reactions. Energy-rich compounds. Irreversible reactions. ATP and phosphoryl group transfer.
6.3. Biological oxidation-reduction reactions: Redox reactions in metabolism. Coenzymes of redox reactions.
TOPIC 7.- Carbohydrates: Description, classification, carbohydrates of metabolic interest.
TOPIC 8.- Carbohydrate catabolism.
8.1 Glycolysis: General concepts of carbohydrate metabolism. Glycolysis: Sequence of reactions and balance.
8.2. Fates of pyruvate under anaerobic and aerobic conditions. Regulation.
8.3. Glycogenolysis.
TOPIC 9.- Krebs cycle and oxidative phosphorylation.
9.1. Krebs cycle: Sequence of reactions, energy balance and functions.
9.2. Respiratory chain: Location, components, reactions and control. Variation of free energy in the respiratory chain.
9.3. ATP synthesis: Mitchell's chemiosmotic theory. ATP synthase. Mechanism. Respiratory control.
9.4. Energy balance of total glucose oxidation.

TOPIC 10.- Carbohydrate Anabolism
10.1. Gluconeogenesis: Stages and balance from pyruvate. Other substrates of the pathway. Cori's cycle. Coordinated regulation of glycolysis and gluconeogenesis.
10.2. Glycogenogenesis. Allosteric and hormonal regulation of glycogen metabolism.
TOPIC 11.- Lipids: Concept of lipids, classification and biological interest.
TOPIC 12.- Lipid catabolism.
12.1. Mobilization of triglycerides from adipose tissue. Activation and transport of fatty acids from the cytoplasm to the mitochondrial matrix.
12.2. Beta-oxidation of saturated fatty acids. Energy balance. Oxidation of fatty acids of odd number of carbon atoms and unsaturated fatty acids.
12.3. Ketone bodies: Biosynthesis and utilization of ketone bodies. Function of ketone bodies. Ketosis.
TOPIC 13.- Lipid anabolism
13.1. De novo synthesis of fatty acids: Formation of malonyl-CoA. Fatty acid synthase complex. Reactions and balance of palmitic acid synthesis. Elongation and unsaturation of fatty acids.
13.2. Cholesterol biosynthesis.

TEACHING METHODS

LECTURES: 45 hours
Theoretical concepts and practical exercises (problems, questions, tests, etc.) will be worked on.

BIOCHEMISTRY LABORATORY: 3 sessions of 4 hours
1.- Preparation of an extract and determination of an enzyme activity.
2.- Determination of the Vmax and Km of the extracted enzyme.
3.- Chromatographic separation of lipids.

COMPUTER PRACTICES: 1 session of 3 hours
1.- Calculation of the kinetic parameters of an enzyme by iterative fitting using specific software. The data obtained in the laboratory will be fitted to curves and straight lines whose constants coincide with these parameters. Exercises and proposed problems will be carried out.

NON-PERSONAL ACTIVITY: 90 hours
- Consultation of texts, elaboration of diagrams and study.
- Solving problems and exercises in class.
- Use of the e-learning platform (eGela) to obtain the information provided by the teaching staff (scripts and groups of practices, videos/ showings, etc.) and to answer the tests and questions posed through this platform.
- Use of information and communication technologies (ICT) to view animations and additional didactic material.
NOTE: If face-to-face teaching is suspended, the teaching methodology of the different modalities will be carried out on-line, using the resources and digital platforms provided by the UPV/EHU.

TYPES OF TEACHING

Types of teaching	M	S	GA	GL	GO	GCL	TA	TI	GCA
Hours of face-to-face teaching	45			12	3				
Horas de Actividad No Presencial del Alumno/a	67,5			18	4,5				

Legend: M: Lecture-based | S: Seminar | GA: Applied classroom-based groups | GL: Applied laboratory-based groups | GO: Applied computer-based groups | GCL: Applied clinical-based groups | TA: Workshop | TI: Industrial workshop | GCA: Applied fieldwork groups

Evaluation methods

- Continuous evaluation
- End-of-course evaluation

Evaluation tools and percentages of final mark

- Multiple choice test 60%
- Exercises, cases or problem sets 20%
- Individual assignments 10%
- Teamwork assignments (problem solving, Project design) 10%

ORDINARY EXAMINATION PERIOD: GUIDELINES AND OPTING OUT

The final exam consists of a theoretical and a practical part. The theoretical part will account for 60% of the final grade of the course. The practical part will account for 20% of the final grade. To pass the course it is necessary to pass both parts separately. The remaining 20% of the grade is obtained through continuous assessment, through questions and exercises that the teacher will pose in class or on the eGela platform during the course. The realization of laboratory practices is mandatory. During the development of the practices, the attitude and skills in the laboratory work will be graded, as well as the students' capacity of expression and teamwork.

In any case, students will have the right to be evaluated through the final evaluation system, regardless of whether or not they have participated in the continuous evaluation system. To do so, students must submit in writing to the teacher responsible for the subject the waiver of continuous assessment, for which they will have a period of 9 weeks from the beginning of the course.
Both in the case of continuous assessment and in the case of final assessment, failure to attend the test set on the official exam date will mean the automatic waiver of the call, and will result in the qualification of not presented.

NOTE: In the event that the evaluation cannot be carried out in person, the tests will be taken on-line using the digital tools and platforms offered by the UPV/EHU.

EXTRAORDINARY EXAMINATION PERIOD: GUIDELINES AND OPTING OUT

Students who pass any of the parts in the ordinary exam will not have to repeat it in the extraordinary exam, i.e., they will only have to take the exam of the failed part.

MANDATORY MATERIALS

- Computer connected to the Internet (available in the computer rooms)
- Textbooks (available in the library)
- Lab coat
- Practice scripts and graph paper (or computer)

BIBLIOGRAFÍA

Basic bibliography

1.-"Lehninger. Principles of biochemistry", D.L. Nelson and M.M. Cox, 8th edition. 2021.
2.-"Biochemistry. Essential Concepts.", E. Feduchi et al. 2nd edition, 2014.
3.-"Biochemistry. Basic course.", J.L.Tymoczco , L. Stryer, J.M. Berg and, 2nd edition, 2014.
4.-"Fundamentals of Biochemistry: Life at the Molecular Level", D. Voet, J.G. Voet and C.W. Pratt, 4th edition, 2016.

Detailed bibliography

1.-"Metabolic Regulation: A human prespective" K. N. Frayn, 3rd edition, 2019

Journals

http://www.nature.com/nature/index.htlm
http://www.science.com/science/index.htlm
http://www.ehu.eus/ojs/index.php/ekaia

Web sites of interest

http://highered.mheducation.com/sites/0072507470/student_view0/index.html
https://www.sebbm.es/web/en/
https://www.sciencedaily.com/news/matter_energy/biochemistry/
https://www.rcsb.org/

http://www.ehu.es/biomoleculas
http://www.biorom.uma.es/

OBSERVATIONS

COURSE GUIDE 2023/24

Faculty 125 - Faculty of Pharmacy **Cycle** .

Degree GNUTRI10 - Bachelor's Degree in Human Nutrition & Dietetics **Year** Second year

COURSE

25203 - Gene Expression & Metabolic Control **Credits, ECTS:** 6

COURSE DESCRIPTION

Human organism needs energy to carry out vital processes, to play sports, or simply to sleep ... And food is the only source of energy for the human organism.
In this course,students will learn the metabolic processes that occur with nutrients after eating them until the body uses them to get energy. In addition,students will learn that all these processes are regulated, so they occur at the time and extent and in the place when and where they are required.
To understand metabolic regulation, it is necessary to know how enzymes (proteins) are synthesized, how their synthesis is regulated, how their activity is adjusted to the needs of each organ and tissue, and how all this is coordinated in order to satisfy the needs of the organism, as a whole, at any time of the day. That is, you will understand how the metabolism adapts throughout the day, in the cycles of feeding and fasting; and, in the longer term, how metabolism adapts to different physiological and pathophysiological situations (eg, diets to lose weight or prolonged fasting).

COMPETENCIES/LEARNING RESULTS FOR THE SUBJECT

-Know different mechamism for metabolic regulation.
-Understand the structure and metabolism of macromolecules that are the basis of genetic information.
-Understand the relationship between gene expression and the metabolic condition of the cell, and, by the way, understand how this expression affects the state of the organism and its nutritional needs.
-Know the metabolic function of each human organ and tissue.
-Predict metabolic changes and adaptations of the organism to different nutritional state.
-To be able to analyze the genetic material and the results of its expression and to interpret the results obtained in the analyses.
-Have the ability to search, critique and explain information on any subject related to the regulation, control and integration of metabolism.
-Understand how food components, through changes in gene expression, can control metabolism.
-Know the mechanims by which food controls the metabolic processes by changes in gene expression.

CONTENIDOS TEÓRICO-PRÁCTICOS

1.Introduction to the course:Planning. Programme. Evaluation system. Tasks. Bibliography.

PART 1. METABOLISM OF NUCLEIC ACIDS AND PROTEINS
2. STRUCTURE OF NUCLEIC ACIDS. Primary structure. DNA secondary structure.
DNA supercoiling. Nucleosomes. Chromatin. Human Genome organization.
3. METABOLISM OF AMINOACIDS AND NUCLEOTIDES. Routes of synthesis and degradation.
4. DNA REPLICATION. General characteristics. Enzymes and phases. Replication in eukaryotic cells.
5. ESTRUCTURE OF RNA. RNA types and functions.
6. TRANSCRIPTION. General characteristics. Structure of genes. Transcription enzymes and phases.
7. MATURATION OF THE RNA. Primary transcripts. Maturation of mRNA precursors in eukaryotic cells. tRNA and rRNA processing.
8. TRANSLATION. Genetic code. General characteristics. Amino acids activation.
9. SYNTHESIS OF PROTEINS II. Initiation, elongation and termination.
10. MATURATION, FATE AND DEGRADATION OF PROTEINS. Protein processing. Polypeptide chain folding. Protein destination. Degradation.
11. MUTATION AND DNA REPAIR MECHANISMS. DNA molecules modifications: types causes and consequences. Methods to repair the DNA. Physiologic polymorphisms. Mutations and pathologic polymorphisms.

PART 2. REGULATION OF GENE EXPRESSION
12. REGULATION OF GENE EXPRESSION I. General concepts. Transcription factors. Negative and positive models for gene regulation. Regulation in prokaryotes. Operon model.
13. REGULATION OF GENE EXPRESSION IN EUKARYOTES. Eukaryotic promotors and enhancers. Epigenetic regulation, chromatin restructuration and gene silencing. Regulators RNA.

PART 3. METABOLIC CONTROL
14. METABOLIC REGULATION. AN OVERVIEW. Systems and levels for metabolic regulation.
15. METABOLIC SPECIALIZATION OF HUMAN ORGAN AND TISSUES. Circulatory system. Liver. Brain. Adipose tissue. Muscle.

16. HORMONAL METABOLIC REGULATION. Hormones that control the metabolism. Types. Hormonal receptors. Secondary messengers. Short term and long term regulation mechanisms.
17. ADAPTATIONS OF THE ENERGETIC METABOLISM. Feeding-fasting cycles. Stress conditions. Diets.

PART 4. NUTRIGENOMIC
18. NUTRIGENOMIC AND NUTRIGENETIC. Definitions and objectives.
19. Nutritional factors and gene expression regulation. Gene-nutrient interactions.
20. Applications of nutrigenomic. Advances. Public Health. Applications in medicine. Applications in food industry. Legal aspects.

PRACTICAL PROGRAMME
LABORATORY PRACTICES
1. DNA extraction, characterization and quantification.
2. STR polymorphism analysis by PCR.
3. Analysis of lactate dehydrogenase (LDH) isozymes.

COMPUTER PRACTICES
Nutrigenomic applications.

TEACHING METHODS

The theoretical contents of the course will be developed in master classes. During these classes, lecturers or professors will raise questions or exercises that the students will have to solve within the period established by teachers.
The laboratory practices will consist of three practical sessions of four hours each.
Previously, the student must read the laboratory protocols and answer a questionnaire.At the end of the laboratory practice period, the student will have to submit a practice report and take an exam.
The computer practices will be carried out in 1 session od three hours. At the end, the students must submit a report on the work done.

TYPES OF TEACHING

Types of teaching	M	S	GA	GL	GO	GCL	TA	TI	GCA
Hours of face-to-face teaching	45			12	3				
Horas de Actividad No Presencial del Alumno/a	67,5			18	4,5				

Legend:
M: Lecture-based
S: Seminar
GA: Applied classroom-based groups
GL: Applied laboratory-based groups
GO: Applied computer-based groups
GCL: Applied clinical-based groups
TA: Workshop
TI: Industrial workshop
GCA: Applied fieldwork groups

Evaluation methods

- Continuous evaluation
- End-of-course evaluation

Evaluation tools and percentages of final mark

- Written test, open questions 10%
- Multiple choice test 50%
- Exercises, cases or problem sets 20%
- Individual assignments 10%
- Teamwork assignments (problem solving, Project design) 10%

ORDINARY EXAMINATION PERIOD: GUIDELINES AND OPTING OUT

FINAL THEORY EXAM
It will be about the topics covered in the theoretical classes and will consist in two parts. One part will consist in a multiple choice questions exam. This exam will account for 50% of the final score.
Another part will consist of questions to be short-answered. This will account for 10% of the final score.
To pass the theory exam, it will be necessary to pass both parts. To do this, 60% of the multiple choice questions exam and half of the short-answer questions must be answered correctly.
It will account for 60% of the final grade for the course.
In the case the exam could not be make on-site, it will be done online, using the digital tools and platforms available in UPV/EHU.

EVALUATION OF PRACTICES
The completion of the laboratory practices will be compulsory.
Previous questionnaire: 5% of the final grade; Report: 5% of final grade

Students who do not carry out the laboratory practices must take a laboratory examination.
Practice exam: 10% of the final grade.
Computer practice report: 10% of the final grade.

QUESTIONS AND ACTIVITIES IN THE CLASSROOM AND OUT THE CLASSROOM
The lecturer/professor will periodically raise questions and propose activities to be performed in class or at home. Some of them should be done individually and others in groups.
All these activities will be designed to facilitate understanding and learning of the course topics.
Participating in these activities will account for 15% of the final grade.

All students have the right to obtain 100% of the grade through a single final exam. For that, student have to request it before the 9th week of the semester.
This exam will include theoretical and practical content and will be longer and more complete than the normal exam. In any case, laboratory practices will be mandatory. If they are not done, the final exam will include a laboratory exam.

In any case, not taking the exam on the official date of the call will automatically mean the resignation of the corresponding call and will be classified as "not presented".

EXTRAORDINARY EXAMINATION PERIOD: GUIDELINES AND OPTING OUT

In the extraordinary call, the exam and criteria for passing it will be the same as those described for the ordinary call. If in the ordinary call the theoretical or practical part of the exam is passed, in the extraordinary call only the exam corresponding to the suspended part will be carried out

MANDATORY MATERIALS

Usual safety equipment for laboratory practices (gown, glasses).

BIBLIOGRAFÍA

Basic bibliography

-Frayn KN, Frayn KN. Metabolic Regulation : A Human Perspective. 3rd ed. Chichester: Wiley-Blackwell; 2010.
-Nelson DL, Cox MM, Hoskins AA. Lehninger Principles of Biochemistry. 8th ed. New York: Macmillan Learning; 2021.
-Devlin TM, Devlin TM. Textbook of Biochemistry : With Clinical Correlations. 7th ed. Hoboken: John Wiley & Sons; 2011.
-Herraez, A. "Biología Molecular e Ingeniería Genétia. Conceptos, Técnicas y Aplicaciones en Ciencias de la Salud" Elsevier Ed. Barcelona, 2012
- Gil Hernandez, A. "Tratado de Nutrición. Tomo I: Bases fisiológicas y bioquímicas de la Nutrición" (2.edición) 2010 Editorial Médica Panamericana.

Detailed bibliography

-Berg JM, Gatto GJ, Stryer L, Tymoczko JL. Biochemistry. 9th ed. New York: McMillan International; 2019.
-Voet D, Voet JG, Voet JG, Pratt CW, Pratt CW, Voet D. Fundamentals of Biochemistry : Life at the Molecular Level. 5th ed. New York: Wiley; 2016.
-Lodish H, Lodish H. Molecular Cell Biology. 8th ed. New York: W. H. Freeman; 2016.
- Lozano, J.A.; Galindo, J.D.; Garcia-Borrón, J.C.; Martínez-Liarte, J.H.; Peñafiel, R. y Solano, F. Bioquímica y Biología Molecular para las ciencias de la salud. 3ª edición. Editorial MacGraw-Hill Interamericana. Madrid, 2005. http://www.mcgraw-hill.es
- Mataix J. (2009) Nutrición y Alimentación Humana. 2ª Ed. Ergon, Madrid.
- Ordovas JM, Carmena R. Nutrigenética y nutrigenómica. En: Revista Humanitas. Humanidades médicas, monografía nº 9, 2004. ISSN 1696-0327.

Journals

Web sites of interest

http://w3.cnice.mec.es/proyectos/genetica/precarga.swf
http://www.ehu.es/biomoleculas/an/tema12.htm
http://www.edumedia-sciences.com/m218_l2-molecular-biology.html
http://www.biorom.uma.es/contenido/av_bma/apuntes/T15/transpo.htm

http://sebbm.bq.ub.es/privt/ens/apuntes/umhregmetabol.pdf

OBSERVATIONS

COURSE GUIDE 2023/24

Faculty 125 - Faculty of Pharmacy **Cycle** .

Degree GCAMBI11 - Bachelor's Degree in Environmental Science **Year** First year

COURSE

25227 - Geology **Credits, ECTS:** 6

COURSE DESCRIPTION

This course is intended to provide a solid basis for the understanding of the origin of rocks, the geodynamic context where they are formed and a first approach to their description and classification. In parallel, the course is designed to make the students of this subject understand the geological processes involved in the formation and evolution of the Earth as well as their relationship with humanity and natural environment.

This course is included within the "Module 01: General scientific basis" and it is considered as a fundamental subject for the Degree in Environmental Science.

COMPETENCIES/LEARNING RESULTS FOR THE SUBJECT

BASIC COMPETENCES

G001. Ability to acquire and integrate basic scientific knowledge into social, economic, legal and ethics spheres leading to the identification of possible environmental issues.

G003. Integration into professional working groups focused on professional tasks, including those related to teaching and environmental research.

CB1: Ability to learn and understand the basic principles of certain research fields.

CB2: Ability to apply the acquired knowledge in a professional mannerhab to working practices and vocation

CB3: Ability to collect and interpret significant data in order to address ideas and opinions calling for a profound reflection on important topics related to society, science or ethics.

CB4: Ability to transmit information, ideas, issues and solutions to specialist and non-specialist audience.

CB5: Development of learning abilities to be used with a high grade of autonomy in posterior studies.

CROSS-DISCIPLINARY COMPETENCES

G009: Ability to use, interpret and give information extracted from different sources.

G010: Team-working ability: interchange of information, ideas and suggestions in order to achieve scientific and professional goals.

SPECIFIC COMPETENCES

M01CM03: Ability to use different units, dimensions, scales and tools of all the basic disciplines.

M01CM07: Interpretation of basic geological information obtained from field work and/or geological maps.

Theoretical and Practical Contents

THEORETICAL CONTENTS

1.Introduction to Geology: Concept and methods in Geology. Geological disciplines and relationship with other sciences. Fundamental principles. The geological timescale.

2.Internal structure of the Earth: Introduction. Direct and indirect study methods. Structure and composition of the Earth: crust, mantle and core. Heat flow in the Earth.

3.Organization of the Earth’s surface. Introduction. Plate tectonics. Continental domains. Oceanic domains. Continental margins.

4. Geological structures and deformation: Introduction. Stress and strain. Deformation components. Fracture and brittle deformation. Folds and folding.

5. Mineralogy. Introduction. Minerals and classifications. Macroscopic properties of minerals.

6. Igneous rocks: Introduction. Igneous processes. Magma, melting and changes in the magma composition. Plutonic, volcanic and subvolcanic rocks. Classification of igneous rocks.

7. Metamorphic rocks: Introduction. Metamorphic processes. Factors governing metamorphic processes. Types of metamorphism. Classification of metamorphic rocks. Deformational structures.

8. Sedimentary rocks: Introduction. Sedimentary processes. Components of sedimentary rocks. Clastic rocks. Carbonate rocks. Other non-clastic rocks.

9. Hydrogeology: Introduction. The water cycle. Surface water and groundwater. Groundwater table. Principal parameters controlling groundwater storage and flow. Aquifers and types. Springs and wells. Groundwater pollution.

PRACTICAL CONTENTS

Laboratory sessions

1. Topographic maps: information sources, description, topographic symbols and interpretation
2. Geological maps: information sources, cartographic symbols, representation of geological structures and interpretation of geological maps
3. Geological cross-sections, interpretation and reconstruction of the recorded geological history
4. Measurement of geological structures: planes and lines
5. Representation of orientation measures: orthogonal projection
6. Identification of igneous rocks
7. Identifications of metamorphic rocks
8. Identification of sedimentary rocks

Field trips

1. Half day trip in order to provide valuable experience of geological principles and practice

TEACHING METHODS

TEACHING METHODS

1. Theory classes: they take place in a classroom and are intended to give an overview of the course, introduce the theoretical content of the subject in an organized manner and provide practical information and dates (due dates for assignments, exams...)

2. Laboratory classes: group work sessions. They are supervised by a professor and are focused on the identification and recognition of rocks, measurement and representation of geological structures, and interpretation of topographic, geological maps and cross-sections.

3. Fieldwork in order to consolidate and put into practice the theoretical and practical content worked upon during the course.

TYPES OF TEACHING

Types of teaching	M	S	GA	GL	GO	GCL	TA	TI	GCA
Hours of face-to-face teaching	39			15					6
Horas de Actividad No Presencial del Alumno/a	60			25					5

Legend:
M: Lecture-based
S: Seminar
GA: Applied classroom-based groups
GL: Applied laboratory-based groups
GO: Applied computer-based groups
GCL: Applied clinical-based groups
TA: Workshop
TI: Industrial workshop
GCA: Applied fieldwork groups

Evaluation methods

- End-of-course evaluation

Evaluation tools and percentages of final mark

- Written test, open questions 70%
- Exercises, cases or problem sets 20%
- Individual assignments 10%

ORDINARY EXAMINATION PERIOD: GUIDELINES AND OPTING OUT

The evaluation methods are those stipulated in the BOPV of March 13, 2017 "Acuerdo de 15 de diciembre de 2016, Consejo de Gobierno de la Universidad del País Vasco/Euskal Herriko Unibertsitatea, por el que se aprueba la Normativa Reguladora de la Evaluación del Alumnado en las titulaciones oficiales de Grado". and posterior modifications.

As such, this is an end-of-course evaluation (Chapter II, Article 8, Paragraph 2b) including individual assignments that permit to achieve and evaluate the specific and cross-disciplinary competences and skills contemplated in this course.

The final grade is the weighted sum of the individual scores attained in each evaluated part. A score of more than 4 is required in each of the parts in order to pass the subject.

During the examination the protocol on academic ethics and prevention of dishonest or fraudulent practices in assessment tests and in academic work at the UPV/EHU will be applied.

EXTRAORDINARY EXAMINATION PERIOD: GUIDELINES AND OPTING OUT

The evaluation methods are those stipulated in the BOPV of March 13, 2017 "Acuerdo de 15 de diciembre de 2016, Consejo de Gobierno de la Universidad del País Vasco/Euskal Herriko Unibertsitatea, por el que se aprueba la Normativa Reguladora de la Evaluación del Alumnado en las titulaciones oficiales de Grado". and posterior modifications.

As such, this is an end-of-course evaluation (Chapter II, Article 8, Paragraph 2b) including individual assignments that permit to achieve and evaluate the specific and cross-disciplinary competences and skills contemplated in this course.

The final grade is the weighted sum of the individual scores attained in each evaluated part. A score of more than 4 is required in each of the parts in order to pass the subject.

During the examination the protocol on academic ethics and prevention of dishonest or fraudulent practices in assessment tests and in academic work at the UPV/EHU will be applied.

MANDATORY MATERIALS

BIBLIOGRAPHY

Basic bibliography

1. TARBUCK, E.J., LUTGENS, F. K. (2013). Ciencias de la Tierra. Una introducción a la Geología Física. Pearson, 10 Ed., Madrid, 616 p.

2. POZO RODRiGUEZ, M., GONZALEZ YELAMOS, J., GINER ROBLES, J. (2008). Geología Práctica. lntroducción al reconocimiento de materiales y análisis de mapas, Prentice Hall, Madrid, 744 p.

3. MONROE, J.S., WICANDER, R., POZO, M. (2008). Geología. Dinámica y evolución de la Tierra. Cengage Learning Paraninfo, Madrid.

4. GROTZINGER, J.P., JORDAN, T.H. (2014). Understanding Earth. W.H.Freeman and Company, 7 Ed., New York, 672 p.

5. MURPHY, B., NANCE, D. (1998). Earth Science Today. Brooks/Cole Wadsworth. Pacific Grove, 684 p.

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7. BASTIDA, F. (2005). Geología. Ed. Trea, Barcelona, 1031 p.

Detailed bibliography

Journals

Web sites of interest

1) www.scotese.com

2) www.igme.com

3) www.agportal.eve.eus

4) www.geo.euskadi.eus

5) www.sociedadgeologica.org

OBSERVATIONS

COURSE GUIDE 2023/24

Faculty 125 - Faculty of Pharmacy **Cycle** .

Degree GCAMBI10 - Bachelor`s Degree in Environmental Sciences **Year** Third year

COURSE

25238 - Meteorology and Oceanography **Credits, ECTS:** 6

COURSE DESCRIPTION

Meteorology and Oceanography is the last course from the module Scientific Bases of Natural Environment. This module involves those sciences most specifically related to the knowledge, interpretation and description of natural environment, in order to correctly interpret the multiple relations between this and human activities: their repercussion, protection or conservation actions, etc.

This course particularly analyzes meteorological phenomena and their origin, as well as basic climate processes and their relation with oceans. An special importance is given to the gathering and analysis of meteorological data.

It is encouraged to previously study first year's Physics and Mathematics in order to realize this course.

COMPETENCIES/LEARNING RESULTS FOR THE SUBJECT

Apart from the basic competences, which are common to every degree, the following general competences will be practiced:

G001: To acquire basic scientific knowledge and use it in the social, economic,legal and ethical spheres, in order to identify environmental problems.

G003: To be part of professional teams (including teaching or research work) from the environmental field.

And the transversal competence (G009): To be able to use the information obtained from different sources about an applied topic. To interpret it correctly, to extract significant conclusions and to present them publicly.

Regarding the specific module competences, the following will be practiced:

M02CM05: To learn the basic principles of structural-, dynamical- and climatic-geomorphology.

M02CM06: To use the basic techniques for the obtainment, analysis and cartographic representation of the environmental information.

M02CM08: To analyze and interpret meteorological and oceanographic processes, and use them for the planning and development of environmental projects, territorial planning and the methodology of environmental impact evaluation.

The learning results of the student will be the following:

a)The student is able to describe the basic caracteristics and causes of the following meteorological and oceanographic phenomena:
- Greenhouse effect
- General atmospheric and oceanic circulation
- Wind
- Sea/land breezes and foehn effect
- Turbulence
- Tides
- Waves
- Oceanic upwellings

b) The student is able to apply the following equations in order to describe atmospheric/oceanic behavior:
- Hydrostatic equation
- Geostrophic equation
- Technical formula for the obtainment of altitude wind's value inside the Atmospheric Boundary Layer
- Weibull's statistical distribution for the wind
- Electrical power generated by an aerogenerator
- Tide's height sinusoidal interpolation

c) The student is able to use correctly the technical vocabulary employed in meteorology and Oceanography.

d) The student is able to obtain and use meteorological/oceanographic information through internet.

Theoretical and Practical Contents

1. Composition and structure of Earth's atmosphere:
- Atmospheric layers
- Principal atmospheric meteors
- Hydrostatic equation
- Vertical atmospherical sounding
- Types of clouds in the troposphere

2. Atmospheric general circulation
- Wind's geostrophic equation
- Atmospheric Boundary Layer (ABL)
- Electrical power of an aerogenerator
- Mesometeorological phenomena
- Dispersion of pollutants
- General circulation cells and world wind systems
- Influence of general circulation in Earth's climate
- Air masses affecting Iberic Peninsula

3. Earth atmosphere's heat budget
- Insolation
- Geophysical limit for energy sustainability
- Sun-Earth irradiation flux
- Greenhouse effect
- 1D simple model for climate change

4. Composition and structure of ocean
- Oceanic layers
- Oceanic temperature, salinity and density profiles
- Ocean bottom

5. Oceanic currents and tides
- General oceanic circulation
- Thermohaline circulation
- Forces generating tides
- Types of tides
- Tide height estimation
- Eckman's spiral
- Descent and subsidence phenomenon due to Eckman's pumping
- Oceanic upwelling

6. Waves and their energy
- Wave amplitude, valley, length, period and velocity
- Beaufort's scale
- Estimation of wave's height (fetch)
- Energy of waves

TEACHING METHODS

During this course we do not completely differentiate between the so called master classes and practical lessons (being these last ones compulsory). Instead, master classes are complemented with the resolution of practical activities. With that purpose, lessons in the regular classroom and lessons in the computer room are equally combined.

Both in the classroom and the computer room an active participatory methodology is followed, where the student is the protagonist of her/his own learning process. In the classroom, usually theoretical contents are presented through bibliographical research, presentations or problem resolution, whereas in the computer room meteorological/oceanographic information is collected for its posterior treatment and analysis.

TYPES OF TEACHING

Types of teaching	M	S	GA	GL	GO	GCL	TA	TI	GCA
Hours of face-to-face teaching	30				27				3
Horas de Actividad No Presencial del Alumno/a	45				40,5				4,5

Legend: M: Lecture-based | S: Seminar | GA: Applied classroom-based groups | GL: Applied laboratory-based groups | GO: Applied computer-based groups | GCL: Applied clinical-based groups | TA: Workshop | TI: Industrial workshop | GCA: Applied fieldwork groups

Evaluation methods

- Continuous evaluation
- End-of-course evaluation

Evaluation tools and percentages of final mark

- Written test, open questions 40%
- Exercises, cases or problem sets 30%
- Teamwork assignments (problem solving, Project design) 15%
- Oral presentation of assigned tasks, Reading¿ 15%

ORDINARY EXAMINATION PERIOD: GUIDELINES AND OPTING OUT

There are two types of evaluation: the continuous and the final one.

Those who choose final evaluation, should officially notify it to the professor during the first 9 weeks of the course. In this case, if the student does not show up to the final exam, that will be enough to renounce to the evaluation.

Those who choose continuous evaluation do not have to do a final exam. Apart from group problems, projects, presentations, etc. students should realize a practical exam and two theoretical exams. In order to pass the course it will be compulsory to pass those practical and theoretical exams. In order to renounce to the evaluation, students should officially notify it to the professor at least a month before the semester ends.

In case sanitary situation obligates to take measures which impede a face-to-face evaluation a distance evaluation will be activated. The students will be informed about that.

Spelling or syntax mistakes will be penalized; each mistake will rest 0.1 points and a maximum of 0.5 points will be rested.

EXTRAORDINARY EXAMINATION PERIOD: GUIDELINES AND OPTING OUT

In the extraordinary call the only evaluation form will be the final one. In order to renounce to the evaluation, it will be enough not to be presented to the final exam.

In case sanitary situation obligates to take measures which impede a face-to-face evaluation a distance evaluation will be activated. The students will be informed about that.

Spelling or syntax mistakes will be penalized; each mistake will rest 0.1 points and a maximum of 0.5 points will be rested.

MANDATORY MATERIALS

BIBLIOGRAPHY

Basic bibliography

- Understanding Weather and Climate, E. Aguado y J.E. Burt, Pearson Education
-The Atmosphere. F. K. Lutgens y E. J. Tarbuck. Pearson Education
- Introduction to Physical Oceanography. R. H. Stewart. https://www.colorado.edu/oclab/stewart-textbook
- An Introduction to Physical Oceanography, Matthias Tomczak.
http://gyre.umeoce.maine.edu/physicalocean/Tomczak/IntroOc/index.html

Detailed bibliography

Practical Meteorology, R. Stull. https://www.eoas.ubc.ca/books/Practical_Meteorology/

Journals

Web sites of interest

- Wyoming-eko unibertsitatea: http://weather.uwyo.edu/

- Euskalmet: http://www.euskalmet.euskadi.eus/hasiera

- AEMET: http://www.aemet.es/eu/portada

- UK meteorologia zerbitzua: https://www.metoffice.gov.uk/

- Wetterzentrale: http://www.wetterzentrale.de/

- National Center for Atmosferic Research (USA): https://ncar.ucar.edu/

- Bilbaoport: https://www.bilbaoport.eus/eu/

- Puertos del Estado: http://www.puertos.es/

OBSERVATIONS

COURSE GUIDE 2023/24

Faculty 125 - Faculty of Pharmacy **Cycle** .

Degree GFARMA10 - Bachelor`s Degree in Pharmacy **Year** First year

COURSE

25259 - Physics **Credits, ECTS:** 6

COURSE DESCRIPTION

Physics is one of the basic courses of the first year of the Degree in Pharmacy. Here some basic physical concepts are developed, which will be later applied in other courses of the degree, such as Instrumental Techniques.

COMPETENCIES/LEARNING RESULTS FOR THE SUBJECT

1.- To accurately use the International System of Units and Magnitudes.
2.- To apply computational and data processing techniques to Physics-related data and information.
3.- To apply Physics-related criteria to the design of experiments.
4.- To understand the nature and effects of the different types of radiation used in medical diagnosis and therapies.
5.- To be able to interpret the symbols and parameters of the radioactive nuclei, along with understanding their physical behavior and their use in radio-pharmacy.

Common competences
To develop communication and information transmission capabilities, both oral and written.
To encourage team-work abilities.

CONTENIDOS TEÓRICO-PRÁCTICOS

Unit 1.- Observables, magnitudes, units. Dimensional equations. Scale relations. Treatment and representation of experimental data.
Unit 2.- Ideal fluid mechanics.
Unit 3.- Oscillations. Resonance phenomenon. Relation to microscopic systems.
Unit 4.- Mechanical waves. Sound waves. Standing waves. Doppler effect. Non-sinusoidal waves.
Unit 5.- Electromagnetic waves: electromagnetic spectrum. Properties of each type of radiation, and their interaction with physical matter.
Unit 6.- Basics of Nuclear Physics. Structure and characteristics of nuclides. Time evolution laws. Short life isotopes: marked molecules.

Computer practice sessions
1.- Introduction to spreadsheets: relative and absolute variables, cell filling with various types of contents, functions, formats, data tables, and graphical representation.
2.- Numerical derivation as a limit. Example: constant translational acceleration in a straight line.
3.- Black Body. Planck’s Radiation Law. Wien’s Law. Stefan-Boltzmann’s Law.

Laboratory practice sessions
1.- Hooke’s Law. Determination of the elastic constant of an oscillator.

TEACHING METHODS

- Lectures: classes in which the teacher will explain the contents of the course. Low/medium difficulty problems may be proposed and solved during the class, in order to help settle the newly learned concepts. Student participation is encouraged.

- Class practices: the teacher and/or designated students will solve medium/high difficulty problems from a list assigned at the start of each unit.

- Computer/laboratory practices: the students will perform experiments and computer calculations on matters closely related to the contents of the course. Student attendance is mandatory.

TYPES OF TEACHING

Types of teaching	M	S	GA	GL	GO	GCL	TA	TI	GCA
Hours of face-to-face teaching	36		12	3	9				
Horas de Actividad No Presencial del Alumno/a	54		18	4,5	13,5				

Legend:
M: Lecture-based
S: Seminar
GA: Applied classroom-based groups
GL: Applied laboratory-based groups
GO: Applied computer-based groups
GCL: Applied clinical-based groups
TA: Workshop
TI: Industrial workshop
GCA: Applied fieldwork groups

Evaluation methods

- Continuous evaluation

- End-of-course evaluation

Evaluation tools and percentages of final mark

- Written test, open questions 80%
- Exercises, cases or problem sets 20%

ORDINARY EXAMINATION PERIOD: GUIDELINES AND OPTING OUT

Students will be able to choose between "continuous assessment" and "final assessment" modalities:

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Continuous assessment

The exams and their weights break down as follows:
- Midterm exam: 20% of the grade.
- Final exam: 80% of the grade (20% for the practices exam, 60% for the course contents exam).

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Final assessment

A single final examination will be taken at the end of the term, weighting 100% of the grade (20% for the practices exam, 80% for the course contents exam).

EXTRAORDINARY EXAMINATION PERIOD: GUIDELINES AND OPTING OUT

The June examination will be graded following the final assessment modality, therefore a single final examination will be taken, weighting 100% of the grade (20% for the practices exam, 80% for the course contents exam).

MANDATORY MATERIALS

En las pruebas de evaluación solo se permitirá la utilización de material de escritura (bolígrafo, corrector) y calculadora no programable.

BIBLIOGRAFÍA

Basic bibliography

- Davidovits P. Physics in Biology and Medicine. 4th edition. Academic Press; 2012.

- Tipler PA. Physics for Scientists and Engineers. 6th edition. Freeman & Company, W. H.; 2007.

- Kane JW, Sternheim MM. Physics. 3rd ed. Wiley; 1998.

Detailed bibliography

- Serway RA, Jewett JW. Physics for Scientists and Engineers. 10th ed. Cole Publishing; 2013

Journals

Web sites of interest

- What is a Wave? Available at http://www.acs.psu.edu/drussell/Demos/waves-intro/waves-intro.html [last access, July 2023]

- Nuclear Data Center at KAERI. Available at http://atom.kaeri.re.kr/ [last access, July 2023]

- Interactive simulations. Available at URL: https://phet.colorado.edu/en/simulations/category/physics [last access, July 2023]

- Física con ordenador. Available at http://www.sc.ehu.es/sbweb/fisica/ [last access, July 2023]

OBSERVATIONS

COURSE GUIDE 2023/24

Faculty 125 - Faculty of Pharmacy **Cycle** .

Degree GFARMA10 - Bachelor`s Degree in Pharmacy **Year** Second year

COURSE

25265 - Clinical Biochemistry **Credits, ECTS:** 6

COURSE DESCRIPTION

Clinical analyses are common in the professional practice of pharmacists. These analyses serve for screening, diagnosis, prognosis and monitoring of multiple health conditions and it is important for them to be able to perform and understand these analyses in order to explore and treat multiple health conditions.

Therefore, the general objectives for students in the Clinical Biochemistry class are the following:

1.- To know and to explain the biochemical changes that occur during pathological processes in relation to normal physiological states.

2.- To Know the procedures that are commonly used in the laboratory for the detection of biochemical changes, diagnosis and monitoring of pathological states that pharmacy graduates can find in their professional activity as well as the limitations of such procedures.

COMPETENCIES/LEARNING RESULTS FOR THE SUBJECT

Prior knowledge of Biochemistry, Molecular Biology, Physiology, Physiopathology, Analytical Chemistry and Statistics is convenient.

Along the course, students will…

1.- Know how to treat and manipulate biological samples that are analyzed in Clinical Biochemistry laboratories.

2.- Appropriately apply analysis procedures, taking into account their analytical properties and their usefulness for detecting biochemical alterations in pathological situations.

3.- Know how to use the appropriate quality controls for the different components and stages that are part of the analytical processes.

4.- Assess the limitations of each analytical procedure, in order to choose the most appropriate one.

5.- Know how to define the reference values of the biochemical substances present in the biological fluids of apparently healthy populations.

6.- Know the possible causes that influence the deviations from reference values.

7.- Based on the results obtained with the analyses carried out on biological fluids, interpret the biochemical processes of various pathological states and their variations with respect to a situation considered physiologically normal,

LEARNING OUTCOMES

Students will correctly interpret and explain (both orally and in writing) the theoretical contents of the subject. They will be able to carry out the analyses indicated in the practical contents section both individually and in groups and will be able to search for information on the subject.

CONTENIDOS TEÓRICO-PRÁCTICOS

THEORETICAL CONTENT:

1. Introduction. Usefulness of biochemical tests in clinical medicine. Taking and handling samples.

2.- Analysis of samples and results. Reference values. Interpretation of results. Quality control.

3.- Physiological electrolytes. Distribution and homeostasis of water, sodium and potassium. Gases in blood: oxygen and carbon dioxide.

4.- Acid-base balance. Buffering systems. Acid-base balance disorders.

5.- Plasma proteins. Immunoglobulins. Proteins in urine and other body fluids.

6.- Clinical enzymology. Isoenzymes. Enzymes with diagnostic utility.

7.- Tumor markers.

8.- Carbohydrates. Regulation of blood glucose. Diabetes mellitus. Hypoglycemia.

9.- Lipids. Lipoprotein metabolism. hyperlipoproteinemias.

10.- Amino acids. Excretion nitrogenous compounds: urea, ammonia and creatinine.
Amino acid derivatives. Purine metabolism: uric acid and gout.

11.- Heme metabolism. Bilirubin formation. Hyperbilirubinemia. Porphyrin biosynthesis. porphyrias.

12.- Iron metabolism and its alterations. Abnormal hemoglobins. Metabolism of erythrocyte

13.- Cardiac function. Cardiac markers.

14.- Liver function. Liver function tests.

15.- Gastrointestinal function. Exocrine pancreatic function. Malabsorption tests.

16.- Renal function. Kidney function tests.

17.- Mineral and bone metabolism. Regulatory hormones of calcium and phosphate homeostasis. Bone function tests.

18.- Hormones: mechanisms of hormonal action. Pituitary hormones and function.

19.- Thyroid hormones. Thyroid function. Thyroid function tests.
20.- Adrenal glands: cortical activity and its alterations. Endocrine function -reproductive: evaluation of gonadal alterations. Biochemical aspects of pregnancy.

TEACHING METHODS

Students will have lectures (35 hours), laboratory sessions (15 hours) and classroom practical sessions (10 hours)

TYPES OF TEACHING

Types of teaching	M	S	GA	GL	GO	GCL	TA	TI	GCA
Hours of face-to-face teaching	35		10	15					
Horas de Actividad No Presencial del Alumno/a	60		15	15					

Legend:
M: Lecture-based
S: Seminar
GA: Applied classroom-based groups
GL: Applied laboratory-based groups
GO: Applied computer-based groups
GCL: Applied clinical-based groups
TA: Workshop
TI: Industrial workshop
GCA: Applied fieldwork groups

Evaluation methods

- Continuous evaluation
- End-of-course evaluation

Evaluation tools and percentages of final mark

- Written test, open questions 30%
- Multiple choice test 40%
- Exercises, cases or problem sets 15%
- Individual assignments 5%
- Oral presentation of assigned tasks, Reading¿ 10%

ORDINARY EXAMINATION PERIOD: GUIDELINES AND OPTING OUT

Students with continuous or final evaluation system have to pass a final test, which consists of two parts
1.1) Theoretical part of the subject. It will be a multiple-choice test with 40 questions with a single answer out of five possible ones. Score: 1 point for each correct answer; 0.25 negative points for each incorrect answer; 0 points for each blank answer. Students can obtain a maximum of 40 points.
1.2) Technical and practical part of the subject. It will consist of 6 questions with short answer sub-questions. Each question will score a maximum of 5 points. Student can obtain a maximum of 30 points.
In all cases, students must obtain a minimum of 35 points out of 70 in the final test to pass the class. Of these, it is essential to obtain at least 20 points in the multiple choice test of the theoretical part and 15 points in the questions related to the technical and practical part. Students who do not pass the test in one call must take the full test (both parts, multiple choice and short answer questions) in the next call even if they have passed one of the two parts.
To renounce an evaluation call, it will be sufficient not to take the final exam.
2.- Continuous evaluation.
In addition to the final test, students with continuous evaluation have to ….
2.1.) Solve theoretical-practical exercises in class with the help of their class notes. Maximum score: 15 points.
2.2.) Develop brief written works related to the topics of the subject, which will later be presented orally. Maximum score: 10 points.
2.3.) Assessment of active participation in the classroom and in the laboratory. Maximum score: 5 points.
Students who obtain the minimum score required in the final test will obtain the final grade for the subject by adding the points obtained in the final test to in the continuous evaluation score. A minimum toal of 50 points is required in order to pass the class
The results obtained in the continuous evaluation may be taken into account for the two calls of the same academic year.
Laboratory experience is essential in order to pass the class. That is why there are laboratory sessions. Students who do not carry out these practical sessions will have to demonstrate their experience by completing a practical test in the laboratory.

3.- Final evaluation.
Students have the right to invoke the final evaluation system. Interested students must inform the professor within the first nine weeks of the semester and all of the final score depends on the final test.
In any case, they will have the same obligations as the rest of the students with respect to laboratory sessions. Therefore, students who do not carry out the practical sessions will have to demonstrate their experience by completing a practical test in the laboratory.

EXTRAORDINARY EXAMINATION PERIOD: GUIDELINES AND OPTING OUT

Same as the ordinary call (see previous box).

MANDATORY MATERIALS

BIBLIOGRAFÍA

Basic bibliography

"Tietz. Fundamentals of Clinical Chemistry", C. A. Burtis & E. R. Ashwood, 8th ed. Saunders, 2019.
"Clinical Chemistry", W. J. Marshall, M. Lapsley & A. Day, 9th ed. Elsevier, 2020.
"Clinical Biochemistry", W. J. Marshall & S. K. Bangert, 7th ed. Mosby, 2012.
"Clinical Biochemistry and Molecular Pathology", A. González, 3rd ed. Elsevier, 2019
"Clinical biochemistry and molecular pathology", X. Fuentes Arderiu-eta., 2. ed. I reversed, 1998.
"Clinical biochemistry", J.M. Gonzalez de Buitrago-eta. McGraw-Hill Inter-American, 1998.
"Clinical Biochemistry", A. Gaw et al., 5th ed. Elsevier, 2015.
"The clinic and the laboratory", J.M. Prieto Valtueña-eta, 23. edition. 2019
"Medical Biochemistry", J. W. Baynes and M. H. Dominiczak, 4th ed. Elsevier, 2015.
"Molecular Pathology", J. M. González de Buitrago-eta. McGraw-Hill Inter-American, 2001.
"Clinical Chemistry. Theory, Analysis, Correlation", L.A. Kaplan, A. J. Pesce eta S.C. Kazmierczak, 4th ed. Mosby, 2003.

Detailed bibliography

1.- "Química clínica. Principios, procedimientos y correlaciones", M. L. Bishop y cols., 5ª ed. McGraw-Hill Interamericana, 2007.
2.- "Tietz. Fundamentals of Clinical Chemistry", C. A. Burtis & E. R. Ashwood, 5ª ed. Saunders, 2001.
3.- "Clinical Chemistry", W. J. Marshall & S. K. Bangert, 5ª ed. Mosby, 2004.
4.- "Bioquímica médica", J. W. Baynes y M. H. Dominiczak, 2ª ed. Elsevier, 2006.
5.- "Patología Molecular", J. M. González de Buitrago y cols. McGraw-Hill Interamericana, 2001.

Journals

1.- Clinical Chemistry
2.- Clinica Chimica Acta
3.- Clinical Biochemistry
4.- Annals of Clinical Biochemistry

Web sites of interest

http://www.seqc.es
http://www.sciencedirect.com
http://www.clinchem.org
http://www.aacc.org
http://www.efcclm.org/

OBSERVATIONS

COURSE GUIDE 2023/24

Faculty 125 - Faculty of Pharmacy **Cycle** .

Degree GFARMA10 - Bachelor`s Degree in Pharmacy **Year** Third year

COURSE

25272 - Galenical Pharmacy **Credits, ECTS:** 9

COURSE DESCRIPTION

 SUBJECT: Galenic Pharmacy
 DEPARTMENT: Pharmacy and Food Sciences
 ACADEMIC YEAR: 3
 FOUR-MONTH PERIOD: 2
 TYPE: Compulsory
 ECTS CREDITS: 9

Galenic Pharmacy is a subject in which the basic principles of the design of drug delivery systems are studied. These principles are based on the physico-chemical properties of the active ingredients, the characteristics of the dosage forms, and the physio-pathological conditions of the patients. Therefore, concepts that the students have previously taken in other subjects of the degree (such as Physico-chemistry, Human Anatomy or Human Physiology) are handled. These subjects are scheduled in the 1st or 2nd academic year.

This subject is closely related to the subjects Biopharmacy and Pharmacokinetics, Pharmaceutical Technology I, and Pharmaceutical Technology II, scheduled in the 4th academic year. It is convenient that the students take the subject Galenic Pharmacy before taking the mentioned subjects.

COMPETENCIES/LEARNING RESULTS FOR THE SUBJECT

SPECIFIC SKILLS
1.- Evaluate the influence of anatomic and physiological aspects of the site of administration on the disposition of drugs.
2.- Identify and assess the properties of the drugs that condition their disposition in the organism from the dosage forms.
3.- Analyse and evaluate the biopharmaceutical behaviour of drug products that condition the design of the dosage forms.
4.- Select the most suitable route of administration based on the characteristics of the patient, the drug, and the desired therapeutic effect.
5.- Determine the bioavailability, evaluate the bioequivalence, and know the factors that condition them

TRANSVERSAL SKILLS

1. Develop communication and information skills, both oral and written, to deal with patients and users of the work center where the professional activity is performed. Promote working and collaborative capacities in multidisciplinary teams and those capacities related to other healthcare professionals.

2. Recognize the own limitations and the need to maintain and update professional skills, paying special attention to the self-learning of new knowledge based on the available scientific evidence.

Theoretical and Practical Contents

THEORETICAL PROGRAMME
MODULE I: RELEASE AND ABSORPTION OF DRUGS
1. Introduction to Galenic Pharmacy.
2. Transit of drugs in the organism: concept of LADME.
3. Drug release.
4. Drug absorption.

MODULE II: ENTERAL ROUTES OF ADMINISTRATION OF DRUGS
5. Drug administration routes.
6. Oral administration.
7. Buccal administration
8. Rectal administration.

MODULE III: PARENTERAL ROUTES OF ADMINISTRATION OF DRUGS
9. Parenteral routes of drug administration.
10. Intravenous and intra-arterial drug administration.
11. Intramuscular administration.

12. Subcutaneous administration.
13. Other routes of parenteral administration.

MODULE IV: ADMINISTRATION OF DRUGS THROUGH MUCOUS
14. Nasal administration
15. Pulmonary administration.
16. Administration of drugs in the skin.
17. Ophthalmic administration.
18. Administration in the ear.
19. Vaginal administration.

MODULE V: ADMINISTRATION OF DRUGS IN THE CENTRAL NERVOUS SYSTEM
20. Administration of drugs in the central nervous system.

MODULE VI: BIOAVAILABILITY AND BIOEQUIVALENCE
21. Bioavailability.
22. Bioequivalence.

MODULE VII: ADMINISTRATION OF BIOLOGICAL DRUGS
23. Administration and delivery of therapeutic peptides and proteins.
24. Administration and delivery of DNA and RNA in gene therapy.

PRACTICAL PROGRAMME
Practice 1. Determination of the partition coefficient of salicylic acid.
Practice 2. Influence of the excipient in the release of active ingredients based on an iodine ointment: release test.
Practice 3. Release study of pantoprazole from gastro-resistant tablets using a continuous flow dissolving equipment.
Practice 4. Determination of the solubility of drugs.
Practice 5. Dissolution kinetics of furantoin from tablets.
Practice 6. Evaluation in of the permeation capacity of various semi-solid formulations by using Franz cell chambers.

COMPUTER PRACTICES:
1. "Biopharmaceutics" program.
2. In vitro equivalence study of citalopram formulations.

CLASSROOM PRACTICES
1. Dissolution kinetics: a practical case
2. Calculation of the permeability constant of a drug: a practical case
3. Preparation of the group work
4. Bioequivalence study: a practical case
5. Self-evaluation tests

TEACHING METHODS

METHODOLOGY
1. Lectures. (5.5 ECTS)
2. Classroom practices: solving practical cases. (0.5 ECTS)
3. Practical laboratory classes. (2.6 ECTS)
4. Practical computer class. (0.4 ECTS)
5. Self-evaluation tests through the e-Gela platform.

TYPES OF TEACHING

Types of teaching	M	S	GA	GL	GO	GCL	TA	TI	GCA
Hours of face-to-face teaching	55		5	26	4				
Horas de Actividad No Presencial del Alumno/a	82,5		7,5	39	6				

Legend:
M: Lecture-based
S: Seminar
GA: Applied classroom-based groups
GL: Applied laboratory-based groups
GO: Applied computer-based groups
GCL: Applied clinical-based groups
TA: Workshop
TI: Industrial workshop
GCA: Applied fieldwork groups

Evaluation methods

- Continuous evaluation
- End-of-course evaluation

Evaluation tools and percentages of final mark

- Written test, open questions 60%
- Exercises, cases or problem sets 15%
- Individual assignments 10%
- Teamwork assignments (problem solving, Project design) 15%

ORDINARY EXAMINATION PERIOD: GUIDELINES AND OPTING OUT

COMBINED EVALUATION SYSTEM
Compulsory written test.
Requirements:
Absence of conceptual errors
Obtain a score higher than 0 in at least 70% of the questions
Obtain a minimum of 5 points
Spelling and syntax errors will be penalised depending on their number (-0.1 points for each one, up to a maximum of -0.5 points).
Practical classes.
Attendance at and benefit from practical classes. Scores from 0 to 5.
Punctuality
Good housekeeping
Attitude
Results and preparation of the practice book
To pass the practical part of the subject, the sum of the scores in sections A and B must be 7 points as a minimum.
Laboratory examination. Students who have not attended all the practical classes. The following will be considered: good housekeeping, laboratory skills and the results and preparation of the final report. The percentage of this test in the final mark is 15% (7% work and 8% oral presentation).
Oral presentation and debate on the group work. 10-15-minute oral presentation of a scientific publication related to the subject, using an audiovisual followed by a 10-minute debate. The professors will decide which part of the work will be presented by each student. An evaluation matrix will be used to evaluate each student. It will be handed over together with the work. The final mark for the work (7%) will be the same for the members of the group (i.e. average for the group).
Withdrawal: The student must submit her/his exam withdrawal request. The deadline will be the day before the official call.

EXTRAORDINARY EXAMINATION PERIOD: GUIDELINES AND OPTING OUT

The positive results of the activities of continuous evaluation (laboratory practices and group work) will be maintained in the extraordinary call.

MANDATORY MATERIALS

Cuaderno de prácticas de laboratorio y de ordenador. Este cuaderno es elaborado por el profesorado y se hace accesible para los alumnos a través de la plataforma eGELA. Los alumnos deben disponer de él cuando acudan a realizar las prácticas.

BIBLIOGRAPHY

Basic bibliography

1. Tratado general de Biofarmacia y Farmacocinética. Volumen I. LADME. Análisis farmacocinético. Biodisponibilidad y Bioequivalencia. J. Domenech, J. Martínez Lanao, J. Plà Delfina. Editorial Síntesis. 2013.
2. Tratado general de Biofarmacia y Farmacocinética. Volumen II. Vías de administración de fármacos: aspectos biofarmacéuticos. Farmacocinética no lineal y clínica. J. Domenech, J. Martínez Lanao, J. Plà Delfina. Editorial Síntesis. 2013.
3. Drug Delivery. Principles and Applications. B. Wang, T. Siahaan, RA Soltero. Wiley Interscienes. 2005

Detailed bibliography

1. Clinical Pharmacokinetics: Concepts and Applications. Malcolm Rowland, Thomas N. Tozer. Lippincott, Williams &Wilkins 4rd edition. 2011.
2. Gene therapy. Tools and potential applications. InTech. 2013 (https://www.intechopen.com/books/gene-therapy-tools-and-potential-applications). Acceso libre.- -3. Drug Bioavailabiliy. Estimation of solubility, permeability, absorption and bioavailability. R. Mannhold, H. Kubinyi, G. Folkes. Wiley-VCH. 2004

Journals

Web sites of interest

1. http://ocw.ehu.es/course/view.php?id=199
2. http://ocw.ehu.es/course/view.php?id=291-

3. www.wits.ac.za/pharmacy/biopharmacy.htm
4. A First Course in Pharmacokinetics and Biopharmaceutics. David Bourne, Ph.D. www.boomer.org/c/p1/
5. www.farm.kuleuven.ac.be/pharbio/aplink.htm
6. Internet Tutorial for Pharmacists: Finding Drug Information on the Web. http://pharmacy.dal.ca/youcanfindit/tutorial.h
7. WILEY. http:///www3.interscience.wiley.com
8. ELSEVIER http:///www. Sciencedirect.com

OBSERVATIONS

COURSE GUIDE 2023/24

Faculty 125 - Faculty of Pharmacy **Cycle** .

Degree GFARMA10 - Bachelor`s Degree in Pharmacy **Year** Fifth year

COURSE

25282 - Dermopharmacy **Credits, ECTS:** 6

COURSE DESCRIPTION

Skin pharmacy is a branch of Pharmacy that studies, manufactures and dispenses cosmetic products. A 'cosmetic product' is any substance or preparation designed for contact with the superficial parts of the human body (skin, hair and capillary system, nails, lips and external genital organs) or with teeth and buccal mucosa with the aim of cleaning or perfuming them, modifying their appearance and correcting body odours, and protecting or keeping them in good condition.

This subject is divided into 8 modules, and the histology and physiology of the skin, superficial skin parts, mouth and teeth will be studied. In addition, the cosmetic products used for their care, cleaning, hydratation or treatment will be explored.

COMPETENCIES/LEARNING RESULTS FOR THE SUBJECT

-Know, formulate and prepare products used for the hygiene, protection and beautification of people's skin and appendages.
-Identify states of healthy skin and the alterations/pathologies that require dermo-pharmaceutical treatment.
-Identify and select the most suitable excipients for creating different types of cosmetic formulations.
-Collect and analyse information in the field of dermo-pharmaceutics to develop and formulate a line of specific products for a particular kind of skin.

Theoretical and Practical Contents

THEORETICAL PROGRAMME
MODULE 1: GENERAL CONCEPTS
1. Introduction to dermopharmacy. General concepts and scope of application of the discipline.Pharmaceutical legislation on cosmetic products. Spanish and European legislation.

MODULE 2: STRUCTURE AND PHYSIOLOGY OF THE SKIN: DERMO-PHARMACEUTICAL IMPLICATIONS.
2. Histology and physiology of the skin and appendages. Basic aspects and cosmetic implications.

MODULE 3: DERMO-PHARMACEUTICAL PREPARATIONS FOR FACIAL APPLICATION
3. Facial hygiene. Surfactants and soaps. Cleaning lotions. Eyewashes. Facial tonics. Peelings.
4. Hydration of the skin. Facial treatment lotions. Types of lotions. Preparation. Pathologies that improve with correct body hydration: atopic dermatitis and psoriasis.
5. Acne. Etiopathogeny, clinical signs. Treatment: basic rules, topic and systemic treatment.
6. Skin ageing. Molecular theories on ageing. Anti-ageing cosmetics. Active ingredients.
7. Products for shaving. Before- and after-shave PRODUCTS. Shaving products.

MODULE 4: DERMO-PHARMACEUTICAL PREPARATIONS FOR SOLAR PROTECTION
8. Melanocytes and skin pigmentation. Melanin synthesis. Pigmentation disorders.
9. Skin photoprotection. Photoprotection mechanisms. Aptitude for acquiring a suntan. Photoprotection. Solar filters.

MODULE 5: DERMO-PHARMACEUTICAL PREPARATIONS FOR BODY APPLICATION
10. Treatment of adiposity and cellulitis. Composition and functions of conjunctive tissue. Active ingredients for the topical treatment of cellulitis. Striae atrophica (stretch marks). Appearance and causes. Prevention and treatment.
11. Preparations for bathing. Bath salts. Bath oils. Bath gels. Foam baths. Preparation and control. After-bath products.

MODULE 6: DERMO-PHARMACEUTICAL PREPARATIONS FOR HAIR
12. Estructure and physiology of the hair. Hair hygiene. Shampoos. Properties.
13. Other hair care products. Hair preparations for combing and hair care. Pediculosis.
14. Hair cosmetics. Hair disorders. Hair colouring/dyeing.
15. Anti-dandruff and anti-sebaceous preparations.

MODULE 7: DERMO-PHARMACEUTICAL PREPARATIONS FOR ORAL HYGIENE
16. Oral hygiene. Description of the mouth. Most common anomalies of cosmetic interest. Preparations for dental cosmetics. Preparation of toothpaste. Other oral hygiene products.

MODULE 9: CONTROLS ON COSMETICS
17. Control of cosmetic products.

WRITTEN WORK IN GROUPS
Students will make an analysis of the type of skin presented to formulate the most suitable product. They will write a report containing 5 specific formulations for their type of skin.

PRACTICAL PROGRAMME
Preparation of different formulations
- -Exfoliating gel
- -Fluid or body lotion for dry skin
- -Shampoo with panthenol and silk proteins
- -Moisturising-nourishing cream
- -After-shave cream-gel
- -Serum with alpha hydroxy acids
- -Facial tonic
- -Oily dermal paste with physical filters
- -Anti-acne, anti-sebaceous and keratolytic mask
- -Lip salve
- -Oil-free hand cream

TEACHING METHODS

METHODOLOGY
Theoretical lessons
Practical case solving
Laboratory practices
eGela
Tutorials

TYPES OF TEACHING

Types of teaching	M	S	GA	GL	GO	GCL	TA	TI	GCA
Hours of face-to-face teaching	40			20					
Horas de Actividad No Presencial del Alumno/a	70			20					

Legend:
M: Lecture-based | S: Seminar | GA: Applied classroom-based groups
GL: Applied laboratory-based groups | GO: Applied computer-based groups | GCL: Applied clinical-based groups
TA: Workshop | TI: Industrial workshop | GCA: Applied fieldwork groups

Evaluation methods

- Continuous evaluation
- End-of-course evaluation

Evaluation tools and percentages of final mark

- Written test, open questions 60%
- Exercises, cases or problem sets 10%
- Teamwork assignments (problem solving, Project design) 30%

ORDINARY EXAMINATION PERIOD: GUIDELINES AND OPTING OUT

EVALUATION INSTRUMENTS AND CRITERIA

THEORETICAL-PRACTICAL WRITTEN EXAMINATION (60%):
- Objective test (multiple-choice, short comprehension questions on theory, solving practical cases)
- A mark of 50% must be achieved in the exam to pass the subject
- Evaluation criteria:
  - Understanding the general concepts of the theory, coherent explanation.
  - Correct application of the concepts, reasoning of the answers given.
  - Relationship between theoretical and practicant contents.
  - Absence of conceptural mistakes.

WRITTEN WORK IN GROUPS(30%):
- Development of cosmetic products suitable for patients/clients skin type.
- Presentation of the final report before deadline

- Evaluation criteria:
  - Content and knowledge degree of the topic, absence of severe mistakes.
  - Structure of the information provided, clarity, originality.
  - Participation in the sessions with communicative attitude
  - Work in group

LABORATORY PRACTICES (10%)
- Practical work: pass/not pass. If not passed, a laboratory exam should be taken. It is required to pass the laboratory pratices to pass the subject
  Evaluation criteria:
  - Team working and participation
  - Skils for working in the laboratory
  - Organization, cleanliness and correct elimination of the residues.
  - Showing the lecturer the prepared products.
- Analisis of a commercial cosmetic product (10%): determine if a product is adequate for a given type of skin and describe the main function of its components. Written communication (grammar, spelling and language) will also be taken into account.

NOTE ABOUT THE WRITTEN COMMUNICATION
The spelling and syntax mistakes will be taken into account in all the ebaluation documents; Each mistake will diminish the mark by 0.1 points, up to 0.5 points.

SELECTION OF THE EVALUATION SYSTEM
Students can choose to perform only a final exam (of 10 points). For that purpose, they have to communicate it to the lecturer by using the suitable application form, in the first 9 weeks of the semester.

RENOUNCE TO THE CALL
Not attending to the official evaluation test will implie getting the "not presented" mark.

EXTRAORDINARY EXAMINATION PERIOD: GUIDELINES AND OPTING OUT

The last evaluation will be considered as a final evaluation (10 points). Anyway, if the students want so, they can mantain the marks obtained in the continious evaluation activities (laboratory practices and seminar).
This marks can also be mantained for the next academic course, if the student wants so, and by a written document.

RENOUNCE TO THE CALL
Not attending to the official evaluation test will implie getting the "not presented" mark.

MANDATORY MATERIALS

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Basic bibliography

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- Sergio del Río, Verena Santer, César E. Serna, Alicia López, Virginia Merino. Primeros pasos en un laboratorio de dermofarmacia y productos cosméticos. PUV, Valencia, 2019.
- Aiala Salvador, Amaia Esquisabel. Dermofarmazia. Osasuna kanpoaldetik zaintzea. Ed. UPV/EHU. 2016. Disponible en: https://web-argitalpena.adm.ehu.es/listaproductos.asp?IdProducts=UCH00164337#Dermofarmazia.%20Osasuna%20kanpoaldetik%20zaintzea
- Parra Juez, J. L, Pons Gimier, L, Ciencia cosmética: bases fisiológicas y criterios prácticos. Consejo General de Colegios Oficiales de Farmacéuticos, Madrid 1995.
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- Elsner, Peter. Cosmeceuticals and active cosmetics: drugs versus cosmetics, 2005
- Goddard, E.D. y Gruber, J.V. Principles of polymer science and technology in cosmetics and personal care, 1999
- Simmons, John V. Cosméticos: formulación, preparación y aplicación. Ed. A. Madrid Vicente, Madrid, 2000.

Journals

Clinics in Dermatology
http://www.sciencedirect.com/science/journal/0738081X

Journal of the American Academy of Dermatology
http://www.sciencedirect.com/science/journal/01909622

Journal of the European Academy of Dermatology and Venereology
http://www.sciencedirect.com/science/journal/09269959

Current Problems in Dermatology
http://www.sciencedirect.com/science/journal/10400486

Dermatología cosmética médica y quirúrgica
http://www.dcmq.com.mx/

Actualidad dermatologica
http://www.actualidaddermatol.com/

Journal of Dermatological Science
http://www.sciencedirect.com/science/journal/09231811

Offarm
http://www.elsevier.es/es-revista-offarm-4

Farmacia Profesional
http://www.elsevier.es/es-revista-farmacia-profesional-3

Web sites of interest

Consejo General de Colegios Oficiales de Farmacéuticos. Vocalía de Dermofarmacia
http://www.portalfarma.com/

Asociación Europea de Fabricantes de Productos Cosméticos (COLIPA)
www.colipa.com

Cosmetlex
http://pharmacos.eudra.org/F3/home.html

Cosmetic, Toiletry and Fragance Association (CFTA)
http://www.ctfa.org/

Sociedad Dermatológica en internet
http://www.telemedicine.org/

Sociedad Española de Medicina y Cirugía Cosmética
http://www.semcc.com/

SUN-FX 365™
http://www.sun-fx365.com/

OBSERVATIONS

"Dermofarmazia" irakasgaia "Giza Anatomia" eta "Giza Fisiologia" irakasgaiekin lotuta dago. Farmaziako Graduko 1. eta 2. mailetan ematen dira, hurrenez hurren, eta haietan larruazalaren egiturari eta funtzioei buruzko ezagutzak jasotzen dira. Bestalde, Dermofarmazia ikasi aurretik "Farmazia Galenikoa" (3. maila), "Teknologia Farmazeutikoa I" (4. maila) eta "Teknologia Farmazeutikoa II" (4. maila) irakasgaiak menperatzea gomendatzen da, aplikazio topikoaren forma farmazeutikoak, horien elaborazio-prozedurak, eszipienteak eta kontrolak ezagutzeko. "Farmakologia I" eta

"Farmakologia II" irakasgaiak, zeinak Farmaziako Graduko 3. ikasturtean eskaintzen diren, ere egin izana gomendatzen da. Irakasgai horietan ikasitako jakintzak lagungarriak izango dira produktu kosmetikoetako osagai aktiboen ekintza-mekanismoak ulertzeko.

COURSE GUIDE 2023/24

Faculty 125 - Faculty of Pharmacy

Cycle .

Degree GFARMA10 - Bachelor`s Degree in Pharmacy

Year Fifth year

COURSE

25288 - Structural Determination of Pharmaceuticals

Credits, ECTS: 6

COURSE DESCRIPTION

The subject "Structural Determination of Drugs" is an optional subject of the 5th year of the Degree in Pharmacy. It is located in the Chemistry module. Previously, in their first and second year, the students have completed the subjects Organic Chemistry and Advanced Organic Chemistry, related to the structure, properties and reactivity of organic compounds. In the third year of the degree, and within the same module, the students have completed the Pharmaceutical Chemistry course where the main methods for the design, synthesis and analysis of drugs are described.
To conclude with this module, the subject "Structural Determination of Drugs" deals with the application of spectroscopic techniques, such as Infrared, Nuclear Magnetic Resonance and Mass Spectrometry, to concrete examples, which will allow the students to understand the spectrum-structure correlation. The combined use of spectroscopic techniques is the best method for the interpretation of molecular spectra, and the determination of the structure of organic compounds, which are the main components of natural products and drugs.
Unlike most of chemical assays, the spectroscopic techniques are non-destructive and require a very small amount of sample, which is an advantage especially in the case of new or highly complex compounds

COMPETENCIES/LEARNING RESULTS FOR THE SUBJECT

Consolidate the knowledge related to the application of different spectroscopic techniques for the analysis of organic structures.
Apply Spectroscopic Techniques for the Structural Elucidation of Organic Molecules and Drugs.
Determine the structure of polyfunctional compounds in view of the information obtained from the different spectroscopic techniques.
Acquire a solid base for the development of scientific research work.

Theoretical and Practical Contents

1.Infrared spectroscopy. Basic concepts.
1.1.Introduction and applications
1.2.Infrared absorption theory.
1.3.Modes of vibration. Coupling between vibrations. Fermi resonance.
1.4.Selection rules
1.5.Instrumentation. Sample preparation. Accessories. Coupled techniques.
2.Infrared spectroscopy. Applications to qualitative analysis.
2.1.Characteristic frequencies
X-H stretching vibration region
Triple bond stretching vibration region
Double bond stretching vibration region
Fingerprint region
2.2.The effect of the substituents and the chemical environment on the absorption frequency.
Inductive effect
Bond strain
Hydrogen bonding
Conjugation
2.3.Empirical correlations to obtain information about structure
2.4.How to analyze IR spectra. Functional group identification.
3.Mass spectroscopy
3.1.General concepts. Instrumentation. Applications
3.2.Molecular ions. Isotopic abundance.
3.3.HRMS
3.4.Types of fragmentation reactions
3.5.Fragmentations in functional groups
4.Structure determination by Mass Spectroscopy.
4.1.General concepts. Mass spectrum analysis
4.2.Mass spectra of several types of compounds
5.Introduction to NMR Spectroscopy
5.1.Introduction
5.2.NMR Phenomenon.
5.3.Physical basis. Nuclear spin. Magnetic moment.
5.4.NMR instruments.

5.5.Chemical shift.
5.6.Fators affecting chemical shift.
5.7.Signal strength
6.Spin coupling
6.1.Spin-spin interaction
6.2.Magnetic equivalence.
6.3.Pople Nomenclature for coupled spin systems
6.4.First order and second order coupling.
6.5.Two spin systems. A2, AX and AB
6.6.Three spin systems. AB2 and AX2, AMX, ABX and ABC.
6.7.Four spin systems.
7.Coupling constants
7.1.Short and long distance coupling.
7.2.Coupling constant magnitude and sign
7.3.Geminal and vicinal coupling constant
7.4.Long distance coupling constant.
7.5.Structural elucidation.
8.13C NMR Spectroscopy
8.1.Introduction.
8.2.Record techniques and decoupling techniques.
8.3.Shift-structure correlations.
8.4.Coupling constants 13C-1H.
8.5.Structural elucidation.

TEACHING METHODS

Master classes will be used in which an overview of each of the spectroscopic techniques is given, discussing in the first place the theoretical principles to, later, study their applications with concrete examples. In order to settle the concepts, problems and exercises will be provided, that they students will develop individually or in groups. The resolution of the questions in the classroom will be carried out in a participative way.
The laboratory practices will consist of experimental work oriented to learn the spectroscopic techniques and the preparation of different types of samples. Cases with polyfunctional compounds will be carried out, where the joint use of all the technique is necessary for their identification, given their complementary nature. This part will be developed in groups, encouraging the formulation of questions, participation, discussion and teamwork.

TYPES OF TEACHING

Types of teaching	M	S	GA	GL	GO	GCL	TA	TI	GCA
Hours of face-to-face teaching	36			24					
Horas de Actividad No Presencial del Alumno/a	70			20					

Legend:
M: Lecture-based | S: Seminar | GA: Applied classroom-based groups
GL: Applied laboratory-based groups | GO: Applied computer-based groups | GCL: Applied clinical-based groups
TA: Workshop | TI: Industrial workshop | GCA: Applied fieldwork groups

Evaluation methods

- Continuous evaluation
- End-of-course evaluation

Evaluation tools and percentages of final mark

- Written test, open questions 55%
- Exercises, cases or problem sets 15%
- Test IR/MS and RMN 30%

ORDINARY EXAMINATION PERIOD: GUIDELINES AND OPTING OUT

- Continuous evaluation: Throughout the course, there will be several written tests of the different topics (30%). To consider this note in the final grade, you must pass 70% in each of the tests and attend to at least 80% of the face-to-face activities. Otherwise, the whole subject will be evaluated in the final written exam
- Attendance to practical courses, work sheets and practical exam (15%).
- Extraordinary written final exam (55-85%). A 40% minimum in the final exam is mandatory prior to add the note at the practical courses to the final mark..
A 40% minimum in the final exam is mandatory prior to add the note at the practical courses.
In accordance with the regulations of the UPV/EHU, not taking the final evaluation test, whether ordinary or extraordinary, will mean the resignation of the call for evaluation and the qualification of the student will be recorded as a "No Show".
The student who has previously completed the subject may either renounce to the continuous evaluation at other subjects

from previous courses or renounce to the mixed evaluation in Structural Determination and face the whole evaluation in a single final test. In any case, the final test must certify THE ACQUISITION OF BOTH THEORETICAL AND PRACTICAL SKILLS.
The students who have completed the practical courses in the previous years will keep their note for a course (if it is higher than 0.75) and, even if they do not meet the 80% attendance requirement (that is, even if they have opted for the evaluation in a single final test) will have the right to carry out the practices attending always at 100% of the hours (except for reasons of force majeure). The student that chooses not to attend to the practical courses must pass a practical exam as part of the final test.
Protocol on academic ethics: During the development of the evaluation tests, the use of books, or notes, as well as phone, computer or other devices or devices will be prohibited [Only a calculator and spectroscopy tables without any type of mark are allowed]. In view of any case of dishonest or fraudulent practice in the evaluation tests or academic tasks the protocol on academic ethics academics at the UPV/EHU will be applied.

EXTRAORDINARY EXAMINATION PERIOD: GUIDELINES AND OPTING OUT

In the case a student does not pass the subject at the ordinary call, he/she can attend to the final test at the extraordinary call, where the same evaluation system used for the single evaluation will be applied.
- Attendance to practical courses, work sheets and practical exam (15%).
- Extraordinary written final exam (85%). A 40% minimum in the final exam is mandatory prior to add the note at the practical courses to the final mark.
In accordance with the regulations of the UPV/EHU, not taking the final evaluation test, whether ordinary or extraordinary, will mean the resignation of the call for evaluation and the qualification of the student will be recorded as a "No Show".

MANDATORY MATERIALS

The use of the book "Structure Determination of Organic Compounds. M. Badertscher, P. Bühlmann, E. Pretsch, Springer Berlin, Heidelberg 2009, ISBN: 978-3-540-93810-1, DOI: https://doi.org/10.1007/978-3-540-93810-1" is mandatory

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1.- Structure Determination of Organic Compounds. M. Badertscher, P. Bühlmann, E. Pretsch, Springer Berlin, Heidelberg 2009, ISBN: 978-3-540-93810-1, DOI: https://doi.org/10.1007/978-3-540-93810-1
2.- Métodos espectroscópicos en Química Orgánica. M. Hesse, H. Meier, B. Zeeh. Ed.Sintesis. 1997
3.- Spectroscopic Methods in Organic Chemistry. D.H.Williams, I.Fleming. Ed. Mc .Graw Hill.1995
4.- Análisis orgánico. A. García, E. Teso. UNED. 1992

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- Infrared Spectroscopy: Fundamentals and Applications, B. H. Stuart, Ed Wiley , 2004
- Near Infrared Spectroscopy in Food Science and Technology .Yukihiro Ozaki, Alfred A. Christy, W. Fred Mc Clure, Ed Jhon Willey, 2006
- Course Notes on the Interpretation of Infrared and Raman Spectra. D. W.Mayo, F. A. Miller, R. W. Hannah, 2004
- Mass Spectrometry: Principles and Applications, 2nd Edition,Edmond De Hoffmann, Vincent Stroobant Ed Wiley, 2001
- Quantitative Applications of Mass Spectrometry, P. Traldi, F. Magno, I. Lavagnini, R. Seraglia, Ed Wiley, 2006
- Mass Spectra of Volatiles in Food (SpecData), 2nd Edition . Central Institute of Nutrition and Food Research Software, 2003.
- Magnetic Resonance in Chemistry and Medicine. R. Freeman.Ed.Oxford.2003
- High-Resolution NMR Techniques in Organic Chemistry. T. D.W. Claridge. Ed. Pergamon 1999
- 200 and More NMR Experiments S. Berger, S. Braun, Ed. Wiley-VCH. 2004
- Understanding NMR Spectroscopy. J. Keeler , Ed. Wiley . 2005.
- UNMR Spectroscopy in Drug Development and Analysis. U. Holzgrabe, I. Wawer, B. Diehl
- Two-Dimensional NMR Spectroscopy: Applications for Chemists and Biochemists, Second Edition, Fully Updated and Expanded to Include Multidimensional Work W. R. Croasmun (Editor), R. M. K. Carlson (Editor) 1994
- Wiley 1HNMR Spectra of Organic Compounds 2005 A. Yarkov .Software, 2006

Journals

The Journal of Organic Chemistry: http://pubs.acs.org/journal/joceah
Chemical Reviews: http://pubs.acs.org/journal/chreay
Jounal of the American Chemical Society: http://pubs.acs.org/journal/jacsat
Organic Letters: http://pubs.acs.org/journal/orlef7
Tetrahedron: http://www.sciencedirect.com/science/journal/00404020
Tetrahedron Letters: http://www.sciencedirect.com/science/journal/00404039
Journal of Heterocyclic Chemistry: http://onlinelibrary.wiley.com/journal/10.1002/%28ISSN%291943-5193
Heterocycles: http://www.heterocycles.jp/index.php

Web sites of interest

Exercices on spectroscopy:

Elucidación de estructuras orgánicas (Notre Dame) http://www.nd.edu/~smithgrp/structure/workbook.html
Problemas de RMN e IR (UCLA) http://www.chem.ucla.edu/~webspectra/
Problemas IR (Colby College) http://www.colby.edu/chemistry/JCAMP/IRHelperNS.html
PÁGINAS WEB:
Tutorial espectrometría de masas (University of Arizona) http://www.chem.arizona.edu/massspec/
Métodos modernos de espectrometría de masas (University of Leeds)
http://www.astbury.leeds.ac.uk/facil/MStut/mstutorial.htm
Tutorial de RMN y problemas de espectroscopía (Imperial College) http://www.ch.ic.ac.uk/local/nmr/
Espectroscopía RMN. Libro de texto virtual (Joseph Hornak, Rochester Institute of Technology)
http://www.cis.rit.edu/htbooks/nmr/
NMR meets Musicians (University of Erlangen-Nuremberg, Institute of Organic Chemistry) http://www.chemie.uni-erlangen.de/oc/research/NMR/music.html
Herramientas espectroscópicas (RMN, IR y MS, University of Potsdam) http://www.chem.uni-potsdam.de/tools/index.html
Más herramientas espectroscópicas (Aplicaciones para la interpretación de espectros RMN, IR y MS, Colby College)
http://www.colby.edu/chemistry/NMR/NMR.html

OBSERVATIONS

COURSE GUIDE 2023/24

Faculty 125 - Faculty of Pharmacy **Cycle** .

Degree GNUTRI10 - Bachelor's Degree in Human Nutrition & Dietetics **Year** First year

COURSE

25194 - Biochemistry **Credits, ECTS:** 6

COURSE DESCRIPTION

Biochemistry is one of the basic subjects of the first year of three Degrees: (i) Degree in Pharmacy, (ii) Degree in Human Nutrition and Dietetics, and (iii) Double Degree in Pharmacy and Human Nutrition and Dietetics. Studying biochemistry, students acquire a basic knowledge of the structure and functions of the molecules that form living organisms. At the same time, students develop a general and integrated vision of cellular metabolism from the point of view of bioenergetics. To this end, the main metabolic pathways, both degradative and biosynthetic, are described. The course also includes an experimental section, which will contribute to the familiarization of the students with the different basic techniques in biochemistry.
It is, therefore, a subject that lays the foundations of biochemistry on which many of the subsequent subjects of the degree will be based and deepen, such as Molecular Biology, Clinical Biochemistry or Pharmacology, in the Degree in Pharmacy and in the Double Degree, and Gene Expression and Metabolic Control and Human Nutrition, for example, in the Degree in Human Nutrition and Dietetics.
On the other hand, in order to make good progress in this subject, it is required a basic knowledge of concepts of Cell and Tissue Biology, General and Inorganic Chemistry/General Chemistry and Physicochemistry/Physics, and Mathematics and Statistics, subjects that are taught in the first quarter of the first year and that help a better understanding of Biochemistry.

COMPETENCIES/LEARNING RESULTS FOR THE SUBJECT

Competencies:
- To identify the structure, know the properties and biochemical function of biomolecules.
- To understand the chemical processes by which the organism obtains metabolic energy from nutrients, as well as those that consume that energy in the synthesis of essential components.
- To understand the basic principles of enzymology, distinguishing the effects of the different types of factors that modulate enzymatic activity (inhibitors, allosterism) and their application in health sciences.
- To know and interpret the metabolic changes that occur under different nutritional and physical conditions of a healthy organism.
- To be able to understand and evaluate the impact of biochemical problems, and to know how to predict the effect of a metabolic change (defect) on human health.
- To perform biochemical analyses and interpret the results; in order to establish the basis for understanding clinical analyses.

Learning outcomes:
- Differentiates proteinogenic amino acids from other amino acids.
- Knows the properties of the peptide bond.
- Differentiates distinct structural levels of a protein.
- Differentiates enzymes from other catalysts.
- Understands Michaelis-Menten kinetics.
- Calculates the activity of Michaelis enzymes.
- Knows the different metabolic pathways and their interconnections.
- Is able to understand the general mechanisms of regulation of metabolic pathways.

Theoretical and Practical Contents

TOPIC 1.- Biomolecules: Introduction to biological molecules.
TOPIC 2.- Amino acids, peptides and proteins.
2.1. Amino acids: General chemical-biological characteristics. Types.
2.2. Peptides: The peptide bond. Characteristics of the peptide chain. Protein conformation.
2.3. Primary structure of proteins.
TOPIC 3.- Three-dimensional structure of proteins.
3.1. Secondary structure. Alpha helix, beta-sheet, beta-turn. Fibrous and globular proteins.
3.2. Tertiary structure. Stabilizing forces. Denaturation.
3.3. Quaternary structure.
TOPIC 4.- Enzymes
4.1. Enzymes as biological catalysts: Activation energy. Models of enzymatic catalysis. Active center: substrate and reaction specificity.
4.2. Nomenclature and classification of enzymes. Coenzymes and prosthetic groups.

TOPIC 5.- Enzyme kinetics.
5.1. General concepts: Speed of enzymatic reactions. Factors that modify the enzymatic activity: pH, temperature and inhibitors.
5.2. Michaelian kinetics: Michaelis-Menten equation. Meaning of the kinetic constants. Graphical representations. Determination of Vmax and Km. Lineweaver-Burk transformation. Effect of inhibitors.
5.3. Regulatory enzymes: Generalities. Allosteric enzymes: concept and characteristics. Regulation by covalent modification.
TOPIC 6.- Bioenergetics and metabolism.
6.1. Introduction to intermediary metabolism: Concept of metabolic pathway. Anabolism and catabolism. Regulation of metabolism.
6.2. Energetics of metabolism: Bioenergetics. Coupled reactions. Energy-rich compounds. Irreversible reactions. ATP and phosphoryl group transfer.
6.3. Biological oxidation-reduction reactions: Redox reactions in metabolism. Coenzymes of redox reactions.
TOPIC 7.- Carbohydrates: Description, classification, carbohydrates of metabolic interest.
TOPIC 8.- Carbohydrate catabolism.
8.1 Glycolysis: General concepts of carbohydrate metabolism. Glycolysis: Sequence of reactions and balance.
8.2. Fates of pyruvate under anaerobic and aerobic conditions. Regulation.
8.3. Glycogenolysis.
TOPIC 9.- Krebs cycle and oxidative phosphorylation.
9.1. Krebs cycle: Sequence of reactions, energy balance and functions.
9.2. Respiratory chain: Location, components, reactions and control. Variation of free energy in the respiratory chain.
9.3. ATP synthesis: Mitchell's chemiosmotic theory. ATP synthase. Mechanism. Respiratory control.
9.4. Energy balance of total glucose oxidation.

TOPIC 10.- Carbohydrate Anabolism
10.1. Gluconeogenesis: Stages and balance from pyruvate. Other substrates of the pathway. Cori's cycle. Coordinated regulation of glycolysis and gluconeogenesis.
10.2. Glycogenogenesis. Allosteric and hormonal regulation of glycogen metabolism.
TOPIC 11.- Lipids: Concept of lipids, classification and biological interest.
TOPIC 12.- Lipid catabolism.
12.1. Mobilization of triglycerides from adipose tissue. Activation and transport of fatty acids from the cytoplasm to the mitochondrial matrix.
12.2. Beta-oxidation of saturated fatty acids. Energy balance. Oxidation of fatty acids of odd number of carbon atoms and unsaturated fatty acids.
12.3. Ketone bodies: Biosynthesis and utilization of ketone bodies. Function of ketone bodies. Ketosis.
TOPIC 13.- Lipid anabolism
13.1. De novo synthesis of fatty acids: Formation of malonyl-CoA. Fatty acid synthase complex. Reactions and balance of palmitic acid synthesis. Elongation and unsaturation of fatty acids.
13.2. Cholesterol biosynthesis.

TEACHING METHODS

LECTURES: 45 hours
Theoretical concepts and practical exercises (problems, questions, tests, etc.) will be worked on.

BIOCHEMISTRY LABORATORY: 3 sessions of 4 hours
1.- Preparation of an extract and determination of an enzyme activity.
2.- Determination of the Vmax and Km of the extracted enzyme.
3.- Chromatographic separation of lipids.

COMPUTER PRACTICES: 1 session of 3 hours
1.- Calculation of the kinetic parameters of an enzyme by iterative fitting using specific software. The data obtained in the laboratory will be fitted to curves and straight lines whose constants coincide with these parameters. Exercises and proposed problems will be carried out.

NON-PERSONAL ACTIVITY: 90 hours
- Consultation of texts, elaboration of diagrams and study.
- Solving problems and exercises in class.
- Use of the e-learning platform (eGela) to obtain the information provided by the teaching staff (scripts and groups of practices, videos/ showings, etc.) and to answer the tests and questions posed through this platform.
- Use of information and communication technologies (ICT) to view animations and additional didactic material.
NOTE: If face-to-face teaching is suspended, the teaching methodology of the different modalities will be carried out on-line, using the resources and digital platforms provided by the UPV/EHU.

TYPES OF TEACHING

Types of teaching	M	S	GA	GL	GO	GCL	TA	TI	GCA
Hours of face-to-face teaching	45			12	3				
Horas de Actividad No Presencial del Alumno/a	67,5			18	4,5				

Legend: M: Lecture-based | S: Seminar | GA: Applied classroom-based groups | GL: Applied laboratory-based groups | GO: Applied computer-based groups | GCL: Applied clinical-based groups | TA: Workshop | TI: Industrial workshop | GCA: Applied fieldwork groups

Evaluation methods

- Continuous evaluation
- End-of-course evaluation

Evaluation tools and percentages of final mark

- Multiple choice test 60%
- Exercises, cases or problem sets 20%
- Individual assignments 10%
- Teamwork assignments (problem solving, Project design) 10%

ORDINARY EXAMINATION PERIOD: GUIDELINES AND OPTING OUT

The final exam consists of a theoretical and a practical part. The theoretical part will account for 60% of the final grade of the course. The practical part will account for 20% of the final grade. To pass the course it is necessary to pass both parts separately. The remaining 20% of the grade is obtained through continuous assessment, through questions and exercises that the teacher will pose in class or on the eGela platform during the course. The realization of laboratory practices is mandatory. During the development of the practices, the attitude and skills in the laboratory work will be graded, as well as the students' capacity of expression and teamwork.

In any case, students will have the right to be evaluated through the final evaluation system, regardless of whether or not they have participated in the continuous evaluation system. To do so, students must submit in writing to the teacher responsible for the subject the waiver of continuous assessment, for which they will have a period of 9 weeks from the beginning of the course.
Both in the case of continuous assessment and in the case of final assessment, failure to attend the test set on the official exam date will mean the automatic waiver of the call, and will result in the qualification of not presented.

NOTE: In the event that the evaluation cannot be carried out in person, the tests will be taken on-line using the digital tools and platforms offered by the UPV/EHU.

EXTRAORDINARY EXAMINATION PERIOD: GUIDELINES AND OPTING OUT

Students who pass any of the parts in the ordinary exam will not have to repeat it in the extraordinary exam, i.e., they will only have to take the exam of the failed part.

MANDATORY MATERIALS

- Computer connected to the Internet (available in the computer rooms)
- Textbooks (available in the library)
- Lab coat
- Practice scripts and graph paper (or computer)

BIBLIOGRAPHY

Basic bibliography

1.-"Lehninger. Principles of biochemistry", D.L. Nelson and M.M. Cox, 8th edition. 2021.
2.-"Biochemistry. Essential Concepts.", E. Feduchi et al. 2nd edition, 2014.
3.-"Biochemistry. Basic course.", J.L.Tymoczco , L. Stryer, J.M. Berg and, 2nd edition, 2014.
4.-"Fundamentals of Biochemistry: Life at the Molecular Level", D. Voet, J.G. Voet and C.W. Pratt, 4th edition, 2016.

Detailed bibliography

1.-"Metabolic Regulation: A human prespective" K. N. Frayn, 3rd edition, 2019

Journals

http://www.nature.com/nature/index.htlm
http://www.science.com/science/index.htlm
http://www.ehu.eus/ojs/index.php/ekaia

Web sites of interest

http://highered.mheducation.com/sites/0072507470/student_view0/index.html
https://www.sebbm.es/web/en/
https://www.sciencedaily.com/news/matter_energy/biochemistry/
https://www.rcsb.org/

http://www.ehu.es/biomoleculas
http://www.biorom.uma.es/

OBSERVATIONS

COURSE GUIDE 2023/24

Faculty 125 - Faculty of Pharmacy **Cycle** .

Degree GCAMBI11 - Bachelor's Degree in Environmental Science **Year** Second year

COURSE

25235 - Treatment of the Environmental Pollution **Credits, ECTS:** 9

COURSE DESCRIPTION

Environmental Pollution Control is a compulsory subject in the Degree in Environmental Science (2nd year, 2nd term). The subject accounts for 9 ECTS credits: 4.0 credits of lectures, 2.3 credits of classroom practices, 1.9 credits of laboratory practices and 0.8 credits of field practice.
Environmental Pollution Control subject belongs to the 4th module (Environmental Technology). In this module, several aspects related to the different forms of environmental pollution are studied: fundamentals, origin, measurement, technologies for its control, treatment or mitigation, etc. The significance of these aspects in Environmental Science is evident and the module, along with other two modules, forms the core of the 2nd year. The module accounts for 24 credits, divided into three subjects: Fundamentals of Environmental Engineering, Pollutant Analysis and Environmental Pollution Control.

COMPETENCIES/LEARNING RESULTS FOR THE SUBJECT

1. To be able to use the basic models for the dispersion of air pollutants and to understand the air quality monitoring networks.
2. To understand pollution treatment methods and to be able to select the most suitable one in each situation.
3. To know the technologies to prevent or correct water and soil pollution.
4. To be able to design physical-chemical purification methods for gaseous effluents.

Theoretical and Practical Contents

Lesson 1. State of the environment in the Basque Country
UNIT I: WATER
Lesson 2. Water pollution
Lesson 3 Potabilization of water
Lesson 4. Wastewater treatment
UNIT II: AIR
Lesson 5. Air pollution
Lesson 6. Dispersion of air pollutants in the atmosphere
Lesson 7. Treatment of gaseous effluents: gases and vapours
Lesson 8. Treatment of gaseous effluents: particle separation
UNIT III: SOIL AND WASTE
Lesson 9. Soil pollution
Lesson 10. Soil remediation
Lesson 11. Municipal solid waste management

- Laboratory practice:
Practice 1: Water treatment by adsorption with activated carbon
Practice 2: Analysis of the absorption column for CO2 sequestration
Practice 3: Particle separation using a cyclone
Practice 4: Sedimentation tank
Practice 5: Energy production through solar and fuel cells

- Field practice:
Visits to water treatment plants: Araka (drinking water treatment plant, DWTP) and Crispijana (wastewater treatment plant, WWTP)

TEACHING METHODS

- Lectures to explain the basic principles of each lesson
- Classroom practice to solve problems
- Laboratory practice
- Problem-solving seminars: the students, working in small groups, will solve a proposed exercise
- Field practice

TYPES OF TEACHING

Types of teaching	M	S	GA	GL	GO	GCL	TA	TI	GCA
Hours of face-to-face teaching	40		23	17,5	1,5				8
Horas de Actividad No Presencial del Alumno/a	60		34,5	28,5	0				12

Legend:
M: Lecture-based | S: Seminar | GA: Applied classroom-based groups
GL: Applied laboratory-based groups | GO: Applied computer-based groups | GCL: Applied clinical-based groups
TA: Workshop | TI: Industrial workshop | GCA: Applied fieldwork groups

Evaluation methods

- End-of-course evaluation

Evaluation tools and percentages of final mark

- Written test, open questions 80%
- Multiple choice test 20%

ORDINARY EXAMINATION PERIOD: GUIDELINES AND OPTING OUT

- Tools and percentages for grading:
Laboratory practice: 20% (exam in the computer room)
Final exam (theoretical-practical): 80%
Problem-solving seminars: additional mark (maximum of 10 %)

- Opting out of the ordinary sitting
Failure to appear at the final exam on the official date of the ordinary sitting will automatically mean opting out of that sitting, which will lead to the grade of Not Sat.

EXTRAORDINARY EXAMINATION PERIOD: GUIDELINES AND OPTING OUT

In the extraordinary sitting, the only system to assess the student will be the final evaluation system. Nevertheless, if the student has a positive grade in laboratory practices or problem-solving seminars, those grades will be maintained. On the contrary, if the results are negative, the final exam will enable the student to get 100% of the final grade.

MANDATORY MATERIALS

Lesson notes, lists of exercises, tables and graphs, calculator, practice scripts.
Students must wear a laboratory coat during the laboratory practice. Moreover, students must bring a laptop during the laboratory practice (at least one for each group).

BIBLIOGRAPHY

Basic bibliography

Baird, C. "Environmental Chemistry", Freeman and Company, New York (1995).
Boubel, R.W., Fox, D.L., Turner, D.B., Stern, A.C. "Fundamentals of Air Pollution (3rd ed.)", Academic Press, San Diego (1994).
De Nevers, N. "Air Pollution Control Engineering (2nd ed.)", McGraw-Hill, Boston (2000).
Henry, J.G., Heinke, G.W. "Environmental Science and Engineering (2nd ed.)", Prentice-Hall, New Jersey (1996).
Kiely, G. "Environmental Engineering", McGraw-Hill, Boston (1998).
Pepper, I.L., Gerba, C.P., Brusseau, M.L. "Environmental and Pollution Science (2nd ed.)", Academic Press, Amsterdam (2006).
Stern, A.C. "Fundamentals of Air Pollution (2nd ed.)", Academic Press, Orlando (1984).
Wark, K., Warner, C.F., Davies, W.T. "Air Pollution: Its Origin and Control (3rd ed.)", Addison-Wesley, California (1998).

Detailed bibliography

- Tratamiento de aguas residuales. R.S. Ramalho. Ed. Reverte, Barcelona, 1996.
- Contaminación e ingeniería Ambiental. III. Contaminación de las aguas J.L. Bueno, H. Sastre, A.G. Lavin. FICYT. Oviedo, 1997
- Contaminación e ingeniería Ambiental. II. Contaminación atmosférica. J.L. Bueno, H. Sastre, A.G. Lavin. FICYT. Oviedo, 1997
- Ingeniería de aguas residuales. Tratamiento, vertido y reutilización. Metcalf&Eddy. Mc.Graw-Hill, 2000
- Contaminación del suelo: estudios, tratamiento y gestión. M. Seoánez Calvo. Ed. Mundi-prensa, 1999

Journals

Web sites of interest

OBSERVATIONS