

**Code: 1664 Biochemistry****Degree:** 1<sup>st</sup> cycle - Biology**Curricular Year:** 1<sup>st</sup>**Credits:** 6 ECTS**Language:** Portuguese/English**Responsible:** Ricardo Manuel Seixas Boavida Ferreira**Other Lecturers:** Maria da Glória Calado Inglês Esquível and Sara Alexandra Valadas Silva Monteiro**Web Site:** <http://www.isa.utl.pt/home/node/3948>**Semester Course: 2<sup>nd</sup>  
Compulsory****1. Contact hours:****Lecture/Practicals 70 Others 14 Total 84****2. Objectives:**

To provide the students with the theoretical, basic fundamentals of Biochemistry, revealing how Chemistry and Thermodynamics constitute the basis for the function of biological systems.

**3. Programme:**

Introduction to Biochemistry.

Carbohydrates: monosaccharides, oligosaccharides and polysaccharides. The "third alphabet of life": the sugar code.

Lipids: main types. Isoprenoid compounds.

Amino acids, peptides and proteins. Protein amino acids, rare amino acids and nonprotein amino acids. Peptide bond.

Oligopeptides and polypeptides. Protein structure. Vitamins and coenzymes. Energy rich compounds and high energy bonds. Enzymology and enzyme kinetics: basic concepts and mechanisms of enzymatic catalysis. Allostery.

Hormones.

Introduction to Biochemistry of Metabolism.

Metabolism of carbohydrates. Glycolysis, gluconeogenesis and the pentose phosphate pathway. Oxidative decarboxylation of pyruvate, the citric acid cycle and the glyoxylate cycle. Substrate level phosphorylation. Mitochondrial electron transport chain and oxidative phosphorylation. Photosynthesis: phytochemical reactions and the Calvin cycle. Photophosphorylation.

Metabolism of lipids and fatty acids. Fatty acid catabolism:  $\beta$ -oxidation of fatty acids, Lynen helix. Fatty acid biosynthesis, Wakil helix.

Metabolism of amino acids and proteins. Catabolism: Protein half-life and turnover. Proteases. The ubiquitin-proteasome pathway and the lysosome/vacuolar pathways for protein degradation. Glucogenic and ketogenic amino acids. The urea cycle. Amonotelic, uricotelic and ureotelic animals. Biosynthesis: nitrogen and sulphur assimilation. Essential, non-essential and semi-essential amino acids. Protein synthesis.

The flow of energy in living organisms. Integration of metabolism. Bioenergetics of electron transport chains: their relation to human neurodegenerative diseases and to plant photo-oxidation.

**4. Bibliography:****Main Bibliography**

Voet D. and Voet J.G. (2004) Biochemistry. JohnWiley &amp; Sons, Inc.

Enciclopédia Luso-Brasileira de Cultura (1993-2004). Edição Século XXI, Editorial Verbo, Lisboa/São Paul

**Other Bibliography**

Texts prepared for the students, textbooks and copies of the power-point presentations.

**5. Assessment:**

It is compulsory a minimum attendance of 90% of the classes.

Evaluation:

- Continuous evaluation component (50%): reports from each practical class and presentations made by the students in topics to be agreed with the Professor;

- Tests or Final Exam (50%).

**6. Estimated Workload:**

168 Hours

**7. Last Update:**

25/2/2011