Universidad Zaragoza

Year : 2019/20

30807 - Biochemistry

Syllabus Information

Academic Year: 2019/20
Subject: 30807 - Biochemistry
Faculty / School: 105 - Facultad de Veterinaria
Degree: 568 - Degree in Food Science and Technology
ECTS: 6.0
Year: 1
Semester: Second semester
Subject Type: Basic Education
Module: ---

1.General information

1.1.Aims of the course

The degree aims, among others, to make available to the food industry technicians qualified to address both quality control departments, as the production. The discipline of Biochemistry is a matter of basic training, which is essential for the basic knowledge of the structure of biomolecules, metabolic reactions of synthesis and processing, obtaining energy and the molecular basis of heredity, as well as all regulatory mechanisms. Obtaining these principles is important for the knowledge of the components of food and its transformation during processing and storage thereof.
Consequently, the general objective of this course is to instill in students the basics of all biological molecules in subsequent subjects will be applied to the study of changes that may occur during processing as food.

1.2.Context and importance of this course in the degree

Due to the basic character of this subject, overcoming this discipline should enable students to track other specific subjects of the degree.

1.3.Recommendations to take this course

In order to fully understand the contents of the program to be described later, it is recommended that secondary school students have studied the subjects of Biology and Chemistry, with emphasis on organic chemistry.

2.Learning goals

2.1.Competences

. To pass the course, students will be more competent to ...

CG1 Manage information, search for sources, collection and analysis of information, etc.
CG2 Use ICTs.
Teaming CG3.
CG4 think and reason critically.
CG5 Work independently and perform a self-evaluation.
CG6 Respecting the diversity and plurality of ideas, people and situations.
CG7 transmit information orally and in writing both in Castilian and English.
CG9 negotiate with both specialists in the area as non-experts in the field people.
CG10 Adapt to new situations and solve problems.
CB1 That students have demonstrated knowledge and understanding in a field of study that part of the basis of general secondary education, and is typically at a level which, although it is supported by advanced textbooks, includes some aspects that imply knowledge of the forefront of their field of study.
CB2 That students can apply their knowledge to their work or vocation in a professional manner and have competences typically demonstrated through devising and defending arguments and solving problems within their field of study.
CB3 That students have the ability to gather and interpret relevant data (usually within their field of study) to inform judgments that include reflection on relevant social, scientific or ethical.
CB4 That students can communicate information, ideas, problems and solutions to both specialist and non-specialist audiences.
CB5 That students have developed those skills needed to undertake further studies with a high degree of autonomy.

2.2.Learning goals

The student, for passing this subject, must demonstrate that ...

1- Is able to identify and understand the structure of biomolecules, metabolic transformation reactions and synthesis of these biomolecules and regulatory mechanisms.
2- they know the mechanisms of obtaining metabolic energy.
3- they know the molecular basis of heredity.
4- is able to manage in a biochemical laboratory and perform the most basic biochemical techniques.
5- is able to use basic Internet tools for bioinformatics applications in Castilian and English.

2.3.Importance of learning goals

They contribute, along with other skills acquired in the subjects of Biology, Chemistry and Physiology, at training students for management in all basic biological aspects and with later application in the professional profile that develop in meat industries, dairy, fish, fruit and vegetables, oil, sugar, cereal products, beverages, delicatessen, production of food ingredients, additives, etc.
They also contribute, along with other disciplinary matters, to train students to perform professional profiles of Graduate in Science and Food Technology

3.Assessment (1st and 2nd call)

3.1.Assessment tasks (description of tasks, marking system and assessment criteria)

The student must demonstrate that it has achieved the intended learning outcomes through the following evaluation activities

Global test
1) written test partial and final evaluation. The partial examination consisting of 30 test questions with a single correct answer for blocks I and II of the course will be held. To overcome this we must get a score of 18 (5 in the scale of 0 to 10). The partial exam will be voluntary but will eliminate the parts and will keep the note until the September session. Those who have passed this first part will be considered on first call (June) only the second set (Block III program) that consist again in 30 test questions with a unique correct answer and with the same conditions as the first set to pass it. Students who have not passed the first part, will be examined in the first round (June) of a single final exam (blocks I to III) program consisting of 50 multiple choice questions. To overcome this we must get a score of 30 (5 in the scale of 0 to 10). The examination of second call (September) will consist of a partial examination (Block III), for those who have passed the first partial or a single test, for those who have not passed the partial examination.
Passing this test will credit the achievement of learning outcomes 1, 2 and 3 and will be evaluated using the following criteria and levels of demand. The rating is from 0 to 10 and this rating will mean 80% of the student's final grade in the course.

2) Evaluation of practical work. The acquisition of skills and abilities while performing practices will be assessed by continuous observation of student work and correction of documents generated in each practice, or alternatively, for those students who have not attended all practices, through a laboratory test coinciding with the celebration of the global test. In addition, all the students will have to pass a test exam consistent in 10 test questions that will be convened to coincide with the partial or global test. To pass the exam they must get a score of 6 correct questions (5 in the scale of 0 to 10). Passing this test will credit the achievement of learning outcome 4 and will be evaluated using the following criteria and levels of demand. The rating is from 0 to 10 and this rating will represent 10% of the student's final grade.

3) Evaluation of management capacity of bioinformatics with the presentation of tutored projects. Passing this test will credit the achievement of learning outcome 5, They will be evaluated using the following criteria and levels of demand. The rating is from 0 to 10, obtaining a 6 (5 on the scale of 0-10) will be needed to overcome and this rating will represent 10% of the student's final grade in the course. The evaluation will coincide with the final test and additionally after completing the practical teaching according to the teaching program of the current course.

2.2. Endpoints and demand levels

1) written partial and final evaluation test: must be obtained 60% of correct answers (6 of 10). The average final grade partial and represent 80% of the course grade.

2) written resolution of issues related to the practical work that have developed in the laboratory test. You must be obtained 60% of correct answers (minimum score of 0.6 on 1).
Students who have not attended all practices will be invited to an assessment in the biochemistry laboratory in which will be necessary to perform a practical demonstration of their skills in the biochemistry laboratory.

3) Evaluation of the presentation of the tutored projects. synthesis capacity and relevance of the content will be valued. The qualification obtained will will be the final one
It will be necessary to pass the tests 2 corresponding to teaching practical to take the final exam.

Those students who, having passed the evaluation of laboratory practices, have to appear in successive calls for not having passed the subject on first call, they keep the score obtained in practical work.

Ratings System: According to the Regulations Evaluation Standards of Learning at the University of Zaragoza (Agreement Governing Council of 22 December 2010), the results obtained by the student will be graded according to the following numerical scale 0 to 10, with one decimal, which may be added corresponding qualitative rating:
0 to 4.9: Suspense (SS).
5.0 to 6.9: Approved (AP).
7.0 to 8.9: Notable (NT).
9.0 to 10: Outstanding (SB).

The mention of 'honors' may be awarded to students who have achieved a score equal to or greater than 9.0. Their number may not exceed five percent of the students enrolled in the corresponding academic year.

4.Methodology, learning tasks, syllabus and resources

4.1.Methodological overview

The methodology followed in this course is oriented towards the achievement of the learning objectives. A wide range of teaching and learning tasks are implemented, such as: 45 participatory lectures, 10 hours of practice in the laboratory of Biochemistry, 5 hours and conducting seminars and presentation of a protected work.

Regarding participatory lectures, it is scheduled to deliver the documentation for each subject at least 1 week before the start of explanation of each section so that the student review it in detail before the corresponding class. In principle, it is planned to spend 5 minutes a review of the previous class in order to place students in the later explanation, wing 45 minutes exposure of the most important and / or difficult aspects. It will emphasize the need to interrupt the teacher when they see fit to solve problems as they arise during the exhibition.

The seminars will be organized in sessions of two hours and they will progressively working students different problems of Biochemistry in order to achieve the learning outcome 1, 2 and 3.

Practice sessions are held in sessions of 2 hours for each group of 15 students. It is envisaged that each session the group to split into two subgroups of students perform different activities simultaneously for the best use of the laboratory.

Each group is expected to complete a practice week. At the end of the practical test on the same test is performed.

Tutored work will be done in groups of 3-4 students and will be related to the handling of applications relating to the field of study and use of the Internet as a means of communication and source of information. All necessary for carrying out this activity material is in English.

4.2.Learning tasks

The course includes the following learning tasks:

- Lectures: 45 hours.
- Practice session: Laboratory classes: 10 hours.
- Seminars: 5 hours.
- Autonomous work: 68 hours of study.

4.3.Syllabus

The course will address the following topics:

Section I.- AMINOACIDS. Proteins and enzymes.

- Theory:
    - 1. Non-covalent bonds in the structure and function of macromolecules
    - 2. Structure and properties of amino acids, stereochemistry and acid-base properties.
    - 3. Structure of proteins. The peptide bond. Protein conformation. intramolecular forces. Primary and secondary structures. Structure and biosynthesis of collagen. Tertiary structure: myoglobin. Quaternary structure: hemoglobin.
    - 4. Enzymes as catalysts. Basic concepts. Nomenclature. Enzyme-substrate complex. active center. enzyme cofactors and vitamins.
    - 5. Enzyme kinetics. Michaelis-Menten kinetics. Effect of pH and temperature on enzyme activity. competitive and noncompetitive inhibition and irreversible inhibition.
    - 6. Regulation of enzyme activity: allosterism, isoenzymes, covalent modification and proteolytic activation.
- Practice:
    - 1. Quantitative determination of proteins. Protein electrophoresis.
    - 2. Determination of enzyme activity
- Teaching and learning activities:
    - Classes: 12 hours of lectures.
    - Practical Laboratory classes: 4 hours
    - work autonomous student: 18 hours of study.

Section II.- GENETIC INFORMATION FLOW.

- Theory:
    - 1. The flow of genetic information. Structure and function of DNA and RNA.
    - 2. DNA replication. DNA synthesis. DNA polymerases. Mechanism of replication.
    - 3. Transcription. RNA polymerases. RNA synthesis. Inhibitors of transcription.
    - 4. Translation of the genetic message. The genetic code. mRNA, rRNA, tRNA and ribosomes. Amino acid activation. Translation mechanism. Inhibition of translation.
    - 5. Control of gene expression in prokaryotes. The lactose operon. Repression of enzymes.

- 6. Organization of genes in eukaryotes and repetitive DNA expression. Chromatin structure. Regulation of expression in eukaryotes.
- 7. Mitochondrial genetic system.
- 8. Recombinant DNA technology. Restriction endonucleases. recombinant DNA. Plasmid vectors.

- Practice:
  - 1. Preparation of DNA
  - 2. Manipulation of DNA. PCR amplification and restriction enzyme digestion.
- Teaching and learning activities:
  - classes: 9 h of lectures.
  - Practical Laboratory classes: 4 hours
  - autonomous student I work 13.5 hours of study.

Section III.- METABOLISM.

- Theory: CARBOHYDRATE METABOLISM AND ENERGY SUPPLY
  - 1. Introduction to metabolism. High-energy compounds. Electron transport and reducing agents. Regulation of metabolism.
  - 2. Structure and nomenclature of carbohydrates. Monosaccharides and oligosaccharides.
  - 3. Glucolisis. Quivalentes shipping of reduction within the mitochondria. Entry of other sugars to the glycolytic pathway. Fermentation of glucose to ethanol and lactate.
  - 4. The citric acid cycle. Synthesis of acetyl-CoA. The reactions of the citric acid cycle. Regulation of the citric acid cycle. anaplerotic reactions
  - 5. Cargo electron chain. Oxidation-reduction reactions. Components electron transport chain. oxidative phosphorylation. Dehydrogenases, oxidases and oxygenases.
  - 6. pentose phosphate pathway. The oxidative phase. The nonoxidative phase.
  - 7. gluconeogenesis. Regulation of gluconeogenesis.
  - 8. Structure polysaccharides. Glycogen metabolism. Glycogen synthesis. Glycogen degradation. Control glycogen metabolism.

    LIPID METABOLISM
  - 9. Structure and nomenclature. Fatty acids. neutral fats and waxes. Sterols. Phospholipids. biological membranes.
  - 10. Absorption of lipids. plasma lipid transport and deposition. Transport and metabolism of cholesterol. Lipid mobilization.
  - 11. Oxidation of fatty acid ß oxidation. Formation of ketone bodies.
  - 12. Synthesis of fatty acids. Essential fatty acids.

    AMINO ACID METABOLISM AND NITROGEN COMPOUNDS
  - 13. "Pool" of amino acids. Concept nitrogen balance. Interconversion and deamination of amino acids. The urea cycle.
  - 14. Metabolism carbonic amino acid chain. ketogenic and glucogenic amino acids.
  - 15. Biosynthesis of nonessential amino acids. Amino acids as precursors of other nitrogenous compounds.
  - 16. Structure and nomenclature of nucleotides. Purine catabolism.
- Practical teaching:
  - 1. Determination of glycogen and cholesterol in food
- Teaching and learning activities:
  - classes face: 24 hours of lectures.
  - Practical Laboratory classes: 2 hours
  - work autonomous student: 36,5 hours of study.

Summary table of teaching-learning activities:

Activity	HOURS	FACTOR	ACTIVITIES OUTSIDE THE CLASSROOM	TOTAL
THEORY	45	1,5	67,5	112,5
SEMINARS	5	0,5	2,5	7,5

4.4.Course planning and calendar

The tentative

PRACTICAL WORK	10	0,5	5	15
PRACTICAL WORK			12	12
TUTORIAL			0	0
EXAMS			3	3
Total	**60**		**90**	**150**

schedule of the subject is shown below. This time schedule is subject to modification by the center.

WEEK	**THEORY**	**PRACTICAL WORK**	**SEMINARS. EVALUATIONS**	**ACTIVITIES OUTSIDE THE CLASSROOM. TUTORED WORK.**
1	Block I (3h)			
2	Block I (3h)	L. P1. G1 M. P1. G2 Mi. P1. G3 J. P1. G4		
3	Block I (3h)	L. P2. G1 M. P2. G2 Mi. P2. G3 J. P2. G4		
4	Block (3h)	L. P3. G1 M. P3. G2 Mi. P3. G3 J. P3. G4		
5	Block II (3h)	L. P4. G1 M. P4. G2 Mi. P4. G3 J. P4. G4		
6	Block II (3h)		Evaluación de prácticas.G1,2,3,4	
7	Block II (3h)			Approach Problems 1
8	Block III (3h)		Partial and practical work exam (1 h.)	

9	Block III (3h)			
10	Block III (3h)			Approach Problems Resolution 1 Approach Problems 2
11	Block III (4h)			
12	Block III (4h)			Approach Problems resolution 2
13	Block III (4h)			
14	Block III (3h)			
15			Seminarios	
16			Examen final (1 h.)	
Total students	112,5 horas	15 horas	10,5 horas	12 horas
Total professor	45 horas	10 horas	5 horas	

The dates and key milestones of the subject are described in detail, along with the other subjects in the first course in the Grade of CTA, on the website of the Faculty of Veterinary Medicine (link: http://veterinaria.unizar.es / gradocta /). This link will be updated at the beginning of each academic year.

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4.5.Bibliography and recommended resources

[BB: Bibliografía básica / BC: Bibliografía complementaria]

- [BB] Nelson, David L.. Principios de bioquímica / David L. Nelson, Michael M. Cox ; coordinador de la traducción, Claudi M. Cuchillo. 6ª ed. Barcelona : Omega, D.L. 2014
- [BB] Tymoczko, John L.. Bioquímica : curso básico / John L. Tymoczko, Jeremy M. Berg, Lubert Stryer ; [versión española traducida por Juan Manuel González Mañas] Barcelona [etc.] : Reverté, D.L. 2014

Listado de URL

- MITOMAP. A human mitochondrial genome database [http://www.mitomap.org]