



The Goodman  
Faculty of Life Sciences  
Bar-Ilan University

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**Biochemistry II 80-202-01/10**

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**Academic year: 2021-2022 Semester: B Hours/credits: 4 hours / 2 credits**

**Mandatory**

**Prerequisites: Introduction to biochemistry, Biochemistry A**

**Year in program: 2<sup>nd</sup> year**

**Course Overview – Short abstract:**

This course teaches the biochemistry of energy metabolism and its underlying regulatory elements, including hormonal regulation. We mainly focus on Carbohydrate metabolism, Fat metabolism, protein synthesis and related metabolic disorders. Among the different topics are: (1) The generation of ATP - from the Krebs cycle to oxidative phosphorylation. The biological structure of the membrane and its function in transport and cell signaling. Catabolism of fats for the process of energy production and the formation of fatty acids; (2) Metabolism of nitrogenous compounds; ammonia consumption for the biogenesis of organic compounds containing nitrogen; synthesis of amino acids; degradation of proteins and amino acids; metabolism of porphyrins and neurotransmitters; nucleotide metabolism; (3) Understanding the major metabolic pathway in the body - gluconeogenesis. Reciprocity between the various organs in the body in relation to utilization and preservation of energy. The extracellular signaling pathways and hormones involved in these processes

**Assessment: Final test with multiple questions exam**

## Week-by-Week content, assignments and reading

Part	Subject
1. Dr. Moran Dvela	Introduction to Bioenergetics, Carbohydrates structure
	Glycoconjugates: function, importance to cellular biology and research strategies
	Introduction to cellular respiration, Lactic acid and Ethanol fermentation
	Glycolysis: main principles and reactions
	Glycolysis regulation, Pyruvate Dehydrogenase complex: reactions and regulation
	Krebs cycle: main principles and reactions
	Krebs cycle regulation and integration of the cellular respiration pathways
2. Dr. Nissan Yissachar	Oxidative phosphorylation and electron transport chain
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	Membrane structure and function: part 1
	Membrane structure and function: part 1 - continue
	Membrane structure and function: part 2
	Lipid biosynthesis (fat storage, lipoproteins trafficking in the circulation, fatty acids activation, carnitine transport, fatty acids oxidation)
	Lipid biosynthesis / lipid catabolism: Part 1
	Lipid catabolism: Part 2
3. Dr. Yoav Paz	Biosynthesis and recycling of nitrogen-containing compounds.
	Biogenesis of organic nitrogen and metabolism of amino acids.
	Metabolism of amino acids - <i>continuation</i> .
	Protein recycling and breakdown of amino acids; metabolism of the breakdown products of amino acids.
	Porphyrin metabolism, Heme, neurotransmitters, and nucleotides.
	Metabolism of nucleotides - <i>continuation</i> .
4. Prof. Eitan Okun	Gluconeogenesis: Substrates, enzymes, regulation
	Glycogen synthesis and breakdown

	The Cori and Ammonia cycles, Lactate metabolism
	Metabolic fueling of the brain. Caffeine and energy metabolism
	Coordinating energy utilization in different body organs, energy use under different physiological states such as exercise and fasting as well as pathologies such as diabetes. Mechanism of action of diabetes drugs
	Regulation of metabolism by Hormones, AMPK, mTOR, Sirtuins
	Signal transduction mechanisms of metabolism-related hormones, autophagy

**Required text:**

Textbook: Biochemistry, 4th Edition, Mathews C., van Holde K., Appling D. & Anthony-Cahill S.

**Part 1:** Most of the lecture topics are based on chapters 9, 13, and 14 of the course textbook; the rest is from articles distributed throughout the lectures.

**Part 2:** Chapters 10, 15, 18, and 19 of the course's textbook.

**Part 3:** Chapters 20-22 of the course's textbook.

**Part 4:** Chapters 16, 18, and 23 of the course's textbook.