SSD: **BIO10**
Academic year: **2017/2018**
Faculty: **Department of Chemistry**
Study courses: **Biochemistry**
Study plans/Curricula: **Chemistry 1st level degree**
Type: ???????
Total Credits: **6**
Didactic Methods: **Lectures and laboratory**
Didactic Period: **3° year - 2° semester (March – June)**
Exam type: **Oral**
Professor in charge: **Marina Roberti**

Training objectives
Acquisition of knowledge on basic aspects of biochemistry such as: structure and function of proteins and biological membranes, general bioenergetic principles, fundamental metabolic strategies and major metabolic pathways. Acquiring theoretical-practical knowledge on some biochemical techniques. Acquisition of theoretical tools for the interpretation of biochemical processes.

Prerequisites
Basic knowledge of General Chemistry, Inorganic and Organic Chemistry

Didactic Methods
Classroom lectures with the help of PowerPoint presentations

Course programme
Lectures (40 h):
The molecular logic of living organisms. The Biomolecules.

Amino acids: chemical-physical properties. Proteins: primary structure and its determination methods. Secondary, tertiary and quaternary structure of proteins. Protein Purification.

Lipids: chemical-physical properties and classification. The biological membranes.

Relationships between protein structure and function: myoglobin and hemoglobin.

Enzymes: Nature, property, classification. Enzyme kinetics: meaning of Km, Vmax, Kcat; graph of Lineawever-Burk. Enzyme inhibition: Competitive, incompetitive and non-competitive. Factors that affect enzymatic activity. Enzyme regulation. Allosteric enzymes: molecular models. Isozymes. Main vitamins and coenzymes.

Enzymatic Dosage: direct and indirect methods of quantization of substrates and enzymatic activity.

Principle of bioenergetics: production, conservation and use of metabolic energy. General metabolic concepts and drawings. Transfer of phosphoric groups and ATP. ATP hydrolysis free energy.

Carbohydrate metabolism: aerobic and anaerobic glycolysis and its regulation. Glycogenolysis and glycogen synthesis and their regulation. Gluconeogenesis. Pentose phosphate cycle.

Lipid metabolism: Oxidation of saturated and unsaturated fatty acids of even and odd numbers of carbon atoms. Metabolism of ketone bodies. Fatty acid biosynthesis.

Amino Acid metabolism: amino acid reactions: transamination. Ammonia metabolism: ammonia generation, liver transplantation, urea cycle.

Terminal metabolism: structure and organization of mitochondria. Mitochondrial transport systems. Oxidative decarboxylation of pyruvic acid. Citric acid cycle. Mitochondrial electron transport chain: respiratory complexes, potential redox and transfer of reducing equivalents, inhibitors. Oxidative phosphorylation and chemiosmotic theory; uncoupling molecules. P/O ratio and respiratory control index. Energy yield of glucose and fatty acid oxidation.

Hints on the mechanisms of transfer of genetic information

Principles of some biochemical techniques.

<u>Laboratory (15 h):</u>
Practical introduction to the biochemical laboratory, protein dosage, substrate and enzymatic activity dosage, electrophoresis in denaturing and non-denaturing conditions

Reference Texts
Principi di Biochimica di Lehninger- Zanichelli