

COURSE DESCRIPTION

Subject: Genetics and Biochemistry

1st Course 2nd Semester

Dentistry degree

Type of course: on campus

Academic year 2021/2022

School of Medicine

1. COURSE/SUBJECT IDENTIFICATION

1.- COURSE/SUBJECT:

Name: Genetics and Biochemistry		
Code: 19687		
Year (s) course is taught: first	Semester (s) when the course is taught: second	
Type: basic	ECTS of the course: 6	Hours ECTS: (30)
Language: English	Modality: (on campus)	
Degree (s) in which the course is taught: Dentistry		
School which the course is taught: Medicine		

2.- ORGANIZATION OF THE COURSE:

Department: Chemistry and Biochemistry
Area of knowledge: Biochemistry and molecular biology

2. LECTURERS OF THE COURSE/SUBJECT

1.-LECTURERS:

Responsible of the Course	CONTACT
Name:	Julio Sevillano Fernández PhD
Phone (ext):	913724700 Ext:14837
Email:	jsevilla@ceu.es
Office:	International relations office. C building.
Teaching and Research profile	Assistant Professor of Biochemistry
Research Lines	Regulation of metabolism: Molecular mechanisms of insulin resistance in normal and pathological pregnancy. Molecular mechanisms of obesity. Oxidative stress and intrauterine development. 2 six-year research period.

Profesores	DATOS DE CONTACTO
Nombre:	Dr ^a . Esther Lantero Brigas
Tlfno (ext):	913724700
Email:	esther.lanterobrigas@ceu.es
Despacho:	Edificio Medicina Montepíncipe

Profesores	DATOS DE CONTACTO
Nombre:	Jair Tenorio Castaño
Teléfono (ext):	913724700
Email:	jair.tenoriocastano@ceu.es
Despacho:	Edificio Medicina Montepríncipe

2.- TUTORIALS:

For any queries students can contact lecturers by e-mail, phone or visiting their office during the teacher's tutorial times published on the students' Virtual Campus.

3. COURSE DESCRIPTION

The objective of this subject includes the study of the genetic, polymorphic and evolutionary nature of the human being. Particular attention will be paid to the clinical implications of gene alterations, and to genetic transmission between generations.

The aim of this course is to provide students an insight into the metabolic pathways involved in the synthesis and degradation of biomolecules in the body and its regulation. It should enable the student to integrate the metabolic pathways in different tissues of the human body, and in different physiological and pathological situations.

4. COMPETENCIES

1.- COMPETENCIES

Code	Basic and General Competencies
CG.07	Promote the autonomous learning of new knowledge and techniques, as well as the motivation for quality.
CG.11	Understand the basic biomedical sciences on which Dentistry is based to ensure proper oral and dental care
CG.12.	Understand and recognize the structure and normal function of the stomatognathic apparatus, at the molecular, cellular, tissue and organic levels, in the different stages of life.
CB1	That students have demonstrated to possess and understand knowledge in an area of study that starts from the base of general secondary education, and is usually found at a level that, although supported by advanced textbooks, also includes some aspects that imply knowledge coming from the forefront of his field of study

Code	Specific Competencies
CE.1	To know the biomedical sciences on which dentistry is based to ensure proper oral care. Among these sciences should be included appropriate content of: Embryology, anatomy, histology and physiology of the human body; Genetics, Biochemistry, Cellular and Molecular Biology; Microbiology and immunology.
CE.2	To know the morphology and function of the stomatognathic apparatus, including appropriate contents of specific embryology, anatomy, histology and physiology.

2.- LEARNING OUTCOMES:

Code	Learning outcomes
	Know the characteristics of the human genome.
	Know and discriminate the molecular basis of the main pathologies of genetic origin.
	Identify patterns of inheritance of human characters and disorders.
	Describe the molecular basis, regulation and integration of the processes occurring in living organisms and, in particular, in the human being.
	Describe the fundamentals of molecular biology.

5. LEARNING ACTIVITIES

1.- DISTRIBUTION OF STUDENTS' ASSIGNMENT:

Total hours of the course	180
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Code	Name	On-campus hours
	Lecture	1
	Seminar	42
	Academic tutorial	5
	Practice	16
	Workshop	4
TOTAL Presence Hours		68

Code	Name	Not on-campus hours
	Self student work	112

2.- DESCRIPTION OF LEARNING ACTIVITIES:

Activity	Definition
Lecture	The lecturer will make an introduction to the different theoretical blocks of the subject, as well as their integration, according to the program of the subject. Support materials will be used (documents that will be distributed in class and digitized that will be disseminated through the student's portal).
Seminar	The teacher will make the presentation of the different lessons of the program. Seminars will be taught following the program of the subject with the active participation of students. Support materials will be used (documents that will be distributed in class and digitized that will be disseminated through the student's portal).
Workshop	The students, organized in working groups, will analyse and solve practical cases, exercises or problems, derived from the theoretical contents exposed in the lectures and seminars.

Practices	The practical classes will be held in the laboratory for 5 days in sessions of 3 hours per day. Once the student has been assigned to one group of practices, no change will be allowed unless justified cause. The students will organize themselves in work groups to carry out the practical part proposed in the program of the subject under the supervision of the responsible teacher. In addition, the students will analyse and discuss the results obtained and individually present them in a laboratory notebook, which will be delivered exclusively to the corresponding teacher, on the date and place indicated.
Academic tutorial	Personalized or group attention of students during their training process.

6. ASSESMENT OF LEARNING

1.- CLASS ATTENDANCE:

In order to be eligible for examination by continuous assessment students must attend at least 75% of scheduled class time (attendance sheets will be used). As students may be absent 25% of the classes, no attenuating circumstances will be accepted for absences.

100% attendance at practical classes is required. There are not contemplated practical sessions between the ordinary examination and the re-take extraordinary examination, for that reason the non-realization of these in the months scheduled carries the failure of both examinations.

2.- ASSESMENT SYSTEM AND CRITERIA:

ORDINARY EXAMINATION (continuous assessment)		
Code	Name	Percentage
SE1	Theoretical evaluation	70
SE2	Practical evaluation	15
SE3	Individual and / or group work	15
	TOTAL	100

RE-TAKE EXAM/EXTRAORDINARY EXAMINATION		
Code	Name	Percentage
SE1	Theoretical evaluation	85
SE2	Practical evaluation	15
	TOTAL	100

3.- DESCRIPTION OF ASSESSMENT CRITERIA:

Assessment criteria	Definition
Individual and/or	Evaluation of work done inside or outside the classroom individually or in groups.

group work SE3	
Individual and / or group work SE3	<p>The objectives of knowledge will be assessed through written exams that will include multiple choice questions and can additionally include short written questions and schemes.</p> <p>There will be one midterm written exam throughout the semester. This exam will be valued with 40% of the final mark. In order to pass the exam, a minimum score of 5 points out of 10 is required.</p>
Practical evaluation SE2	<p>The practices will be evaluated through practical exercises, notebooks, exams, realization and exhibition of works, clinical cases, etc ... that collect the practical contents worked.</p> <p>100% attendance at practical classes is required to pass the subject. In order to pass the subject a minimum score of 5 points out of 10 is required in the practical classes.</p> <p>Those students who failed the practical classes will sit an exam concerning the practical classes the day of the final exam. Those students who failed the practical sessions in the final exam will sit an exam concerning the practical classes on the retake exam.</p>
SE1 Theoretical Evaluation Final Exam	<p>Written test in which the totality of the contents of the subjects is evaluated as well as the degree of acquisition of the competences related to them. Exams (or evaluation tests) will be carried out with theoretical-practical questions and resolution of assumptions that collect the contents of the subject studied.</p> <p>There will be a midterm exam that will be assessed with 45% of the student's final grade. To apply this percentage, a minimum score of 5 points out of 10 is required.</p> <p>The ordinary final exam is compulsory for all the students and will concern the second part of the subject. This exam can include questions related to any of the exercises proposed along the course and to the practical classes. This exam will be valued at 25% of the final grade. In order to apply this percentage, a minimum score of 5 points out of 10 is required.</p> <p>Those students who did not pass the continuous assessment midterm exam should sit a final exam that will cover all the course contents. This exam will be valued at 70% of the final grade. In order to apply this percentage, a minimum score of 5 points out of 10 is required.</p>
SE1 Theoretical Evaluation Retake exam	<p>Written test in which the totality of the contents of the subjects is evaluated as well as the degree of acquisition of the competences related to them. Exams (or evaluation tests) will be carried out with theoretical-practical questions and resolution of assumptions that collect the contents of the subject studied.</p> <p>Students that do not pass the final exam through continuous assessment should sit the retake exam. This retake exam will cover all the course contents and can include questions concerning any of the exercises proposed along the course and the practical classes. This exam will be valued at 85% of the final grade. In order to apply this percentage, a minimum score of 5 points out of 10 is required.</p> <p>Those students who failed the practical sessions in the final examination will sit an exam concerning the practical classes on the retake exam. In order to pass the subject a minimum score of 5 points out of 10 is required in the practical classes.</p>

	<p>In this examination session, any marks obtained in the continuous assessment will not be considered, just the final mark on the grade awarded for laboratory sessions.</p> <p>Those students who did not sit the final exam in the final exam or the retake exam will be graded as "Absent", no matter if they have done any activity of the continuous assessment system.</p>
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7. COURSE PROGRAMME

1.- COURSE PROGRAMME:

THEORETICAL:

INTRODUCTION

1. Concept of Biochemistry. Chemical composition of living systems.
2. Water as organic solvent and as a medium for chemical reactions. pH and physiological buffers.

STRUCTURE AND FUNCTION OF PROTEINS

3. Amino Acids: general structure, classification functions and properties.
4. Proteins: Classification. Levels of protein organization. Peptide bond. Native Structure and denaturation

ENZYMES

5. Enzymes: Characteristics and classification.
6. Enzyme kinetics.
7. Regulation of enzyme activity.

INTRODUCTION TO METABOLISM. BIOENERGETICS.

8. Overview of metabolism.
9. Cellular bioenergetics. High-energy compounds. Electron transport chain and oxidative phosphorylation.

CARBOHYDRATES.

10. Structure and properties of carbohydrates. Digestion and absorption.
11. Glycolysis and fermentation. Destinies of pyruvate.
12. Citric acid cycle.
13. Gluconeogenesis.
14. Glycogen metabolism.

LIPIDS.

15. Structure and properties of lipids. Digestion and absorption.
16. Lipolysis
17. β -oxidation.
18. Metabolism of ketone bodies.
19. Fatty acid biosynthesis.

20. Metabolism of cholesterol and lipoproteins.

NITROGEN COMPOUNDS: PROTEINS AND AMINO ACIDS.

21. Digestion of proteins and absorption of amino acids.

22. General metabolism of amino acids: Destination of the carbon skeleton and ammonium ion of amino acids. The urea cycle.

METABOLIC INTEGRATION

23. Metabolic interrelationship of tissues in various nutritional and hormonal states. (**Lecture**).

IX. NUCLEIC ACIDS.

24. Structure of nucleotides. Structure of DNA double helix. RNA structure and types.

25. Replication

26. Transcription.

27. Translation.

GENETICS:

G01 Genetics concept. Human chromosomes and gene transmission.

G02. Genetics of sex. Sexual differentiation of the embryo. Inactivation of X and its consequences.

G03. Monogenic inheritance models. Family analysis. Family trees. Dominance and recessivity. Autosomal inheritance and sex-linked inheritance. Factors that complicate inheritance patterns.

G04. Organization of the human genome. Genes and noncoding sequences. Genome and mitochondrial inheritance.

G05. Mutation. Types and consequences of mutations. Genetic bases of molecular pathology. Genetic diagnosis.

G06. Chromosomal abnormalities. Aneuploidies and chromosomal rearrangements.

G07. Genetic polymorphism. Clinical implications: normal variants and disease-causing variants. Genetic risk factors. Pharmacogenetics.

G08. Quantitative and multifactorial characters. Continuous variation. Genetic and environmental components; heritability. Congenital malformations. Disorders of adulthood.

G09. Cancer genetics. Oncogenes, tumor suppressors, and DNA repair genes. Epigenetic modifications. Clonal evolution. Cancer in families.

G10. Genetics of human populations. Gene and genotypic frequencies. Hardy-Weinberg Law. Inbreeding and consanguinity.

G11. Cranio-facial evolution in hominids

PRACTICAL WORK PROGRAMME:

1. Buffer solutions: Preparation of buffer solution and evaluation of its buffering capacity.
2. Enzyme Activity: Evaluation of the activity of tyrosinase.
3. On-line databases of Human Genetics. Obtaining the characteristics of a genetic syndrome. OMIM reference; locus, gene product, type of inheritance. Resources for molecular genetic diagnosis.

8. RECOMMENDED READING

1.- ESSENTIAL BIBLIOGRAPHY:

- Nelson D., Cox, M. (2017): "Principles of Biochemistry". 7th Edition. W. H. Freeman & Co. USA
- Voet, Berg J., Tymoczko J., Stryer L. (2015): "Biochemistry". 8th Edition. W. H. Freeman & Co. USA.
- Baynes, J.W; Dominiczak, (2018) M.H.: Medical Biochemistry. 5th edition. Ed. Elsevier.
- JORDE L.B., CAREY J.C. & BAMSHAD M.J. (2020) Medical genetics 6th edition. Elsevier.
- NUSSBAUM R.L., MCINNES R.R. & WILLARD H.F. (2016) Genetics in Medicine. 8th edition. Elsevier-Masson.

2.- ADDITIONAL BIBLIOGRAPHY:

- Devlin, T.M (2010): Textbook of Biochemistry with clinical correlations. 7th Ed. Wiley & Sons. Wiley-Liss. USA.
- Mathews, C., Van Holde, K., Ahern, K. (2018): "Biochemistry". 5th edition. Addison Wesley Longman, Inc. USA
- Voet, D., Voet, J. (2013): "Principles of Biochemistry". 4rd edition. Wiley International Edition. USA.
- Voet, D., Voet, J. (2011): "Biochemistry". 4th edition. Wiley International Edition. USA.
- PASSARGE E. (2006) Color Atlas of Genetics. Thieme.

3.- WEB RESOURCES:

Students' gateway with several documents and exercises in order to complement the contents of the seminars and lecture.

- <http://biomodel.uah.es/>
- <http://www.dnai.org>
- Online Mendelian Inheritance In Man: <http://www.omim.org/>
- Medline Plus: <http://www.nlm.nih.gov/medlineplus/>
- Orphanet: <http://www.orpha.net/>

9. ATTITUDE IN THE CLASSROOM

1.- REGULATIONS

Any irregular act of academic integrity (no reference to cited sources, plagiarism of work or inappropriate use of prohibited information during examinations) or signing the attendance sheet for fellow students not present in class will result in the student not being eligible for continuous assessment and possibly being penalized according to the University regulations.

The use of illegal systems during an examination by any means (physical or telematic ones), will be graded as "fail" with a mark of 0,0 in this examination. In addition, the Faculty will have the option to decide if the student has to be assessed orally in the next exam.

The use of electronic devices during the theoretical and practical classes is not allowed.

The use of documentation provided by the teacher through the Students' Portal (presentations, questions, exercises, seminars, practical workbooks) is restricted to the preparation of the subject. Teachers reserve the right to make use of the measures covered by the current Intellectual Property legislation, in cases of misuse and/or unauthorized disclosure of such material.

10. EXCEPTIONAL MEASURES

Should an exceptional situation occur which prevents continuing with face-to-face teaching under the conditions previously established to this end, the University will take appropriate decisions and adopt the necessary measures to guarantee the acquisition of skills and attainment of learning outcomes as established in this Course Unit Guide. This will be done in accordance with the teaching coordination mechanisms included in the Internal Quality Assurance System of each degree.