General information	
Academic subject	**Structural and Metabolic Biochemistry**
Degree course	Animal Science
Academic Year	2021/2022
European Credit Transfer and Accumulation System (ECTS)	6
Language	Italian
Academic calendar (starting and ending date)	II semester
Attendance	Mandatory

Professor/ Lecturer	
Name and Surname	Elisabetta Casalino
E-mail	elisabetta.casalino@uniba.it
Telephone	+39 80 5443864
Department and address	Veterinary Medicine Campus – Valenzano (BA)
Virtual headquarters	Teams platform, cod: **zitea26**
Tutoring (time and day)	Every day, from Monday to Friday, by appointment

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Syllabus	
Learning Objectives	The course aims to provide students with basic knowledge of the molecular components and the main metabolic pathways of the cell, correlated with the production of energy and its use, which contribute to the metabolic function of the cell and the whole organism.
Course prerequisites	Prerequisites: General and Inorganic Chemistry The student must also have acquired knowledge and skills relating to the general concepts of physics, especially thermodynamics, and cytology, with particular regard to the knowledge of the structure of the eukaryotic cell.
Contents	**Principles of organic chemistry**: Carbon chemistry. Isomerism. Functional consequences of isomerism. Aliphatic and aromatic hydrocarbons. Functional groups: chemical characteristics and reactivity. Alcohols. Carboxylic acids. Aldehydes and Ketones. Amines. Heterocyclic compounds. **Biochemistry of biological macromolecules**. Carbohydrates, Lipids, Nucleotides, Amino acids: structural aspects Proteins: Peptide bond and peptides, properties and functions. Primary, secondary, tertiary and quaternary structure of proteins. Haemoglobin and Myoglobin. **Enzymes and enzymatic catalysis**. Nature of enzymes. General concepts of enzymatic catalysis. Mechanism of enzymatic catalysis. Enzyme classification. Effectors and inhibitors of enzymatic activity. Regulation of enzymatic activity. Enzymes in food technology. **Bioenergetics and metabolism:** The thermodynamics of living matter. Compounds with a high energy level. Cellular energy charge and ATP reactions. Redox reactions of biological interest. **Oxidative phosphorylation**: The respiratory chain. Chemiosmotic theory of oxidative phosphorylation. Biological role of inhibitors and uncouplers. **Carbohydrate metabolism in species of veterinary interest** Glycolysis. Glycogenolysis and glycogenosynthesis. Gluconeogenesis. Cori cycle. Pentose-phosphate cycle. Regulation of carbohydrate metabolism. **Citric acid cycle:** The reactions of the cycle and their regulation. Anaplerotic reactions of the cycle.

U.O. Didattica e servizi agli studenti
Strada prov.le 62 per Casamassima, km. 3,00
70010 Valenzano (Bari) - Italy
Tel. (+39) 080 5443944-45-46 • fax (+39) 080 5443939
francesca.colaianni@uniba.it

	Lipid metabolism in species of veterinary interest: Beta-oxidation of fatty acids. Biosynthesis of fatty acids. Synthesis of ketone bodies **Protein metabolism in species of veterinary interest**: Protein turnover. Degradation of amino acids. Elimination of protein nitrogen in different animal species. Urea cycle **Rumen biochemistry**: Rumen metabolism of polysaccharides, nitrogenous substances and lipids. Rumen and animal metabolism: utilization of volatile fatty acids, proteins, amino acids, and lipids.
Books and bibliography	○ D'Andrea G. – Biochimica Essenziale – EdiSES, 2017 ○ Ferrier D.R. – Le basi della biochimica – Zanichelli Editore, 2014
Additional materials	Books can be supplemented by lecture notes and slides projected in class (available on the google drive platform)

Work schedule			
Total	Lectures	Hands on (Laboratory, working groups, seminars, field trips)	Out-of-class study hours/ Self-study hours
Hours			
150	60		90
ECTS			
6	*6*		

Teaching strategy	The theoretical part of the course takes place in classrooms equipped with PC, projector and internet connection, using power point slides.
Expected learning outcomes	
Knowledge and understanding on:	○ The student will have to know the structural and functional characteristics of biological macromolecules, as well as the fundamental concepts of cellular biochemistry, with particular reference to the knowledge more closely related to the veterinary and nutritional field.
Applying knowledge and understanding on:	○ The student must be able to correlate the metabolism of macromolecules with animal physiology, animal nutrition and welfare, animal productivity and dairy production
Soft skills	• *Making informed judgments and choices* ○ At the end of the course, student must be able to place the acquired knowledge in an interdisciplinary context that also allows them to operate in the field of veterinary nutrition and, in a broader sense, in the human and animal nutritional field • *Communicating knowledge and understanding* ○ The student must be able to present the acquired knowledge with the appropriate scientific terminology • *Capacities to continue learning* ○ The student must also be able to autonomously approach the update sources relating to the subject in question (databases, publications accredited nationally and internationally)

Assessment and feedback	
Methods of assessment	The assessment of knowledge takes place through an oral test.
Evaluation criteria	• *Knowledge and understanding* ○ The student will have to demonstrate to have acquired knowledge of the basic principles of organic chemistry, structural biochemistry and metabolic biochemistry.

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	• *Applying knowledge and understanding*
	  ○ The student should be able to correlate the role of macromolecules in cellular metabolic pathways in relation to the state of the organism as a whole.
	• *Autonomy of judgment*
	  ○ The student should be able to autonomously organize a broad speech illustrating a certain process using all the knowledge acquired.
	• *Communicating knowledge and understanding*
	  ○ the student must be able to present the knowledge acquired during the course using the appropriate terminology
	• *Communication skills*
	  ○ The student must be able to use the appropriate scientific terminology in a clear and simple way, understandable even to those who do not have in-depth knowledge of the subject
	• *Capacities to continue learning*
	  ○ The student must be able to correlate the knowledge acquired by integrating and harmonizing them with the concepts previously acquired in the other related disciplines (eg: physics, chemistry ...)

Criteria for assessment and attribution of the final mark	The final grade is expressed out of thirty. The exam is passed when the grade is greater than or equal to 18/30. Knowledge of all metabolic pathways is an essential requirement for passing the exam.
Additional information	

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