

Course Description					
Name	Code	Semester	T+A Hour	Credit	ECTS
MOLECULAR CELL BIOLOGY and BIOCHEMISTRY	MKBD1121930	Fall Semester	4+0	4	10
Prerequisites Courses					
Recommended Elective Courses					
Language of Instruction	Turkish				
Course Level	Third Cycle (Doctorate Degree)				
Course Type	Elective				
Course Coordinator	Res.Assist. Feyza BAYRAMOĞLU				
Name of Lecturer(s)	Prof.Dr. Neslin EMEKLİ, Prof.Dr. Esra ÇAĞAVI, Assoc.Prof. Sultan Sibel ERDEM, Assist.Prof. Deniz DURALI, Assist.Prof. Kıvanç KÖK, Prof.Dr. Türkan YİĞİTBAŞI, Assist.Prof. Salih GENCER, Assist.Prof. Esra Nur YİĞİT, Res.Assist. Feyza BAYRAMOĞLU				
Assistant(s)	Prof.Dr.Nesrin Emekli, Prof.Dr.Türkan Yiğitbaşı, Prof.Dr.Gürkan Öztürk, Prof.Dr. Süleyman Yıldırım, Doç. Dr. Esra Çağavi, Dr.Öğr.Üyesi Sibel Erdem, Dr.Öğr.Üyesi Deniz Duralı				
Aim	The aim of this course is to provide an understanding of the structure and basic metabolic activities of the eukaryotic cell as a whole and with a multidisciplinary approach.				
Course Content	This course contains; Cell Mechanics, Cytoskeleton and Motor Proteins, Interaction with ECM,Cell Cycle, Mitosis, Meiosis and Cancer,Cell survival and death mechanisms, Apoptosis, Necrosis, Autophagy and Aging,Signal transmission mechanisms,Cell Regeneration and Differentiation, Stem Cell and Tissue Repair,Cell Biochemistry,Carbohydrates,Lipids,Proteins and Nucleic Acids,Cell Energy Metabolism, Mitochondria, Cancer and Hunger,Human Microbiome and Taxonomy, Identification of Microorganisms, Immune Organs,Natural Immunity and Its Components, Phases of Immune Response,Acquired Immunity and Its Components,Complement System, Autoimmunity and Viruses.				
Course Learning Outcomes			Teaching Methods	Assessment Methods	
1-Cell Mechanics, Cytoskeleton and Motor Proteins, Interaction with ECM (Prof. Dr. Gürkan Öztürk)			10, 11, 16, 19, 6, 9	A, D, E	
1.1.Explains the importance of cell mechanics, cellular formations and their functions.			10, 11, 16, 19, 6, 9	A, D, E	
1.2.Explains the proteins that form the cytoskeleton and their cellular functions.			10, 11, 16, 19, 6, 9	A, D, E	
1.3.Defines the motor proteins associated with the cytoskeleton and their functions.			10, 11, 16, 19, 6, 9	A, D, E	
1.4.Explains the structure and functions of structural and adhesive extracellular matrix components with examples.			10, 11, 16, 19, 6, 9	A, D, E	
2-Cell Cycle, Mitosis, Meiosis and Cancer (Assoc. Prof. Dr. Esra Çağavi)			10, 11, 16, 19, 6, 9	A, D, E	
2.1.Defines the stages of the cell cycle in eukaryotic cells.			10, 11, 16, 19, 6, 9	A, D, E	
2.2.Explains the molecular mechanisms of cyclins and cyclin-dependent kinases that control the cell cycle.			10, 11, 16, 19, 6, 9	A, D, E	
2.3.Mitoz ve mayoz bölünmenin evrelerini tanımlar.			10, 11, 16, 19, 6, 9	A, D, E	
2.4.Explains the molecular mechanisms of cancer and the stages of metastasis.			10, 11, 16, 19, 6, 9	A, D, E	
2.5.Explains the basic principles of cancer formation, progression and treatment with examples.			10, 11, 16, 19, 6, 9	A, D, E	
3- Cell survival and death mechanisms, Apoptosis, Necrosis, Autophagy and Aging (Dr. Lecturer Turan Demircan)			10, 11, 16, 19, 6, 9	A, D, E	
3.1.Hücre sağkalm ve ölüm mekanizmalarını açıklar			10, 11, 16, 19, 6, 9	A, D, E	
3.2.Explains the mechanism of apoptosis, organelles, enzymes and molecular steps of apoptosis.			10, 11, 16, 19, 6, 9	A, D, E	
3.3.Defines necrotic death and compares it with apoptotic death.			10, 11, 16, 19, 6, 9	A, D, E	
3.4.Explains the mechanism of autophagy and the diseases it is associated with with examples.			10, 11, 16, 19, 6, 9	A, D, E	
3.5.Defines the intra- and extracellular mechanisms and factors effective in cell aging.			10, 11, 16, 19, 6, 9	A, D, E	
4-Signal transmission mechanisms (Prof. Dr. Gürkan Öztürk)			10, 11, 16, 19, 6, 9	A, D, E	
4.1.Explains the molecular principles of signal transmission.			10, 11, 16, 19, 6, 9	A, D, E	
4.2.Explains the mechanism of signal transduction mediated by G-protein coupled receptors (GPCR).			10, 11, 16, 19, 6, 9	A, D, E	
4.3.Explains the mechanism of receptor tyrosine kinase (RTK)-mediated signal transduction.			10, 11, 16, 19, 6, 9	A, D, E	
5-Cell Regeneration and Differentiation, Stem Cell and Tissue Repair (Assoc. Prof. Dr. Esra Çağavi)			10, 11, 16, 19, 6, 9	A, D, E	
5.1.Defines intracellular and extracellular factors that play a role in cell renewal			10, 11, 16, 19, 6, 9	A, D, E	
5.2.Defines stem cells according to embryonic and adult origin and explains with examples.			10, 11, 16, 19, 6, 9	A, D, E	
5.3.Explains the production and characterization of induced pluripotent stem cells and their usage areas in the laboratory.			10, 11, 16, 19, 6, 9	A, D, E	
5.4.Interprets stem cell applications in tissue engineering and repair.			10, 11, 16, 19, 6, 9	A, D, E	
6- Cell Biochemistry (Prof. Dr. Nesrin Emekli)			10, 11, 16, 19, 6, 9	A, D, E	
6.1.Explains the entry of dietary nutrients into enterocytes.			10, 11, 16, 19, 6, 9	A, D, E	
6.2.Explains that resynthesis occurs in enterocytes.			10, 11, 16, 19, 6, 9	A, D, E	
6.3.Explains energy production from exogenous and endogenous molecules.			10, 11, 16, 19, 6, 9	A, D, E	
6.5.Explains the synthesis, degradation and metabolism of molecules that will take part in various reactions.			10, 11, 16, 19, 6, 9	A, D, E	
7- Carbohydrates (Prof.Dr.Nesrin Emekli)			10, 11, 16, 19, 6, 9	A, D, E	
7.1.Can question the metabolic pathway of carbohydrates			10, 11, 16, 19, 6, 9	A, D, E	
7.2.Explain the fate of glucose in the blood and glycemic control.			10, 11, 16, 19, 6, 9	A, D, E	
8- Lipids (Prof.Dr.Türkan Yiğitbaşı)			10, 11, 16, 19, 6, 9	A, D, E	
8.1.Explains the structure and properties of lipids			10, 11, 16, 19, 6, 9	A, D, E	
8.2.Explains the properties and importance of fatty acids.			10, 11, 16, 19, 6, 9	A, D, E	
8.3.Explains essential fatty acids and their role in cardiac diseases.			10, 11, 16, 19, 6, 9	A, D, E	
8.4.Explains the importance of lipoproteins.			10, 11, 16, 19, 6, 9	A, D, E	
8.5.Explains the importance of apoproteins in lipid metabolism.			10, 11, 16, 19, 6, 9	A, D, E	
8.6.Explains alcohols esterified with fatty acids.			10, 11, 16, 19, 6, 9	A, D, E	
8.8.Explains the importance of lipids in energy metabolism			10, 11, 16, 19, 6, 9	A, D, E	
9- Proteins and Nucleic Acids (Assoc. Prof. Dr. Sibel Erdem)			10, 11, 16, 19, 6, 9	A, D, E	
9.1.Explains the structure and properties of Nucleic Acids			10, 11, 16, 19, 6, 9	A, D, E	

Course Learning Outcomes		Teaching Methods	Assessment Methods
9.3.Explains the steps of purine and pyrimidine synthesis and their activation and inhibition.		10, 11, 16, 19, 6, 9	A, D, E
9.4.Explains the degradation of purine and pyrimidine bases and related pathologies.		10, 11, 16, 19, 6, 9	A, D, E
10-Cell Energy Metabolism, Mitochondria, Cancer and Fasting (Prof. Dr. Türkan Yiğitbaşı)		10, 11, 16, 19, 6, 9	A, D, E
10.1.Explain that cancer cell energy metabolism is different from the normal cells.		10, 11, 16, 19, 6, 9	A, D, E
10.2.Explains the Warburg effect.		10, 11, 16, 19, 6, 9	A, D, E
10.3.Explains the mechanisms by which cancer cells use excess glucose.		10, 11, 16, 19, 6, 9	A, D, E
10.4.Explain the role of Hypoxia inducible factor-1 alpha (HIF-1 α) in the metabolism of cancer cells.		10, 11, 16, 19, 6, 9	A, D, E
11-Human Microbiome and Taxonomy, Identification of Microorganisms, Immune Organs (Prof. Dr. Süleyman Yıldırım, Ass. Prof. Dr. Deniz Duralı)		10, 11, 16, 19, 6, 9	A, D, E
12-Innate Immunity and Its Components, Phases of the Immune Response, (Prof. Dr. Süleyman Yıldırım, Ass. Prof. Dr. Deniz Duralı)		10, 11, 16, 19, 6, 9	A, D, E
13-Adaptive Immunity and Its Components (Prof. Dr. Süleyman Yıldırım, Ass. Prof. Dr. Deniz Duralı)		10, 11, 16, 19, 6, 9	A, D, E
14-Complement System, Autoimmunity and Viruses (Prof. Dr. Süleyman Yıldırım, Ass. Prof. Dr. Deniz Duralı)		10, 11, 16, 19, 6, 9	A, D, E
6.4. Explains detoxification of metabolites (urea synthesis, H ₂ O ₂ etc.).		10, 11, 16, 19, 6, 9	A, D, E
7.3. Explains the ways of producing energy from glucose		10, 11, 16, 21, 6, 9	A, D, E
7.4. Explains the ways of converting glucose into other molecules and other molecules into glucose		10, 11, 16, 19, 6, 9	A, D, E
7.5. Explains the importance of carbohydrates in energy metabolism		10, 11, 16, 19, 6, 9	A, D, E
8.7. Questions the importance of lipid metabolism disorders and lipids in the development of atherosclerosis.		10, 11, 16, 19, 6, 9	A, D, E
9.2. Explains the denova synthesis of purine and pyrimidine bases and the drug metabolisms that act by inhibiting the synthesis.		10, 11, 16, 19, 6, 9	A, D, E
Teaching Methods	10: Discussion Method, 11: Demonstration Method, 16: Question - Answer Technique, 19: Brainstorming Technique, 21: Simulation Technique, 6: Experiential Learning, 9: Lecture Method		
Assessment Methods	A: Traditional Written Exam, D: Oral Exam, E: Homework		
Lecture Schedule			
Sequence	Topics	Preliminary Preparation	
1	Cell Mechanics, Cytoskeleton and Motor Proteins, Interaction with ECM		
2	Cell Cycle, Mitosis, Meiosis and Cancer	source 4	
3	Cell survival and death mechanisms, Apoptosis, Necrosis, Autophagy and Aging		
4	Signal transmission mechanisms		
5	Cell Regeneration and Differentiation, Stem Cell and Tissue Repair	source 4	
6	Cell Biochemistry	1, 2, 3	
7	Carbohydrates	1, 2, 3	
8	Lipids	1, 2, 3	
9	Proteins and Nucleic Acids	1, 2, 3	
10	Cell Energy Metabolism, Mitochondria, Cancer and Hunger	1, 2, 3	
11	Human Microbiome and Taxonomy, Identification of Microorganisms, Immune Organs		
12	Natural Immunity and Its Components, Phases of Immune Response		
13	Acquired Immunity and Its Components		
14	Complement System, Autoimmunity and Viruses		
Evaluation Methods		Weight(%)	
Midterm Exam		50	
General Exam		50	

Resources	
1. Yiğitbaşı T, Emekli N. Biyokimya Laboratuvarı. İstanbul Medipol Üniversitesi, Yayınları, Akademi Basın Yayın, İstanbul 2013.	
2. Emekli N. Temel ve Uygulamalı Biyokimya, 4. Baskı. Akademi Basın Yayın, İstanbul 2006.	
3. Marks Basic Medical Biochemistry A Clinical Approach. Lieberman M, Marks, AD. Lippincott Williams Wilkins.	
4. Güneş HV, Moleküler Hücre Biyolojisi, 5. Baskı, İstanbul Tıp Kitabevi, 2018. Internet database.	