

## GENEL TANIM / GENERAL DESCRIPTION

Ders Adı / Course Name	BIOCHEMISTRY-I / BIOCHEMISTRY-I	
Ders Kodu / Course Code	BKM202	
Ders Türü / Course Type		
Ders Seviyesi / Course Level	First Cycle / First Cycle	
Ders Akts Kredi / ECTS	6.00	
Haftalık Ders Saati (Kuramsal) / Course Hours For Week (Theoretical)	4.00	
Haftalık Uygulama Saati / Course Hours For Week (Objected)	0.00	
Haftalık Laboratuvar Saati / Course Hours For Week (Laboratory)	0.00	
Dersin Verildiği Yıl / Year	2	
Öğretim Sistemi / Teaching System	Face to Face / Face to Face	
Eğitim Dili / Education Language	Turkish / Turkish	
Ön Koşulu Olan Ders(ler) / Precondition Courses	Yok	None
Amacı / Purpose	Biyolojik bilimlerde büyük reformlar gerçekleşmektedir ve biyokimya bu gelişmelerin başında yer almaktadır. Biyokimya I dersi ile canlı materyalin yapı, organizasyon ve fonksiyonu hakkında moleküler düzeyde bilgi sağlamak temel hedeftir. Bu giriş dersinde; biyolojik bileşenlerin kimyası ve biyolojik fonksiyon ile ilişkilendirilmesi ve biyolojik enformasyon hakkında temel bilgilerin verilmesi amaçlanmıştır.	Biochemistry seeks to describe the structure, organization and functions of living matter in molecular level. The aim of this introduction course of biochemistry is to explain the structural chemistry of the components of living matter and the relationship of the biological function to chemical structure, the chemistry of processes and substances that store and transmit biological information.
İçeriği / Content	Biyokimyaya giriş, biyolojik sistemlerde yapılanmalar, Biyomoleküllerin yapı ve fonksiyonları; Aminoasitler, peptidler, proteinler, enzim, koenzimler, nükleik asitler, biyokimyasal evrim, protein sentezi(DNA replikasyonu, transkripsiyon ve translasyon) protein katlanması ve post-translasyonel modifikasyonlar detaylı olarak anlatılmaktadır.	Introduction to Biochemistry, Structure and function of biomolecules; Amino acids, peptides, proteins, enzymes, coenzymes, nucleic acids, biochemical evolution, Protein synthesis (DNA replication, transcription and translation), protein folding, post-tranlational modifications
Önerilen Diğer Hususlar / Recommended Other Considerations	Yok	None
Staj Durumu / Internship Status	Yok	None
Kitabı / Malzemesi / Önerilen Kaynaklar / Books / Materials / Recommended Reading	Lehninger Principles of Biochemistry”, 5 th Edn. Palgrave Macmillan, (2008) Voet D., Fundamentals of Biochemistry: Life at the molecular Level.(2008) Horton R., Principles of Biochemistry, Prentis Hall (2005) Boyer R. Interactive Concepts in Biochemistry 2/e, Wiley (2008)	Lehninger Principles of Biochemistry”, 5 th Edn. Palgrave Macmillan, (2008) Voet D., Fundamentals of Biochemistry: Life at the molecular Level.(2008) Horton R., Principles of Biochemistry, Prentis Hall (2005) Boyer R. Interactive Concepts in Biochemistry 2/e, Wiley (2008)
Öğretim Üyesi (Üyeleri) / Faculty Member (Members)	Prof.Dr. Ali KILINÇ	Prof.Dr. Ali KILINÇ

## ÖĞRENME ÇIKTILARI / LEARNING OUTCOMES

1	Canlı sistemlerdeki Biyomoleküllerin temel bilgilerini kullanabilme becerisi	Possess a general knowledge of the major types of biomolecules, including small, large and supermolecular components found in living cells.
2	Biyomoleküllerin yapı, fonksiyon ve organizmal fonksiyonlarını anlayabilme	Understand the structure and function of the basic biomolecules in living cells and the roles in cellular and organismal function.
3	Farklı biyomolekülleri tanıyabilme ve yaşam için vazgeçilmez özelliklerini anlayabilme becerisi	Be able to recognize the different types of biomolecules and know their essential characteristics and molecular stability that make them indispensable for life
4	Genetik bilgi depolanması, aktarımı ve gen ekspresyonunu regülasyonunu kavrayabilme	Able to be familiar with many details of information storage, expression and regulation of gene expression
5	Biyolojik proseslerdeki reaksiyon mekanizmalarını anlayabilme	Gain understanding the reaction mechanisms in biochemical processes; structure and operation of enzymes and coenzymes.

## HAFTALIK DERS İÇERİĞİ / DETAILED COURSE OUTLINE

Hafta / Week					
	Teorik Dersler / Theoretical	Uygulama	Lab	Öğretim Yöntem ve Teknikleri/Teaching Methods Techniques	Ön Hazırlık / Preliminary
1	Scope of Biochemistry, Weak interactions in an aqueous medium; the nature of non-covalent interactions, the role of water in Biological processes, Interactions of macroions in solution		Preparation of solutions and Buffers		
	Scope of Biochemistry, Weak interactions in an aqueous medium; the nature of non-covalent interactions, the role of water in Biological processes, Interactions of macroions in solution		Preparation of solutions and Buffers		
2	Amino acids; structure/stereochemistry of amino acids, Classification and properties of side chains of amino acids, essential amino acids, ionization of amino acids and isoelectric point, amino acid reactions and amino acid composition analysis.		Qualitative and quantitative analysis of amino acids, Discussion, Report preparation		
	Amino acids; structure/stereochemistry of amino acids, Classification and properties of side chains of amino acids, essential amino acids, ionization of amino acids and isoelectric point, amino acid reactions and amino acid composition analysis.		Qualitative and quantitative analysis of amino acids, Discussion, Report preparation		
3	Peptides; classification and nomenclature, peptide bond and structure, stability and formation of peptide bond, conformations, rotations, peptides as polyampholytes, Basics of peptide structure analysis; N-, C- terminal analysis; Sanger and Edman Degredation Method, Peptide synthesis: Merrifield Method, Biologically active peptides.		Determination of Isoelectric point of amino acids, Discussion, Report preparation		
	Peptides; classification and nomenclature, peptide bond and structure, stability and formation of peptide bond, conformations, rotations, peptides as polyampholytes, Basics of peptide structure analysis; N-, C- terminal analysis; Sanger and Edman Degredation Method, Peptide synthesis: Merrifield Method, Biologically active peptides.		Determination of Isoelectric point of amino acids, Discussion, Report preparation		
4	Proteins; Functional and structural classification, Organization of protein structure, Primary structure: nature of protein sequences, Secondary structure: helices and plated sheets, stability, $\beta$ -turn, random coil, characteristics, ramachandran plots, Super secondary structure; common protein motifs and domains.		Quantitative analysis of proteins; Lowry and Biure, Discussion, Report preparation		
	Proteins; Functional and structural classification, Organization of protein structure, Primary structure: nature of protein sequences, Secondary structure: helices and plated sheets, stability, $\beta$ -turn, random coil, characteristics, ramachandran plots, Super secondary structure; common protein motifs and domains.		Quantitative analysis of proteins; Lowry and Biure, Discussion, Report preparation		

	Teorik Dersler / Theoretical	Uygulama	Lab	Öğretim Yöntem ve Teknikleri/Teaching Methods Techniques	Ön Hazırlık / Preliminary
5	Tertiary structure; Factors effecting tertiary structure formation, Thermodynamics of protein folding, Charperones, Denaturation Quaternary structures: multimeric structures, Fibrous proteins; fibroin, keratin, collagen, elastin, Preview of protein isolation and purification.		N-Terminal analysis of peptides and proteins; Dansyl Method. 2D-TLC, Tutorial Study questions, Discussion, Report preparation		
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6	Teorik Dersler / Theoretical	Uygulama	Lab	Öğretim Yöntem ve Teknikleri/Teaching Methods Techniques	Ön Hazırlık / Preliminary
	Protein Function: Oxygen transport and storage; Hemoglobin/Myoglobin, cooperative binding and allostery, Models for the allosteric change in Hemoglobin, Effects of other ligands on the allosteric behaviour, Bohr effect, Immunoglobulins; Antigenes and antibodies, Proteins in motion.		Enzyme assays; Determination of $\alpha$ - amylase activity Effect of substrate concentration, Discussion, Report preparation		
	Protein Function: Oxygen transport and storage; Hemoglobin/Myoglobin, cooperative binding and allostery, Models for the allosteric change in Hemoglobin, Effects of other ligands on the allosteric behaviour, Bohr effect, Immunoglobulins; Antigenes and antibodies, Proteins in motion.		Enzyme assays; Determination of $\alpha$ - amylase activity Effect of substrate concentration, Discussion, Report preparation		
7	Teorik Dersler / Theoretical	Uygulama	Lab	Öğretim Yöntem ve Teknikleri/Teaching Methods Techniques	Ön Hazırlık / Preliminary
	Enzymes; Terminology, classification and properties, principles of catalysis, kinetics of enzyme catalysis and kinetic parameters, enzyme inhibition, regulation of enzyme activity, Enzyme catalysis mechanisms, Ribozymes, Catalytic antibodies, Industrial and medical applications of Enzymes.		Determination of kinetic constants; Michaelis-Menten Lineweaver-Burk plots, Effect of pH and temperature, Discussion, Report preparation		
	Enzymes; Terminology, classification and properties, principles of catalysis, kinetics of enzyme catalysis and kinetic parameters, enzyme inhibition, regulation of enzyme activity, Enzyme catalysis mechanisms, Ribozymes, Catalytic antibodies, Industrial and medical applications of Enzymes.		Determination of kinetic constants; Michaelis-Menten Lineweaver-Burk plots, Effect of pH and temperature, Discussion, Report preparation		
8	Teorik Dersler / Theoretical	Uygulama	Lab	Öğretim Yöntem ve Teknikleri/Teaching Methods Techniques	Ön Hazırlık / Preliminary
	Midterm exam		Tutorial Study questions, Tutorial problem discussion		
	Midterm exam		Tutorial Study questions, Tutorial problem discussion		

	Teorik Dersler / Theoretical	Uygulama	Lab	Öğretim Yöntem ve Teknikleri/Teaching Methods Techniques	Ön Hazırlık / Preliminary
9	Coenzymes, vitamins and Essential metals; Coenzymes/cofactors, classification: structures of metabolite and vitamin derived coenzymes, necessity for enzyme function, protein coenzymes, Vitamins as essential precursors, water and lipid soluble vitamins.		Tutorial Study questions, Tutorial problem discussion		
	Coenzymes, vitamins and Essential metals; Coenzymes/cofactors, classification: structures of metabolite and vitamin derived coenzymes, necessity for enzyme function, protein coenzymes, Vitamins as essential precursors, water and lipid soluble vitamins.		Tutorial Study questions, Tutorial problem discussion		
	Teorik Dersler / Theoretical	Uygulama	Lab	Öğretim Yöntem ve Teknikleri/Teaching Methods Techniques	Ön Hazırlık / Preliminary
10	Nucleic acids; The nature of nucleic acids, Primary, secondary and tertiary structure of nucleic acids; base pairing, double helices, circular DNA and super coiling, Denaturation / renaturation of DNA, DNA melting point, Principles of nucleic acid sequencing; Maxam-Gilbert and Sanger Method.		DNA isolation and quantification by spectrophotometry and DNA electrophoresis		
	Nucleic acids; The nature of nucleic acids, Primary, secondary and tertiary structure of nucleic acids; base pairing, double helices, circular DNA and super coiling, Denaturation / renaturation of DNA, DNA melting point, Principles of nucleic acid sequencing; Maxam-Gilbert and Sanger Method.		DNA isolation and quantification by spectrophotometry and DNA electrophoresis		
	Teorik Dersler / Theoretical	Uygulama	Lab	Öğretim Yöntem ve Teknikleri/Teaching Methods Techniques	Ön Hazırlık / Preliminary
11	Biological Functions of Nucleic acids; Preview of Molecular Biology; genetic information storage; Genome, central dogma, Preview of molecular biology terminology ; recombinant DNA, PCR, restriction enzymes, Southern blotting, Genetic variations, detection of mutations		PCR(DNA amplification)		
	Biological Functions of Nucleic acids; Preview of Molecular Biology; genetic information storage; Genome, central dogma, Preview of molecular biology terminology ; recombinant DNA, PCR, restriction enzymes, Southern blotting, Genetic variations, detection of mutations		PCR(DNA amplification)		
	Teorik Dersler / Theoretical	Uygulama	Lab	Öğretim Yöntem ve Teknikleri/Teaching Methods Techniques	Ön Hazırlık / Preliminary
12	Protein Biosynthesis; Preview of gene expression, Replication; semiconservative replication, mechanisms and enzymes involved in replication, Telomers and telomerases, DNA damage and repair, mutations Transcription;genes and operons, initiation of transcription, regulation of transcription, introns, exons, RNA processing; capping, splicing, polyadenylation.		Agarose Gel Electrophoresis Evaluation of results Discussion, Report preparation		
	Protein Biosynthesis; Preview of gene expression, Replication; semiconservative replication, mechanisms and enzymes involved in replication, Telomers and telomerases, DNA damage and repair, mutations Transcription;genes and operons, initiation of transcription, regulation of transcription, introns, exons, RNA processing; capping, splicing, polyadenylation.		Agarose Gel Electrophoresis Evaluation of results Discussion, Report preparation		
	Teorik Dersler / Theoretical	Uygulama	Lab	Öğretim Yöntem ve Teknikleri/Teaching Methods Techniques	Ön Hazırlık / Preliminary

	Teorik Dersler / Theoretical	Uygulama	Lab	Öğretim Yöntem ve Teknikleri/Teaching Methods Techniques	Ön Hazırlık / Preliminary
13	Translation: genetic code, code/anti code interaction, Wobble hypothesis and base pairs, Activation, initiation, elongation and termination, Control of protein synthesis, Mitochondrial protein synthesis, Post-translational modifications, Proteolytic processing, Protein turnover and protein degradation systems.		Tutorial Study questions, Tutorial problem discussion		
	Translation: genetic code, code/anti code interaction, Wobble hypothesis and base pairs, Activation, initiation, elongation and termination, Control of protein synthesis, Mitochondrial protein synthesis, Post-translational modifications, Proteolytic processing, Protein turnover and protein degradation systems.		Tutorial Study questions, Tutorial problem discussion		
14	Teorik Dersler / Theoretical	Uygulama	Lab	Öğretim Yöntem ve Teknikleri/Teaching Methods Techniques	Ön Hazırlık / Preliminary
	Tutorial problem discussion				
	Tutorial problem discussion				
15	Teorik Dersler / Theoretical	Uygulama	Lab	Öğretim Yöntem ve Teknikleri/Teaching Methods Techniques	Ön Hazırlık / Preliminary
	Tutorial problem discussion				
	Tutorial problem discussion				
16	Teorik Dersler / Theoretical	Uygulama	Lab	Öğretim Yöntem ve Teknikleri/Teaching Methods Techniques	Ön Hazırlık / Preliminary
	Final exam				
	Final exam				

## DEĞERLENDİRME / EVALUATION

Yarıyıl (Yıl) İçi Etkinlikleri / Term (or Year) Learning Activities	Sayı / Number	Katkı Yüzdesi / Percentage of Contribution (%)
Ara Sınav / Midterm Examination	1	75
Laboratuvar / Laboratory	1	25
Toplam / Total:	2	100
Başarı Notuna Katkı Yüzdesi / Contribution to Success Grade(%):		40
Yarıyıl (Yıl) Sonu Etkinlikleri / End Of Term (or Year) Learning Activities	Sayı / Number	Katkı Yüzdesi / Percentage of Contribution (%)
Final Sınavı / Final Examination	1	100
Toplam / Total:	1	100
Başarı Notuna Katkı Yüzdesi / Contribution to Success Grade(%):		60
Etkinliklerinin Başarı Notuna Katkı Yüzdesi(%) Toplamı / Total Percentage of Contribution (%) to Success Grade:		100
Değerlendirme Tipi / Evaluation Type:		

İŞ YÜKÜ / WORKLOADS

Etkinlikler / Workloads	Sayı / Number	Süresi (Saat) / Duration (Hours)	Toplam İş Yüğü (Saat) / Total Work Load (Hour)
Laboratuvar / Laboratory	13	3.00	39.00
Rehberli Problem Çözümü / Tutorial	6	2.00	12.00
Quiz / Quiz	10	1.00	10.00
Final Sınavı / Final Examination	1	2.00	2.00
Derse Katılım / Attending Lectures	14	4.00	56.00
Takım/Grup Çalışması / Team/Group Work	10	3.00	30.00
Deney / Experiment	10	3.00	30.00
Ara Sınav / Midterm Examination	1	2.00	2.00
Rapor Hazırlama / Report Preparation	8	1.00	8.00
<b>Toplam / Total:</b>	<b>73</b>	<b>21.00</b>	<b>189.00</b>
<p>Dersin AKTS Kredisi = Toplam İş Yüğü (Saat) / 30.00 (Saat/AKTS) = 189.00/30.00 = 6.30 ~ / Course ECTS Credit = Total Workload (Hour) / 30.00 (Hour / ECTS) = 189.00 / 30.00 = 6.30 ~</p>			



PROGRAM VE ÖĞRENME ÇIKTISI / PROGRAM LEARNING OUTCOMES

Öğrenme Çıktıları / Learning Outcomes	Program Çıktıları / Program Outcomes														
	1.1.1	1.1.2	1.1.3	1.1.4	1.1.5	1.1.6	1.1.7	1.1.8	1.1.9	1.1.10	1.1.11	1.1.12	1.1.13	1.1.14	1.1.15
1.Canlı sistemlerdeki Biyomoleküllerin temel bilgilerini kullanabilme becerisi / Possess a general knowledge of the major types of biomolecules, including small, large and supermolecular components found in living cells.	5	5				5		5		5	5		4		
2.Biyomoleküllerin yapı, fonksiyon ve organizmal fonksiyonlarını anlayabilme / Understand the structure and function of the basic biomolecules in living cells and the roles in cellular and organismal function.	5		5				4	4	4	5	5	4		4	4
3.Farklı biyomolekülleri tanıyabilme ve yaşam için vazgeçilmez özelliklerini anlayabilme becerisi / Be able to recognize the different types of biomolecules and know their essential characteristics and molecular stability that make them indispensable for life	5			4	5				4	4	5	4	4		
4.Genetik bilgi depolanması, aktarımı ve gen ekspresyonunu regülasyonunu kavrayabilme / Able to be familiar with many details of information storage, expression and regulation of gene expression	5	4	4		4	5	3	4	4	4	5		4		
5.Biyolojik proseslerdeki reaksiyon mekanizmalarını anlayabilme / Gain understanding the reaction mechanisms in biochemical processes; structure and operation of enzymes and coenzymes.	5					4					5			4	3

Katkı Düzeyi / Contribution Level : 1-Çok Düşük / Very low, 2-Düşük / Low, 3-Orta / Moderate, 4-Yüksek / High, 5-Çok Yüksek / Very high