BAU TIP

BAHÇEŞEHİR UNIVERSITY SCHOOL OF MEDICINE

"scientia et amore vitae"

BAHÇEŞEHİR UNIVERSITY

SCHOOL OF MEDICINE

CLASS 1

ACADEMIC PROGRAMME

2026-2027

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BAHÇEŞEHİR ÜNİVERSİTESİ TIP FAKÜLTESİ
"scientia et amore vitae"

Dean	Adnan Kaya, Prof.
Vice Dean	Timuçin Avşar, Assoc. Prof.
Head Coordinator	Özlem Unay Demirel, Assoc. Prof.
Class 1 Coordinator	Betül Şahin, Assist. Prof.

FIRST YEAR					
1. Semester					
CODE	**COURSE**				
ENG1003	Communication Skills and Academic Reporting	2	2	3	4
MED1105	History of Medicine and Ethics I	2	0	2	6
MED1001	Philosophy of Science			2	6
TMED1100	Normal Structure and Function of the Human Body				
MED1101	Molecular and Cellular Basis of Tissue and Organ Systems	6	4	8	12
MED1102	Musculoskeletal Systems	6	4	8	12
		18	**10**	**23**	**40**
2. Semester					
CODE	**COURSE**				
ENG1004	Communication Skills and Academic Reporting II	2	2	3	4
MED1106	History of Medicine and Ethics II	2	0	2	6
MED1002	Bioistatistics			2	6
TMED1100	Normal Structure and Function of the Human Body				
MED1103	Cardiovascular, Respiratory Systems, and Blood	6	4	8	12
MED1104	Gastrointestinal Systems	6	4	8	12
		18	**10**	**23**	**40**

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"scientia et amore vitae"

	COURSE 1 / MED1101		COURSE 2 / MED1102		COURSE 3 / MED1103		COURSE 4 / MED1104		
	T	P	T	P	T	P	T	P	
Anatomy	0	0	53	32	25	14	13	8	145
Medical Education	-	-	6	-	12	-	6	-	18
Biophysics	21	1	8	1	10	1	1	1	44
Biochemistry	20	2	9	0	5	2	33	0	71
Histology and Embryology	25	8	7	2	12	4	12	9	79
Medical Biology	34	4	-	-	-	-	-	-	38
Medical Microbiology	3	0	-	-	-	-	-	-	3
Physiology	12	3	12	3	26	6	15	0	77
Clinical Skills	4	3	1	1	1	1	2	4	17
Communication Skills in Medicine	8								8
TOTAL	**119**	**21**	**93**	**40**	**88**	**27**	**82**	**22**	**498**
STUDY TIME	**81**		**160**		**92**		**170**		**503**
History of Medicine and Ethics	12		12		16		8		48
Philosophy of Science	12		12		-		-		24
Biostatistics	-		-		16		8		24
Communication Skills and Academic Reporting	24		28		28		20		100

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BAHÇEŞEHİR ÜNİVERSİTESİ TIP FAKÜLTESİ
"scientia et amore vitae"

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"scientia et amore vitae"

BAHCESEHIR UNIVERSITY SCHOOL OF MEDICINE 2026 – 2027 ACADEMIC CALENDAR FOR THE FIRST YEAR	
2026 – 2027 ACADEMIC YEAR FALL SEMESTER	
September 14, 2026, Monday	Orientation Program
September 14, 2026 – November 5, 2026	Committee 1 – Molecular and Cellular Basis of Tissue and Organ Systems
November 6, 2026, Friday	1st Block Committee Exam
November 9, 2026 – January 14, 2027	Committee 2 – Musculoskeletal Systems
December, 14-27, 2026	Final Exams for Communication Skills and Academic Reporting, History of Medicine and Ethics I, Philosophy of Science
January 15, 2027, Friday	2nd Block Committee Exam
February 01-06, 2027	Make-up Exams for Committees
October 29, 2026, Thursday	National Holiday (Republic Day)
January 01, 2027, Friday	New Year Holiday
January, 04-10, 2026	Make-up exam for Communication Skills and Academic Reporting, History of Medicine and Ethics I, Philosophy of Science
January 18 – 29, 2027	Semester Break

2026 – 2027 ACADEMIC YEAR SPRING SEMESTER	
February 1, 2027 – April 1, 2027	Committee 3 – Cardiovascular, Respiratory Systems, and Blood
April 2, 2027, Friday	3rd Block Committee Exam
April 5, 2027 – June 10, 2027	Committee 4 – Gastrointestinal Systems
March 9 – 11, 2027, Tuesday – Thursday	Ramadan Feast Holiday
April 23, 2027, Friday	National Sovereignty and Children's Day
April 19 -May 02, 2027	Final Exams for Communication Skills and Academic Reporting, History of Medicine and Ethics II, Biostatistics
May 01, 2027, Saturday	Labor and Solidarity Day
May 08-14, 2027	Make-up exam for Communication Skills and Academic Reporting, History of Medicine and Ethics II, Biostatistics
May 19, 2027, Wednesday	Commemoration of Atatürk, Youth and Sports Day
May 16 – 19, 2027, Sunday – Wednesday	Feast of Sacrifice
June 11, 2027, Friday	4th Block Committee Exam
June 14-15, 2027	Make-up Exams for Committees
June 21, 2027, Monday	Final Exam
July 13, 2027, Monday	Resit Exam for the Final Exam

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BAHÇEŞEHİR ÜNİVERSİTESİ TIP FAKÜLTESİ
"scientia et amore vitae"

BAHÇEŞEHİR UNIVERSITY SCHOOL OF MEDICINE PHASE I (2022-2023)										
		EXAM 1 (Theoretical Exam)		EXAM 2 (Practical Exam)		AVERAGE OF COMMITTEE GRADES	EXAM 3 (FINAL EXAM)		YEAREND GRADE	PASSING GRADE
	Committee Names	**Method**	**%**	**Method**	**%**		**Method**	**%**		
YEAR 1	Committee 1: Molecular and Cellular Basis of Tissue and Organ Systems	MCQ (100 questions)	80 %	PRACTICAL EXAMS[1]	20%	**(C1 + C2+ C3+ C4) / 4**	MCQ (200 question) (2sections)	100%	AVERAGE OF COMMITTEE GRADES (60%) + FINAL EXAM SCORE (40%)	YEAREND GRADE (85%) + CLINICAL SKILLS GRADE (10%) + COMMUNICATION SKILLS SCORE (5%)
	Committee 2: Musculoskeletal Systems	MCQ (100 questions)	80 %	PRACTICAL EXAMS[1]	20%					
	Committee 3: Cardiovascular, Respiratory Systems, and Blood	MCQ (100 questions)	80 %	PRACTICAL EXAMS[1]	20%					
	Committee 4: Gastrointestinal Systems	MCQ (100 questions)	80 %	PRACTICAL EXAMS[1]	20%					
	Communication Skills [3]	%100								
	Clinical Skills	OSCE	%50	Clinical Skills Evaulation[4]	%50	%100				

[1]Practical Exams include Anatomy, Histology, Physiology, Biochemistry, Medical Microbiology, and Biophysics courses and are graded as a total of 20% according to the hour weight of the practice in that committee.

[3] Communication Skills are evaluated according to APPENDİX 1.

[4] Clinical Skills are evaluated according to APPENDİX 2.

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"scientia et amore vitae"

APPENDIX 1

COMMUNICATION SKILLS ASSESSMENT METHOD

There are 4 sessions. Evaluation will be performed out of **25 points after each session** according to the level of participation of the student.

Each student will have from **0…. to 5** for each of the items below:

	0	**1**	**2**	**3**	**4**	**5**
Joined in the discussion and commented						
Asked questions about the subject discussed						
Gave an example from his/her own life						
Did the exercises						
Did the homework						
TOTAL (0-25)						

Each student will receive **a score out of 100 after completion of all 4 sessions.**

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"scientia et amore vitae"

APPENDIX 2

CLINICAL SKILLS EVALUATION FORM

	Satisfactory	Needs Improvement	Poor
A- Professionalism			
Always on time and has no unexcused tardiness/absence	**2**	**1**	**0**
Appearance is appropriate: respects dress code, wears name tag	**2**	**1**	**0**
Has team work ability	**2**	**1**	**0**
Shows effective time management	**2**	**1**	**0**
Obeys clinical skills laboratory rules	**2**	**1**	**0**
B- Medical Knowledge and Clinical Reasoning			
Demonstrates theoretical knowledge	**2**	**1**	**0**
Demonstrates analytical thinking	**2**	**1**	**0**
C-Interpersonal and Communication Skills			
Demonstrate the ability to communicate effectively with the lecturer and friends	**2**	**1**	**0**
D- Clinical Skills			
Performs steps of the clinical skill in the guideline appropriately	**2**	**1**	**0**
Applies standard precautions for infection prevention and control	**2**	**1**	**0**
TOTAL			

Total GRADE: ……../100

STUDENT NAME-SURNAME:	
CLASS:	
CLINICAL SKILL TOPIC:	
DATE:	

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"scientia et amore vitae"

CLASS 1

AIM: The purpose of the Class 1 Program is to provide knowledge about the normal structure and functions of the human body at the cell and tissue level, the history of medicine and universal ethical values, and the philosophy of science; get skills necessary for the most basic medical practices and effective communication techniques; and attitudes for being a medical doctor.

LEARNING OBJECTIVES:

At the end of this class, the students should be able to:

KNOWLEDGE:

1. Define the normal structure and functions of the human body at the cell and tissue level.
2. Explain the anatomical structure of bones, joints, and muscles.
3. Explain microorganisms and their interaction with the host.
4. List the basic communication techniques.
5. Define the prominent events in the history of medicine.
6. Define the rules of professional ethics and ethical behavior.
7. Explain the basic concepts of the philosophy of science.
8. Get knowledge about behavioral sciences.
9. Get knowledge about immunology.
10. Get knowledge about scientific method, research process, abstract, index databases, reviewing the literature, variables, and types of measurement scale.

SKILLS:

11. Perform the most basic medical practices (hand washing, sterile gloving, history taking, basic physical examination, preparing parenteral injections, taking vital signs, recovery position, basic life support, applying a cervical collar, insertion of an oropharyngeal airway).
12. Describe the structure and working principles of the light microscope and use it effectively.
13. Find and distinguish the locations of anatomic structures on models and cadavers.
14. Communicate effectively with the colleagues.
15. Understand the importance of effective communication between a patient and a doctor.

ATTITUDES:

16. Have the perception that medicine is a honorable and respected profession, reflect this on his/her behavior.
17. Observe the rules of professional ethics in his/her relations with the colleagues.
18. Realize the contribution of philosophy to analytical thinking in professional life.
19. Realize the importance of following the working principles ad rules in multidisciplinary, anatomy, and clinical skills laboratories.
20. Realize the importance of hand hygiene in preventing diseases.
21. Emphasing that the cadaver is the first patient of a medical student, adopt concepts such as empathy, respect, physician role, and responsibility.
22. Realize the importance of introducing himself/herself to the patient, giving information about the interventions to be made, and getting approval.
23. Gain the program evaluation culture.

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KOMİTE 1 (MED1101) – Molecular and Cellular Basis of Tissue and Organ Systems

MED1101 / KOMİTE 1: MOLECULAR AND CELLULAR BASIS OF TISSUE AND ORGAN SYSTEMS				
Course Date	September 14 – November 5, 2026			
Exam Dates	Block Committee Exam: November 6, 2026			
Course Coordinator:	Betül Şahin, Assist. Prof			
Academic Unit	**Academic Staff**	**Theoretical**	**Practical**	**Total**
Biochemistry	Özlem Unay Demirel, Assoc. Prof. Yeşim Neğiş, Assoc. Prof. Merve Karayel, Assist. Prof. İrem Kırış, Assist. Prof.	**20**	**2**	**22**
Biophysics	Serdar Durdağı, Prof. Bircan Dinç, Assist. Prof. Duygu Tarhan, Assist. Prof. İrem Demirkan, Assist. Prof.	**21**	**1**	**22**
Histology and Embryology	Yasemin Ersoy Canıllıoğlu, Assoc. Prof. Merjem Purelku, Assist. Prof.	**25**	**8**	**33**
Medical Biology	Timuçin Avşar, Assoc. Prof. Betül Şahin, Assist. Prof. Asuman Çelebi, Assist. Prof.	**34**	**4**	**38**
Medical Microbiology	Gülden Çelik, Prof. Şeyda İğnak Tarlığ, Assist. Prof.	**3**	**0**	**3**
Physiology	Numan Ermutlu, Prof. Dr. Yasemin Keskin Ergen, Assist. Prof. Betilay Topkara Arslan, Assist. Prof. Elif Bahadır, Assist. Prof.	**12**	**3**	**15**
Clinical Skills	Faize Elif Bahadır, Assit Prof.	**4**	**3**	**7**
TOTAL		**115**	**18**	**133**
History of Medicine and Ethics	Hıdır Kadircan Keskinbora, Aran Arslan, Yasemin Koçer-Tulgar	**12**	**-**	**12**
Philosophy of Science	Hıdır Kadircan Keskinbora, Aran Arslan	**12**	**-**	**12**
Communication Skills and Academic Reporting	Figen Dağlı, Prof.	**8**	**-**	**8**
STUDY TIME				**81**

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COURSE AIM:

The aim of this course is to: provide knowledge about the structural properties and basic functions of organic compounds and biomolecules; the structure, function and biophysical/biochemical properties of the cell and its organelles; the molecular biology of the cell, including DNA structure, replication, transcription and translation; the fundamentals of medical biology, medical microbiology and immunology; the physiological basis of homeostasis, membrane transport, and cellular excitability; the histological structure of the basic tissue types; introduce the history of medicine and medical ethics, the philosophy of science, and basic clinical and communication skills.

Biochemistry

At the end of this lesson, the student will be able to:		
KNOWLEDGE		
DEP.	**TOPIC**	**LEARNING OUTCOMES**

BIOCHEMISTRY	Introduction to Biochemistry: Biomolecules (T-1)	1. Describe the scope of biochemistry and its importance in the study of living systems. 2. Explain the chemical properties of biologically important elements, chemical bonds, and intermolecular interactions. 3. Describe the structure and biological significance of major functional groups and isomerism in biomolecules. 4. Classify the major classes of biomolecules and describe their general structural characteristics.
	Biochemical properties of water (T-1)	1. Describe the structural and physicochemical properties of water. 2. Explain the role of hydrogen bonding in determining the unique properties of water. 3. Explain the interactions of water with hydrophilic and hydrophobic molecules and their biological significance. 4. Explain the role of water as a biological solvent and its importance in living systems.
	Ionization of water and pH (T-1)	1. Explain the ionization of water and the concept of the ion product constant of water (Kw). 2. Explain the concepts of pH and pOH and their relationship to hydrogen ion concentration. 3. Explain the biological significance of pH in maintaining the structure and function of biomolecules. 4. Apply the pH scale to interpret acidic, neutral, and alkaline biological solutions.
	Acids, Bases and Buffers (T-1)	1. Explain the properties of acids and bases and distinguish between strong and weak acids and bases. 2. Explain the concepts of pH, pKa, and their relationship in acid–base chemistry. 3. Explain the principles of biological buffer systems and their role in maintaining acid–base balance. 4. Interpret the titration curve of a weak acid and explain the relationship among pH, pKa, and buffering capacity.
	The Structure and Properties of Amino Acids (T-3)	1. Describe the structural and physicochemical properties of the common amino acids and classify them according to the characteristics of their side chains. 2. Describe the structure and biochemical properties of peptide bonds and peptides. 3. Explain the chemical reactivity and post-translational modifications of amino acids. 4. Describe the occurrence and biological significance of uncommon amino acids in proteins. 5. Explain the stereochemical and acid–base properties of amino acids, including ionization, zwitterion formation, titration behavior, and the isoelectric point.
	Protein Structure and Function (T-2)	1. Describe the primary, secondary, tertiary, and quaternary levels of protein structure and their relationship to protein function. 2. Explain the structural principles underlying protein folding, including steric constraints and the forces that stabilize protein structure. 3. Explain the relationship between protein structure and biological function, with relevant examples. 4. Describe the structural and functional significance of protein domains.
	Structure of Nucleotides (T-1)	1. Distinguish nucleotides, nucleosides, and nucleic acids based on their chemical structures. 2. Describe the structural and physicochemical properties of nucleotides. 3. Explain the biological functions of nucleotides in cellular metabolism. 4. Classify nucleotide derivatives and explain their biological significance.

	Structure and function of carbohydrates (T-2)	1. Classify carbohydrates and explain their biological functions. 2. Describe the structural and physicochemical properties of monosaccharides, disaccharides, and oligosaccharides. 3. Explain the structure, biological significance, and major derivatives of glucose. 4. Classify glycoconjugates and explain their biological functions. 5. Describe the relationship between carbohydrate structure and biological function.
	Polysaccharides (T-2)	1. Classify polysaccharides according to their structure and biological functions. 2. Explain the structural and physicochemical properties of major polysaccharides. 3. Classify glycoconjugates and explain their structural organization and biological functions. 4. Describe the structure and physiological roles of glycosaminoglycans, proteoglycans, and glycoproteins. 5. Explain the relationship between the structure of polysaccharides and glycoconjugates and their biological functions.
	Introduction to Lipids: Structure and Function (T-1)	1. Classify the major classes of lipids and fatty acids and explain their biological functions. 2. Describe the structural and physicochemical properties of fatty acids, including saturation, cis/trans isomerism, and omega nomenclature. 3. Describe the structure, classification, and biological functions of simple and complex lipids. 4. Explain the relationship between lipid structure and biological function.
	Lipids of Physiological Significance (T-1)	1. Explain the major biological functions of lipids in energy metabolism, membrane structure, and cell signaling. 2. Compare the structural and functional properties of saturated, unsaturated, and trans fatty acids and their effects on human health. 3. Explain the physiological roles of essential fatty acids, including omega-3 and omega-6 fatty acids. 4. Describe the distribution and biological functions of major membrane lipids, including phospholipids, sphingolipids, and cholesterol.
	Biochemical properties of the enzymes (T-1)	1. Describe the structure, classification, and general properties of enzymes. 2. Compare enzymes with chemical catalysts and explain the biochemical principles of enzyme catalysis. 3. Describe the roles of cofactors, coenzymes, prosthetic groups, apoenzymes, and holoenzymes in enzyme function. 4. Explain the biological functions of major coenzymes and the types of chemical groups they transfer.
	Mechanisms of Enzyme Catalysis (T-1)	1. Explain the structural basis of enzyme specificity and the characteristics of enzyme active sites. 2. Explain the mechanisms by which enzymes accelerate chemical reactions, including transition-state stabilization and activation energy. 3. Compare the lock-and-key and induced-fit models of enzyme action. 4. Explain the factors affecting enzyme activity.
	Enzyme Kinetics (T-1)	1. Explain the principles of enzyme kinetics and the relationship between substrate concentration and reaction velocity. 2. Explain the Michaelis–Menten model and the significance of kinetic parameters, including Km, Vmax, and kcat. 3. Interpret enzyme kinetic data using Lineweaver–Burk plots and other graphical approaches. 4. Explain the biochemical basis of catalytic efficiency.

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	Inhibition of Enzyme Activity (T-1)	1. Classify the major types of enzyme inhibition and explain their mechanisms. 2. Explain the effects of enzyme inhibitors on kinetic parameters, including Km and Vmax. 3. Interpret Lineweaver–Burk plots to distinguish different types of enzyme inhibition. 4. Explain the biochemical basis and clinical significance of mechanism-based (suicide) inhibition.
	Biochemistry Lab: Introduction to Biochemistry laboratory, Buffers and pH (T-1)	1. Demonstrate safe laboratory practices and the proper use of common laboratory equipment and glassware. 2. Demonstrate the correct use of volumetric and automatic pipettes in laboratory procedures. 3. Perform pH measurement using pH indicator strips and a pH meter. 4. Explain the principles and applications of buffers and pH measurement in biochemical laboratories.
	Introduction to Biochemistry: Biomolecules (T-1)	1. Describe the scope of biochemistry and its importance in the study of living systems. 2. Explain the chemical properties of biologically important elements, chemical bonds, and intermolecular interactions. 3. Describe the structure and biological significance of major functional groups and isomerism in biomolecules. 4. Classify the major classes of biomolecules and describe their general structural characteristics.
	SKILLS	
	Biochemistry Lab: Introduction to Biochemistry laboratory, Buffers and pH (P-1)	1. Demonstrate safe laboratory practices and the proper use of common laboratory equipment and glassware. 2. Demonstrate the correct use of volumetric and automatic pipettes in laboratory procedures. 3. Perform pH measurement using pH indicator strips and a pH meter. 4. Explain the principles and applications of buffers and pH measurement in biochemical laboratories.

Biophysics

At the end of this lesson, the student will be able to:		
KNOWLEDGE		
DEP.	**TOPIC**	**LEARNING OUTCOMES**
BIOPHYSICS	Biophysical Systems and Transport Processes in the Human Body (P-1)	1. Describe the concept of a system and explain the characteristics of biological systems. 2. Explain the human body as an open, dynamic system involving continuous exchange of matter and energy. 3. Explain the basic biophysical principles governing the transport of substances and energy in the human body. 4. Relate alterations in transport processes and homeostasis to selected physiological and pathological conditions.
	Ion Channels, Selectivity in Ion Channels (T-2)	1. Define Na and K channels in terms of their topology 2. Explain how ions can permeate very rapidly, as well as with high specificity, within the selectivity filter 3. Explain pore domain and voltage-sensing domains in a channel and describe their roles in ion permeation
	Basics of Molecular Biophysics (T-1)	1. Explain the importance of simplifying models in biophysics 2. Explain the structural and functional characteristics of major biological macromolecules from a biophysical perspective. 3. Describe the atomic-level structural representation of macromolecules 4. Relate intra- and intermolecular interactions to macromolecular structure, stability, molecular recognition, and biological function. 5. Discuss the significance of intermolecular interactions

	The Laws of Thermodynamics in Biological Systems (T-1)	1. Define how energy is stored and used for different types of work in living bodies 2. Define the concepts of system and its surroundings 3. Explain the zeroth and first laws of thermodynamics 4. Explain thermodynamic processes under constant temperature, pressure, and volume and discuss their relevance to biological systems. 5. Distinguish between energy and enthalpy 6. Explain the concepts of entropy and spontaneous processes and relate them to energy transformations in biological systems.
	Gibbs Free Energy and Equilibrium Constant (T-1)	1.Explain Gibbs free energy and its significance in biological systems. 2. Explain the relationship between Gibbs free energy, spontaneity, and chemical equilibrium. 3. Calculate Gibbs free-energy changes from equilibrium constants and determine equilibrium constants from Gibbs free-energy changes. 4. Relate Gibbs free energy and equilibrium to biochemical reactions and metabolic processes.
	Diffusion and Osmosis in Membranes (T-2)	1. Discuss the microscopic (concentration-free) derivation of the relation between diffusion constant, mean distance traveled, and the time 2. Use the relation between diffusion constant, mean distance traveled, and the time 3. Illustrate and use the potential energy of diffusion related to the Boltzmann distribution. 4. Discuss the macroscopic derivation of the diffusion equation: Fick's first and second laws. 5. Illustrate the amount of flux through a cell membrane by Fick's first law 6. Discuss the similarities between the microscopic and the macroscopic diffusion process. 7. Describe the active transport 8. Explain the role of diffusion, osmosis, and membrane permeability in maintaining fluid and electrolyte homeostasis. 9. Relate alterations in diffusion, osmosis, and membrane transport to edema, dehydration, electrolyte disturbances, and impaired gas exchange.
	Bioelectricity: Membrane Potential, Action Potential and Ion Transport (T-1)	1. Explain how neurons transmit information 2. Describe the action potential and how it moves along the axon 3. Define membrane potential and how it is measured, as well as resting potential 4. Explain the functional mechanism of the Na^+/K^+-ATPase and its role in maintaining transmembrane ion gradients and resting membrane potential. 5. Explain the directions of movement of ions Na+ and K+, as well as the number of ions moved through a sodium-potassium pump 6. Discuss how cell membranes behave as capacitors. 7.Relate alterations in ion gradients, membrane potential, and action potential generation to disturbances of neuronal and muscular excitability.
	Membrane biophysics (T-2)	1.Explain the physical principles underlying the structure and function of biological membranes. 2. Describe membrane permeability, transport processes, and steady-state ionic conditions across biological membranes. 3. Explain the biophysical properties of ion channels and ionic conductance in excitable cells. 4. Explain the basic biophysical models of membrane excitability. 5. Relate alterations in membrane transport, ion-channel function, and membrane excitability to selected physiological and pathological conditions.
	Passive Membrane Properties and Nerve Conduction (T-1)	1. Explain how the physical properties of biological membranes affect passive ion transport and electrical signal propagation. 2. Explain membrane time and length constants and their effects on changes in membrane potential. 3. Explain the effects of membrane resistance (Rm), axial resistance (Rax), and membrane capacitance (Cm) on saltatory conduction. 4. Analyze differences in membrane permeability to major physiological ions and their contribution to membrane potential. 5. Relate alterations in membrane electrical properties and myelination to

		impaired nerve conduction and selected neurological disorders.
	Thermal Biophysics: Heat Capacity, Molecular Energy and Protein Stability (T-1)	1. Explain the relationships among internal energy, temperature, and heat capacity in biological systems. 2. Distinguish between heat capacities under constant-pressure and constant-volume conditions. 3. Explain the relationship between heat capacity, protein folding, denaturation, and thermal stability. 4. Explain entropy from a statistical thermodynamic perspective. 5. Explain the Boltzmann distribution and its significance for molecular energy distributions in biological systems. 6. Relate temperature-dependent molecular behavior to protein stability and biological function. 7. Discuss the biophysical consequences of altered body temperature in fever, hyperthermia, and hypothermia.
	Light and lenses (T-1)	1. Explain the basic physical properties of light, including its electromagnetic nature, wavelength, frequency, speed, energy, and photon concept. 2. Describe how atomic energy transitions produce light and relate this process to photon emission. 3. Classify the main interactions of light with matter, including transmission, reflection, scattering, absorption, and refraction. 4. Explain refraction and lens behavior using Snell's law, lens types, focal point, focal length, and basic lens formulas. 5. Describe image formation by converging and diverging lenses and relate these principles to simple and compound microscopy.
	Biophysics of Water: From Molecular Interactions to Fluid Balance and Thermoregulation (T-2)	1. Describe the molecular structure of water and explain its role as the primary biological environment in living systems. 2. Explain the key physical properties of water (e.g., high specific heat, heat of vaporization, solvent properties) and relate them to physiological functions in the human body. 3. Apply thermodynamic principles, including heat capacity and latent heat ($Q = mc\Delta T$, $Q = mL$), to explain temperature regulation and heat exchange in biological systems. 4. Analyze how water influences biomolecular interactions, including the hydrophobic effect, protein folding, and membrane formation. 5. Explain molecular recognition in aqueous environments, including the role of noncovalent interactions and conformational changes (e.g., lock-and-key and induced fit models). 6. Explain the biophysical basis of antigen–antibody interactions and the roles of noncovalent forces and the aqueous environment in molecular recognition, binding specificity, and affinity. 7. Integrate knowledge of water's biophysical properties to interpret clinical conditions related to fluid balance and thermoregulation (e.g., dehydration, fever, heat stroke).
	Bioenergetics: Redox Potential, Free Energy and Cellular ATP Production (T-1)	1. Explain oxidation–reduction reactions, electron transfer, redox couples, and oxidizing and reducing agents in biological systems. 2. Identify biologically important redox carriers, including NAD^+/NADH, FAD/$FADH_2$, FMN, ubiquinone, and protein-bound metal ions. 3. Explain how sequential electron transfer and redox potential drive oxidative phosphorylation. 4. Explain how nutrient oxidation generates NADH and $FADH_2$ and how their reducing power contributes to ATP production. 5. Relate reduction potential, electrochemical potential, and Gibbs free-energy changes to the direction and energy yield of biological redox reactions. 6. Relate impaired electron transport and oxidative phosphorylation to cellular energy failure during hypoxia and ischemia.

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	Electrical Properties of Cell Membranes: Capacitance and Ionic Currents (T-1)	1. Describe the cell membrane as an electrical capacitor and explain the roles of the lipid bilayer, intracellular fluid, and extracellular fluid in charge separation. 2. Define capacitance and relate charge, voltage, and capacitance using the basic capacitor equation. 3. Explain how ionic concentration gradients generate membrane potential and transient capacitive currents. 4. Distinguish between ionic currents and capacitive currents in terms of their mechanisms, conditions, and effects on membrane voltage. 5. Relate membrane capacitance, ionic currents, and axial current to changes in membrane potential and neuronal signal propagation. 6. Relate membrane capacitance, ionic currents, and axial current to changes in membrane potential and neuronal signal propagation. 7. Explain how myelination alters the electrical properties of the neuronal membrane and relate these changes to saltatory conduction and impaired conduction in demyelinating conditions.
	Basics of Voltage Clamp, Patch Clamp (T-2)	1. Define electrophysiology and explain its role in measuring membrane potential changes and ionic currents in excitable cells. 2. Explain the basic principle of voltage clamp, including membrane potential control, command voltage, current recording, and space-clamp limitations. 3. Describe the historical and experimental basis of voltage-clamp studies, including squid axon experiments and cardiac action potential recordings. 4. Explain the principle and essential components of the patch-clamp technique, including glass micropipettes, electrodes, amplifiers, electrolyte solution, and gigaohm seal formation. 5. Distinguish between voltage clamp and patch clamp in terms of experimental aim, recording scale, technical setup, and type of information obtained. 6. Compare major patch-clamp configurations, including cell-attached, whole-cell, perforated patch, loose patch, inside-out, and outside-out recordings, and select appropriate configurations for different experimental purposes. 7. Describe how voltage-clamp and patch-clamp techniques are used to characterize ion channel function, including ion selectivity, conductance, voltage dependence, ligand/drug effects, and channel activation or inhibition.
	SKILLS	
	Biophysics Lab: Measurement, Light, and Lenses (P-1)	1. Measure the dimensions of irregularly shaped objects using a scientific instrument called calipers. 2. Be able to calculate the volume of the irregular objects through the measured dimensions of the shapes of the objects and volume formulas 3. Determine the volume of the object using the overflow experiment 4. Determine the two positions of a thin lens where a sharp image is formed. 5. Determine the focal length of a thin lens.

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Histology and Embryology

At the end of this lesson, the student will be able to:		
KNOWLEDGE		
DEP.	**TOPIC**	**LEARNING OUTCOMES**
HISTOLOGY AND EMBRYOLOGY	Introduction to Histology (T-1)	1. Define the concept and etymology of histology. 2. Classify histology as a discipline within medical sciences. 3. Define the four main tissue types. 4. Describe the essential steps of tissue preparation and staining for light microscopy.
	Introduction to Embryology (T-1)	1. Define the etymology of embryology term 2. Classify the embryonic and fetal periods 3. Explain the terms of general embryology

	Spermatogenesis and Testis (T-2)	1. Describe the histological structure and organization of the testis. 2. Outline the process of spermatogenesis in the germinal epithelium of the seminiferous tubules, from intrauterine life through adulthood. 3. Identify germ cells at various stages of spermatogenesis within the seminiferous tubules, specifying the stages that involve meiosis and those related to cellular differentiation (spermiogenesis). 4. Explain the key stages of spermiogenesis and describe how sperm cells mature and acquire their final structure and function. 5. Differentiate between spermatogenesis and spermiogenesis in terms of their processes and outcomes. 6. Recognize Sertoli and Leydig cells, and explain their roles in sperm production. 7. Describe the structure and functional importance of the blood-testis barrier, including its cellular components. 8. Explain the role of hormonal regulation—particularly the roles of FSH, LH, and testosterone—in the control of spermatogenesis. 9. Describe the main criteria assessed in semen analysis and their clinical significance. 10.Recognize key pathological conditions related to testicular function and spermatogenesis.
	Oogenesis and Ovary (T-2)	1. Describe the major histological features and organization of the female genital system, with emphasis on the ovary. 2. Outline the processes of oogenesis from intrauterine life through adulthood, including the stages and timing of oocyte maturation. 3. Explain the stages of folliculogenesis, follicle development, ovulation, and formation of the corpus luteum. 4. Identify the general stages of meiosis and their specific relevance to oogenesis. 5. Describe the cyclical changes in the ovaries and their correlation with fluctuating levels of estrogen and progesterone. 6. Explain the hormonal regulation of oogenesis, including estrogen production by the theca interna and granulosa cells.
	Ovulation and Fertilization (T-1)	1. Explain the ovulation process and the accompanying changes in the ovary and female reproductive system before fertilization. 2. Describe the preparation and capacitation of spermatozoa in the female reproductive tract. 3. Outline the fertilization process, including sperm penetration of the oocyte, formation of the zygote, its site, and the phases of fertilization. 4. Explain the genetic, meiotic, and early mitotic events involved in fertilization and the resulting chromosomal and developmental outcomes.
	Implantation (T-1)	1. Describe the development of the embryo from the first cells to the blastocyst stage. 2. Explain the histological structure, cyclic changes, and decidual transformation of the endometrium during the menstrual cycle. 3. Describe the stages of implantation and identify its normal site. 4. Recognize the possible sites of ectopic pregnancy and their clinical significance.
	Bilaminar and Trilaminar Disc Formation (T-2)	1. Define the bilaminar embryonic disc and identify its two layers: the epiblast and the hypoblast. 2. Describe the formation of the bilaminar disc during the second week of embryonic development. 3. Explain the significance of the amniotic cavity and yolk sac in relation to the bilaminar disc. 4. Identify the events that lead to the transition from the bilaminar to the trilaminar disc during the third week of development. 5. Describe the process of gastrulation and the role of the primitive streak in trilaminar disc formation. 6. List the three germ layers (ectoderm, mesoderm, endoderm) and describe their embryological origins from the epiblast.

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	Neurulation (T-1)	1. Define neurulation and explain its role in early embryonic development. 2. Describe the formation of the neural plate, groove, and tube. 3. Explain primary neurulation and neural tube closure. 4. Recognize the formation and migration of neural crest cells, and list the key structures derived from them. 5. Recognize common neural tube defects and their prevention.
	Epithelium and Surface Differentiations (T-2)	1. List the four major types of tissue in the body and explain the main role of each tissue 2. Explain the characteristics, functions, and specializations of epithelia 3. Describe the structure and function of junctions. 4. Define the structure of apical specializations and their functions.
	Histology of Lining and Glandular Epithelium (T-2)	1. Define the origin of the lining and glandular epithelium 2. Classify the lining epithelium 3. Classify the glandular epithelium 4. Explain histological features and functions of the lining and glandular epithelium
	Histology of Connective Tissue (T-2)	1. Describe the histological features of the connective tissue 2. List the names of the connective tissue cells and describe their histological features 3. Make correlations between their functions 4. Define fibers of the connective tissue 5. Identify the histological features of the ground substance 6. Define the connective tissue types and their histological feature
	Histology of Cartilage Tissue (T-2)	1. Define the origin of the cartilage tissue 2. Classify the main types of cartilage tissue. 3. Describe the histological characteristics and explain the functions of each type of cartilage.
	Histological Structure of Bone Tissue (T-2)	1. Identify general features of bone tissue 2. Identify the major parts of the bones 3. Describe the cells found in bone tissue and describe their histological features 4. Identify the organic and inorganic components of the bone tissue 5. Define the bone tissue types according to the different criteria 6. Define the features of the mature and immature bone 7. Describe the structure and function of compact and spongy bone tissue. 8. Describe the components of an osteon
	Osteogenesis (T-1)	1. List the steps of intramembranous ossification 2. List the steps of endochondral ossification 3. Differentiate intramembranous ossification from enchondral ossification in embryonic development 4. Explain the growth activity at the epiphyseal plate 5. Explain the growth in thickness of bone
	SKILLS	
	Use of Microscope and Epithelial Tissue (P-2)	1. Learn to use the light microscope effectively for histological observation. 2. Classify epithelial tissues into lining and glandular types, and describe their key histological features. 3. Identify lining epithelium on slides from the esophagus, small intestine, kidney, urinary bladder, trachea, and skin. 4. Identify glandular epithelium on slides from the parotid and submandibular glands.
	Histology of Connective tissue (P-2)	1. Classify the main types of connective tissue. 2. Describe the key histological features of connective tissue using the light microscope. 3. Identify and distinguish connective tissue on slides from mesothelium, skin, tendon, umbilical cord, and adipose tissue.

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	Histology of Cartilage (P-2)	1. Classify the main types of cartilage tissue. 2. Describe the key histological features of cartilage tissue using the light microscope. 3. Identify and distinguish cartilage tissue on slides from the trachea, pinna, and annulus fibrosus.
	Histological Structure of Bone Tissue & Osteogenesis (P-2)	1. Classify the bone tissue 2. Define bone tissue types and their features by light microscope 3. Explain bone formation as intramembranous and endochondral ossification 4. Identify zones of epiphyseal growth plate in endochondral ossification

Medical Biology

At the end of this lesson, the student will be able to:		
KNOWLEDGE		
DEP.	**TOPIC**	**LEARNING OUTCOMES**
MEDICAL BIOLOGY	Introduction to Medical Biology (T-2)	1. Define the scope and importance of medical biology in the context of modern medicine. 2. Explain the structural and functional organization of prokaryotic and eukaryotic cells. 3. Describe fundamental biological molecules (DNA, RNA, proteins, lipids, carbohydrates) and their roles in cellular processes. 4. Compare the hierarchical levels of biological organization (molecules, organelles, cells, tissues, organs, systems). 5. Discuss the relevance of medical biology concepts to clinical practice and biomedical research.
	The universal features of cells (T-2)	1. Define the common and shared features of living organisms. 2. Define the central dogma and its characteristics. 3. Define the characteristics of DNA and gene. 4. Explain the biodiversity and classification of organisms based on different features. 5. Explain the 3 major division of living world 6. Explain the ribosomal gene structure and characteristics 7. List the modes of genetic innovation 8. Explain the model organisms and their importance in biology
	DNA structure and organization (T-2)	1. Compare the eukaryotic and prokaryotic DNA and structure. 2. Explain the properties of gene structure and function. 3. Define the properties of exons and introns. 4. Define histones and nucleosome structure. 5. Explain functions of histones with the perspective of heterochromatin and euchromatin formation. 6. Explain the repetitive and unique DNA sequences 7. Define the structure and function of chromosome 8. Explain the chromosomal organization
	DNA chromosomes and genomes (T-2)	1. Define chromosome, chromatine and chromatid structures and their elements. 2. Define heterochromatin and euchromatine structures and their importance. 3. Explain the terms of gene and chromosome by also considering their attendance to specific cell functions. 4. Explain the differences on chromosomes in different stages of the cell cycle via also including the cellular changes. 5. Define human karyotyping and its importance.

	DNA replication (T-2)	1. Explain the DNA replication with respect to order of events 2. List the main enzymes having role during DNA replication 3. Define the replication machine and tell all components' function 4. individually 5. Describe how DNA replication is initiated and define the characteristics of ori sites 6. Explain the function of telomerases and how DNA replication is terminated
	DNA repair and recombination (T-1)	1. Describe mutations, DNA damage and compare them 2. Count factors that cause DNA damage 3. Groups DNA damages according to their formation mechanism 4. Explain mechanisms used by cells to correct replication errors 5. Explain the strand directed mismatch repair systems 6. Describe base excision repair and nucleotide excision repair systems 7. Explain the key features of homologous recombination and non- homologous end joining mechanisms as repair systems
	Transcription (T-2)	1. Define RNA structure, major elements and compare it with DNA structure 2. Describe the major steps of transcription on prokaryotes and eukaryotes 3. Compare the DNA and RNA polymerase with respect to its structure and function 4. Describe the characteristics of promoter sequences and other requlatory elements of the transcription machinery. Explain the transcription factors and their roles in transcription 5. Define regulatory sequences (TATA box etc.). Explain post-transcriptional modification of RNA and its importance
	Translation (T-2)	1. Explain the codon system, codon usage and alternate codons in translation 2. Describe the major steps of translation on prokaryotes 3. Describe the major steps of translation on eukaryotes 4. Describe the structure and role of RNA types during translation 5. Explain post-translational processing with its importance 6. Compare prokaryotes and eukaryotes in terms of initiation, elongation and termination steps of translation
	The cell structure and function (T-2)	1. Describe the general organization of a eukaryotic cell. 2. Identify the major cellular compartments and their functions. 3. Explain the relationship between cell structure and specialized cell function. 4. Discuss techniques used to study cell structure (microscopy).
	Cell membrane lipid bilayer (T-1)	1. Describe the fluid mosaic model of the plasma membrane. 2. Explain the composition and organization of membrane lipids. 3. Discuss the role of cholesterol in membrane fluidity. 4. Relate membrane lipid composition to membrane permeability.
	Cell-cell junctions and cell surface differentiations (T-2)	1. Classify types of cell junctions (tight junctions, adherens junctions, desmosomes, gap junctions). 2. Explain the molecular composition and function of each junction type. 3. Describe cell surface differentiations (microvilli, cilia, flagella). 4. Relate cell junction abnormalities to disease states.
	The cytoskeleton (T-3)	1. Classify the three main components of the cytoskeleton (microfilaments, intermediate filaments, microtubules). 2. Explain the structure and function of each cytoskeletal component. 3. Discuss the roles of the cytoskeleton in cell shape, movement, and division. 4. Relate cytoskeletal dysfunction to clinical disorders.

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	Organelles (T-2)	1. Identify the major membrane-bound organelles and describe their functions. 2. Explain the structure and role of the endoplasmic reticulum and Golgi apparatus in protein processing. 3. Describe mitochondrial structure and its role in energy production. 4. Discuss the function of lysosomes and peroxisomes in cellular metabolism.
	Extracellular matrix and cell adhesion molecules (T-2)	1. Describe the components of the extracellular matrix (collagen, proteoglycans, fibronectin). 2. Explain the classes of cell adhesion molecules (cadherins, integrins, selectins). 3. Discuss the role of the ECM in tissue structure and cell signaling. 4. Relate ECM abnormalities to disease (e.g., connective tissue disorders).
	Membrane transport and cell signaling (T-1)	1. Classify the mechanisms of membrane transport (passive diffusion, facilitated diffusion, active transport). 2. Describe the structure and function of membrane channels and transporters. 3. Explain the basic principles of cell signaling (receptors, ligands, second messengers). 4. Discuss the significance of signal transduction in cellular communication.
	Cell cycle division (T-2)	1. Describe the phases of the cell cycle (G1, S, G2, M). 2. Explain the regulatory checkpoints and their role in cell cycle control. 3. Discuss the roles of cyclins and cyclin-dependent kinases (CDKs). 4. Relate cell cycle dysregulation to cancer development.
	Cell death (T-2)	1. Differentiate between apoptosis and necrosis. 2. Describe the molecular pathways of apoptosis (intrinsic and extrinsic pathways). 3. Explain the biological significance of programmed cell death. 4. Discuss the clinical relevance of dysregulated apoptosis in disease.
	Mol basis of immunology-1 (T-1)	1. Describe the molecular basis of innate immune recognition. 2. Explain the structure and function of pattern recognition receptors. 3. Discuss the molecular mechanisms of the innate immune response. 4. Relate molecular immunology to the first line of host defense.
	Mol basis of immunology-2 (T-1)	1. Describe the molecular basis of adaptive immunity (antibody and receptor diversity). 2. Explain the mechanisms of antigen recognition by T and B lymphocytes. 3. Discuss the molecular basis of immunological memory. 4. Relate molecular immune mechanisms to vaccination and immune-related disease.
	SKILLS	
	Lab: DNA Isolation: Principles and Hands-on Laboratory Practice (T-1)	1. Explain the principles underlying DNA isolation from biological samples. 2. Perform DNA extraction using standard laboratory protocols. 3. Discuss the importance of sample purity for downstream molecular applications. 4. Relate DNA isolation techniques to their use in diagnostic and research settings.
	Lab: DNA Quantification: Principles, Methods and Practical Application (T-1)	1. Explain the principles of DNA quantification methods (spectrophotometry, fluorometry). 2. Perform DNA quantification using laboratory equipment. 3. Interpret quantification results to assess DNA concentration and purity. 4. Discuss the practical applications of DNA quantification in molecular biology.
	Lab: Agarose Gel Electrophoresis for DNA Analysis: Theory and Hands-on Practice (T-1)	1. Explain the principles of agarose gel electrophoresis for DNA separation. 2. Perform gel electrophoresis to analyze DNA samples. 3. Interpret gel electrophoresis results based on DNA fragment migration. 4. Discuss the applications of gel electrophoresis in molecular diagnostics and research.

	Lab: Cell Cycle and Mitotic Division (T-1)	1. Identify the stages of mitosis using microscopic observation. 2. Relate observed cellular features to the corresponding phase of the cell cycle. 3. Explain the significance of studying mitotic division in a laboratory setting. 4. Discuss the relevance of cell cycle analysis to understanding abnormal cell proliferation.

Medical Microbiology

At the end of this lesson, the student will be able to:		
KNOWLEDGE		
DEP.	**TOPIC**	**LEARNING OUTCOMES**
MEDICAL MICROBIOLOGY	Introduction to Microbiology and History (T-2)	1. Define science of microbiology 2. Define basic concepts in microbiology 3. Define basic terminology in microbiology 4. Classify microorganisms 5. List important properties of microorganisms 6. List landmark contributions in microbiology history
	Sterilization & Disinfection (T-1)	1. Define the terms sterilization, disinfection, decontamination, antisepsis 2. Describe the microorganisms that are most resistant and least resistant according to control measures by chemical and biological tools 3. Define four categories of cellular targets for physical and chemical agents 4. Define the four biosafety levels

Physiology

At the end of this lesson, the student will be able to:		
KNOWLEDGE		
DEP.	**TOPIC**	**LEARNING OUTCOMES**
PHYSIOLOGY	Introduction to physiology (T-1)	1. Define medical physiology and its importance as part of medical education 2. Discuss the relationship between structure and function 3. Outline the level of organization from the cellular level to the system level in a hierarchy
	Homeostasis and control systems (T-2)	1. Describe how homeostasis is the maintenance of a nearly constant internal environment in the body 2. Distinguish extracellular fluid and intracellular fluid compartments 3. Explain the role of the control systems in regulation of homeostasis 4. Explain the difference between negative and positive feedback control systems by giving examples 5. Outline the mechanism of negative feedback by citing the roles of sensor, set point, control center, and effector. 6. Explain how effective homeostasis produces a healthy human body 7. Estimate the possible results of disruption of homeostasis
	Membrane Physiology & Cellular Transport (T-2)	1. Describe the characteristics of the semipermeable cell membrane 2. Describe and compare different types of membrane transport 3. Name the factors that affect substance transport through the cell membrane 4. Explain the types of active transport through the membrane by giving examples 5. Explain the differences between the diffusion and the active transport of substances through the cell membrane 6. Explain the role of ion channels in selective permeability of the membrane 7. Explain how water is transported through the membrane 8. Describe how endocytosis and exocytosis occur and explain their 9. role in substance transport through the membrane

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	Compartments and compositions of body fluids (T-1)	1. Explain the features and the volumes of the different body fluid compartments (i.e. extracellular, intracellular, interstitial, and transcellular fluids) 2. Describe how the body fluid compartments differ with regard to their composition by explaining underlying mechanisms. 3. Explain the meaning of osmole, osmolality, osmotic equilibrium, osmosis, and osmotic pressure terms. 4. Explain how cells regulate their volume in isotonic, hypotonic, and hypertonic environments. 5. Explain the regulation of fluid exchange and osmotic equilibrium between intracellular and extracellular fluids 6. Explain how the volume of the body fluid compartments can be calculated.
	Osmosis and Osmotic Pressure (T-1)	1. Define osmosis and osmotic pressure and explain the factors that determine them. 2. Distinguish between osmolarity and tonicity and their effects on cell volume. 3. Explain the role of osmotic pressure in fluid movement across cell membranes. 4. Discuss the clinical relevance of osmotic pressure in isotonic, hypotonic, and hypertonic solutions.
	Cellular Communication and Signal transduction Pathways (T-2)	1. Describe how do cells communicate with each other 2. Defines the terms target cell, receptor and physiological signals 3. Describe the classes of receptors and the intracellular signal transduction pathways associated with them
	Membrane Potentials (T-1)	1. Describe the distribution of ions in the extracellular and intracellular fluid compartments 2. Explain the origin of the resting membrane potential 3. Define what equilibrium potential of an ion represents by giving examples 4. Compare membrane permeability for different ions 5. Analyze Goldman-Hodgkin-Katz equation that can be used to 6. calculate membrane potential
	Excitable Cells and Action Potential (T-2)	1. Outline the general features of the excitable cells by comparing with non-excitable cells 2. Explain how the movement of the ions across the membrane leads to a reversible change in the membrane potential 3. Describe the stages of an action potential by naming related ion channels with ionic flows 4. Define absolute and relative refractory periods with underlying reasons 5. Explain the difference between propagation of action potential in a myelinated and unmyelinated axon 6. Name the factors that are effecting conduction velocity of a neuron 7. Predict the possible effects of the blockage of particular ion channels on generation of action potential
	SKILLS	
	Lab: Simulating osmotic pressure (P-1)	1. Define the principles of osmosis 2. Explain how tonicity of a solution affects the volume of the cells based on the experiments that they conducted in the simulation platform 3. Define osmotic pressure 4. Discuss the conditions that affect osmotic pressure based on the results of their experiments that they conducted in the simulation platform
	Lab: Membrane potential measurement in a simulation platform (P-1)	1. At the end of the lecture students will be able to 2. Define the term resting membrane potential 3. Measure and observe resting membrane potential from different parts of a neuron 4. Describe the ion channels and ionic flows that are creating membrane potential 5. Discuss the effect of ionic concentration changes on membrane potential based on the results of their experiments that they conducted in the simulation platform 6. Interpret how the resting membrane potential depends on the concentrations of potassium and sodium ions. 7. Discuss the effect of changes in the permeability (conductance) of the

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		membrane for particular ions on membrane potential
	Lab: Action potential measurement in a simulation platform (P-1)	1. Describe how the movement of the ions across the membrane leads to an action potential 2. Describe the stages of an action potential and its propagation 3. Describe the term of threshold for an excitable cell 4. Discuss the underlying mechanisms that create the absolute and the relative refractory periods based on the experimental results that they collect during lab 5. Explain how the threshold is changing during relative refractory period based on the experiments that they conducted in a simulation platform 6. Discuss the relationship between the intensity and the duration of stimulation and the generation of action potentials by a neuron

Clinical Skills

At the end of this lesson, the student will be able to:		
KNOWLEDGE		
DEP.	**TOPIC**	**LEARNING OUTCOMES**
CLINICAL SKILLS	Clinical Skills Lab (CSL) Rules (T-1)	1. List CSL Rules 2. Explain how to work in CSL 3. Get knowledge about the assessment method
	Hand Washing Techniques (T-1) (P-1)	1. Describe why hand washing is important 2. Describe when hands should be washed 3. Explain how to wash hands properly 4. Get skills about working as a part of a team.
	SKILLS	
	Sterile Gloving (T-1) (P-1)	1. Demonstrates how to put on and take off sterile gloves 2. Get skills about working as a part of a team
	Injections I: Preparing Medications from Ampules and Vials (T-1) (P-1)	1. Describe the types of the parenteral drug administration routes 2. List the equipment necessary for the parenteral drug administration 3. Define the needs for safe and effective administration 4. Prepare medications from ampules 5. Prepare medications from vials

Communication Skills

At the end of this lesson, the student will be able to:		
KNOWLEDGE		
DEP.	**TOPIC**	**LEARNING OUTCOMES**
COMMUNICATION SKILLS	Introduction to Communication Skills (P-2)	1. Discuss why communication skills in medicine are important 2. Clarify the feelings that drive human actions 3. Define aggressive, passive and assertive types of behavior 4. Discover that human beings react differently in a given situation depending on their own levels of acceptance 5. Distinguish the necessary action to be taken (listening / self- expression) during communication
	Active Listening and self-expression (P-2)	1. Define the steps of active listening 2. Appraise importance of body language in communication 3. List the sentences that may act as barriers in communication 4. Demonstrates active listening skills when talking to a person in problem 5. Distinguish different forms of self-expression 6. Identify negative effect of judgmental self-expression in interpersonal relationship 7. Describe three steps of self-expression using "ı language" 8.Demonstrate correct self-expression method in role plays

	Self-expression; Conflict Resolution (P-2)	1.Distinguish different forms of self-expression 2. Identify negative effect of judgmental self-expression in interpersonal relationship 3. Describe three steps of self-expression using "ı language" 4. Demonstrate correct self-expression method in role plays 5. Define two different types of conflicts 6. Explain different methods of resolution in necessity based conflicts 7. Comprehends reasons of conflicts in people who has different values 8. Discuss the ways of conflict resolution in people with different values
	Using the basic communication skills in doctor-patient relationship (P-2)	1. Adapts basic communication skills to doctor- patient interaction 2. Uses techniques to build up and maintain rapport with the patient 3. Uses techniques of active listening while talking to the patient 4. Evaluates emotions of the patient and responds in accordance with the emotion 5. Encourages the patient to express his/her concerns

History of Medicine and Ethics

At the end of this lesson, the student will be able to:		
KNOWLEDGE		
DEP.	**TOPIC**	**LEARNING OUTCOMES**
HISTORY OF MEDICINE AND ETHICS	Why Should We Learn and Teach the History of Medicine? (T-2)	1. Comprehend the significance of ancient Chinese, Indian, Egyptian, Greek, and Roman medicine; evaluate the medical approaches of different civilizations and explain their distinctive features. 2. Understand certain medical practices and significant events of prehistoric times; compare them with current practices through examples. 3. Define the distinctive features of Chinese, Indus, Mesopotamian, Egyptian, Greek, and Roman civilizations, their medical treatment methods, and the tools used for diagnosis and prognosis of diseases. 4. Learn the contributions of important historical scientists in medicine from the Eastern and Western world. 5. Explain the distinctive features of Medieval Medicine in Europe, the treatment methods used, and the diagnostic tools; explain the scientific level and legacy of this period in Europe. 6. Explain the principles of medical ethics; explain the general terms and principles of modern bioethics; explain the dynamics between ethics and law; explain how contemporary ethical principles are applied by examining the difference between ideas (duties); explain actions (consequences) in relation to ethical principles; explain why ethics may differ across cultures and why this knowledge is important.
	Medicine of Chinese Civilization (T-2)	1. Comprehend the significance of ancient Chinese, Indian, Egyptian, Greek, and Roman medicine; evaluate the medical approaches of different civilizations and explain their distinctive features. 2. Understand certain medical practices and significant events of prehistoric times; compare them with current practices through examples. 3. Define the distinctive features of Chinese, Indus, Mesopotamian, Egyptian, Greek, and Roman civilizations, their medical treatment methods, and the tools used for diagnosis and prognosis of diseases. 4. Learn the contributions of important historical scientists in medicine from the Eastern and Western world. 5. Explain the distinctive features of Medieval Medicine in Europe, the treatment methods used, and the diagnostic tools; explain the scientific level and legacy of this period in Europe. 6. Explain the principles of medical ethics; explain the general terms and principles of modern bioethics; explain the dynamics between ethics and law; explain how contemporary ethical principles are applied by examining the difference between ideas (duties); explain actions (consequences) in relation to ethical principles; explain why ethics may differ across cultures and why this knowledge is important.

	Medicine of Indus (Indian) Civilization (T-2)	1. Comprehend the significance of ancient Chinese, Indian, Egyptian, Greek, and Roman medicine; evaluate the medical approaches of different civilizations and explain their distinctive features. 2. Understand certain medical practices and significant events of prehistoric times; compare them with current practices through examples. 3. Define the distinctive features of Chinese, Indus, Mesopotamian, Egyptian, Greek, and Roman civilizations, their medical treatment methods, and the tools used for diagnosis and prognosis of diseases. 4. Learn the contributions of important historical scientists in medicine from the Eastern and Western world. 5. Explain the distinctive features of Medieval Medicine in Europe, the treatment methods used, and the diagnostic tools; explain the scientific level and legacy of this period in Europe. 6. Explain the principles of medical ethics; explain the general terms and principles of modern bioethics; explain the dynamics between ethics and law; explain how contemporary ethical principles are applied by examining the difference between ideas (duties); explain actions (consequences) in relation to ethical principles; explain why ethics may differ across cultures and why this knowledge is important.
	Medicine of Mesopotamian Civilization (T-2)	1. Comprehend the significance of ancient Chinese, Indian, Egyptian, Greek, and Roman medicine; evaluate the medical approaches of different civilizations and explain their distinctive features. 2. Understand certain medical practices and significant events of prehistoric times; compare them with current practices through examples. 3. Define the distinctive features of Chinese, Indus, Mesopotamian, Egyptian, Greek, and Roman civilizations, their medical treatment methods, and the tools used for diagnosis and prognosis of diseases. 4. Learn the contributions of important historical scientists in medicine from the Eastern and Western world. 5. Explain the distinctive features of Medieval Medicine in Europe, the treatment methods used, and the diagnostic tools; explain the scientific level and legacy of this period in Europe. 6. Explain the principles of medical ethics; explain the general terms and principles of modern bioethics; explain the dynamics between ethics and law; explain how contemporary ethical principles are applied by examining the difference between ideas (duties); explain actions (consequences) in relation to ethical principles; explain why ethics may differ across cultures and why this knowledge is important.
	Medicine of Egyptian Civilization (T-2)	1. Comprehend the significance of ancient Chinese, Indian, Egyptian, Greek, and Roman medicine; evaluate the medical approaches of different civilizations and explain their distinctive features. 2. Understand certain medical practices and significant events of prehistoric times; compare them with current practices through examples. 3. Define the distinctive features of Chinese, Indus, Mesopotamian, Egyptian, Greek, and Roman civilizations, their medical treatment methods, and the tools used for diagnosis and prognosis of diseases. 4. Learn the contributions of important historical scientists in medicine from the Eastern and Western world. 5. Explain the distinctive features of Medieval Medicine in Europe, the treatment methods used, and the diagnostic tools; explain the scientific level and legacy of this period in Europe. 6. Explain the principles of medical ethics; explain the general terms and principles of modern bioethics; explain the dynamics between ethics and law; explain how contemporary ethical principles are applied by examining the difference between ideas (duties); explain actions (consequences) in relation to ethical principles; explain why ethics may differ across cultures and why this knowledge is important.
	Greek and Roman Civilizations Medicine (T-2)	1. Comprehend the significance of ancient Chinese, Indian, Egyptian, Greek, and Roman medicine; evaluate the medical approaches of different civilizations and explain their distinctive features. 2. Understand certain medical practices and significant events of prehistoric times; compare them with current practices through examples. 3. Define the distinctive features of Chinese, Indus, Mesopotamian, Egyptian, Greek, and Roman civilizations, their medical treatment methods, and the tools used for diagnosis and prognosis of diseases.

		4. Learn the contributions of important historical scientists in medicine from the Eastern and Western world. 5. Explain the distinctive features of Medieval Medicine in Europe, the treatment methods used, and the diagnostic tools; explain the scientific level and legacy of this period in Europe. 6. Explain the principles of medical ethics; explain the general terms and principles of modern bioethics; explain the dynamics between ethics and law; explain how contemporary ethical principles are applied by examining the difference between ideas (duties); explain actions (consequences) in relation to ethical principles; explain why ethics may differ across cultures and why this knowledge is important.

Philosophy of Science

At the end of this lesson, the student will be able to:		
KNOWLEDGE		
DEP.	**TOPIC**	**LEARNING OUTCOMES**
PHILOSOPHY OF SCIENCE	Course Introduction / Introduction to Basic Theoretical Terms; Foundations of Scientific Approach - Overview (T-2)	1. Define the fundamental concepts of scientific research; distinguish between deductive and inductive reasoning and evaluate the validity, soundness, and inductive strength of an argument. 2. Recognize logical fallacies, rhetorical strategies, and cognitive biases encountered in medical texts and clinical claims; question the epistemic basis of a claim in light of the concepts of knowledge, truth, and justification. 3. Apply Bayesian theory and the base-rate fallacy to the interpretation of diagnostic test results and research findings. 4. Compare the main arguments of the scientific realism versus anti-realism debate (No Miracles Argument, Pessimistic Induction) and apply these arguments to theories and hypotheses in medical science. 5. Discuss the concept of evidence in evidence-based medicine and the statistical sources of the replication crisis; evaluate the uses and limitations of neural-network-based AI models in medical research.
	Basic Concepts of Critical Thinking Methods, Cognitive Biases and Prejudices (T-2)	1. Define the fundamental concepts of scientific research; distinguish between deductive and inductive reasoning and evaluate the validity, soundness, and inductive strength of an argument. 2. Recognize logical fallacies, rhetorical strategies, and cognitive biases encountered in medical texts and clinical claims; question the epistemic basis of a claim in light of the concepts of knowledge, truth, and justification. 3. Apply Bayesian theory and the base-rate fallacy to the interpretation of diagnostic test results and research findings. 4. Compare the main arguments of the scientific realism versus anti-realism debate (No Miracles Argument, Pessimistic Induction) and apply these arguments to theories and hypotheses in medical science. 5. Discuss the concept of evidence in evidence-based medicine and the statistical sources of the replication crisis; evaluate the uses and limitations of neural-network-based AI models in medical research.
	Deductive Reasoning and Logical Validity and Soundness (T-2)	1. Define the fundamental concepts of scientific research; distinguish between deductive and inductive reasoning and evaluate the validity, soundness, and inductive strength of an argument. 2. Recognize logical fallacies, rhetorical strategies, and cognitive biases encountered in medical texts and clinical claims; question the epistemic basis of a claim in light of the concepts of knowledge, truth, and justification. 3. Apply Bayesian theory and the base-rate fallacy to the interpretation of diagnostic test results and research findings. 4. Compare the main arguments of the scientific realism versus anti-realism debate (No Miracles Argument, Pessimistic Induction) and apply these arguments to theories and hypotheses in medical science. 5. Discuss the concept of evidence in evidence-based medicine and the statistical sources of the replication crisis; evaluate the uses and limitations of neural-network-based AI models in medical research.

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	Inductive Reasoning and Inductive Strength and Soundness (T-2)	1. Define the fundamental concepts of scientific research; distinguish between deductive and inductive reasoning and evaluate the validity, soundness, and inductive strength of an argument. 2. Recognize logical fallacies, rhetorical strategies, and cognitive biases encountered in medical texts and clinical claims; question the epistemic basis of a claim in light of the concepts of knowledge, truth, and justification. 3. Apply Bayesian theory and the base-rate fallacy to the interpretation of diagnostic test results and research findings. 4. Compare the main arguments of the scientific realism versus anti-realism debate (No Miracles Argument, Pessimistic Induction) and apply these arguments to theories and hypotheses in medical science. 5. Discuss the concept of evidence in evidence-based medicine and the statistical sources of the replication crisis; evaluate the uses and limitations of neural-network-based AI models in medical research.
	Bayesian Theory and the Base-Rate Fallacy (T-2)	1. Define the fundamental concepts of scientific research; distinguish between deductive and inductive reasoning and evaluate the validity, soundness, and inductive strength of an argument. 2. Recognize logical fallacies, rhetorical strategies, and cognitive biases encountered in medical texts and clinical claims; question the epistemic basis of a claim in light of the concepts of knowledge, truth, and justification. 3. Apply Bayesian theory and the base-rate fallacy to the interpretation of diagnostic test results and research findings. 4. Compare the main arguments of the scientific realism versus anti-realism debate (No Miracles Argument, Pessimistic Induction) and apply these arguments to theories and hypotheses in medical science. 5. Discuss the concept of evidence in evidence-based medicine and the statistical sources of the replication crisis; evaluate the uses and limitations of neural-network-based AI models in medical research.
	Knowledge, truth and justification (T-2)	1. Define the fundamental concepts of scientific research; distinguish between deductive and inductive reasoning and evaluate the validity, soundness, and inductive strength of an argument. 2. Recognize logical fallacies, rhetorical strategies, and cognitive biases encountered in medical texts and clinical claims; question the epistemic basis of a claim in light of the concepts of knowledge, truth, and justification. 3. Apply Bayesian theory and the base-rate fallacy to the interpretation of diagnostic test results and research findings. 4. Compare the main arguments of the scientific realism versus anti-realism debate (No Miracles Argument, Pessimistic Induction) and apply these arguments to theories and hypotheses in medical science. 5. Discuss the concept of evidence in evidence-based medicine and the statistical sources of the replication crisis; evaluate the uses and limitations of neural-network-based AI models in medical research.

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KOMİTE 2 (MED1102) – Musculoskeletal Systems

MED1102 / KOMİTE 2: MUSCULOSKELETAL SYSTEMS				
Course Date	November 9, 2026 – January 14, 2027			
Exam Dates	Block Committee Exam: January 15, 2027			
Course Coordinator:	Betül Şahin, Assist. Prof			
Academic Unit	**Academic Staff**	**Theoretical**	**Practical**	**Total**
Anatomy	Ahmet Usta, Prof.	**53**	**32**	**85**
Biochemistry	Özlem Unay Demirel, Assoc. Prof. Yeşim Neğiş, Assoc. Prof. Merve Karayel, Assist. Prof. İrem Kırış, Assist. Prof.	**9**	**0**	**9**
Biophysics	Numan Ermutlu, Prof. Dr. Bircan Dinç, Assist. Prof. İrem Demirkan, Assist. Prof. Duygu Tarhan, Assist. Prof.	**8**	**1**	**9**
Histology and Embryology	Yasemin Çanıllıoğlu, Assoc. Prof. Merjem Purelku, Assist Prof	**7**	**2**	**9**
Physiology	Yasemin Keskin Ergen, Assist. Prof. Betilay Topkara Arslan, Assist. Prof. Numan Ermutlu, Assist. Prof.	**13**	**2**	**15**
Clinical Skills	Betilay Topkara Arslan, Assist. Prof.	**1**	**1**	**2**
Medical Education	İnanç Sümbüloğlu	**6**		**6**
TOTAL		**90**	**37**	**133**
History of Medicine and Ethics	Hıdır Kadircan Keskinbora, Prof Aran Arslan, Asist Prof. Yasemin Koçer-Tulgar	**12**	**-**	**12**
Philosophy of Science	Hıdır Kadircan Keskinbora, Prof Aran Arslan, Assist. Prof	**12**	**-**	**12**
Communication Skills and Academic Reporting	Figen Dağlı, Prof.	**8**	**-**	**8**
STUDY TIME				**160**

COURSE AIM:

The aim of this course is to: provide knowledge about the anatomy, histology, biochemistry, biophysics, and physiology of the musculoskeletal system, including the structure and function of bones, joints, and skeletal muscle; provide detailed knowledge about the anatomy of the musculoskeletal system in terms of function, innervation, and vascular supply; provide a basis for associating normal musculoskeletal structure and function with common clinical disorders; continue the history of medicine and medical ethics, and the philosophy of science; develop basic clinical and communication skills.

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Anatomy

At the end of this lesson, the student will be able to:		
KNOWLEDGE		
DEP.	**TOPIC**	**LEARNING OUTCOMES**
ANATOMY	Basic concepts, descriptions and anatomical nomenclature I and II (T-2)	1. Describe the anatomical position and the three cardinal planes (sagittal, coronal, transverse) and relate them to the imaging planes used in radiology. 2. Classify basic movement terminology (flexion/extension, abduction/adduction, rotation, circumduction, pronation/supination). 3. Apply correct directional terminology (superior/inferior, medial/lateral, proximal/distal) to locate a structure. 4. Describe the four major body cavities (cranial, thoracic, abdominal, pelvic) and their main contents. 5. Apply anatomical position, movement and directional terminology together to

		describe a physical-exam or imaging finding unambiguously.
	General information about bones (T-1)	1. Define bone as a specialized connective tissue and list its main functions (support, protection, movement, mineral storage, hematopoiesis). 2. Classify bones by shape (long, short, flat, irregular, sesamoid) with one example each. 3. Describe the gross anatomy of a long bone (diaphysis, epiphysis, metaphysis, medullary cavity). 4. Differentiate compact vs. spongy bone and explain osteon/trabecular organization. 5. Compare intramembranous and endochondral ossification.
	Upper limb bones: Scapula, Clavicula, Humerus, Radius, Ulna and Skeleton of the Hand I and II (T-2)	1. Identify the osteological landmarks of the scapula, clavicle and humerus (neck, tubercles, condyles) and relate them to muscle attachments. 2. Describe the radius, ulna and interosseous membrane, and correlate distal radius anatomy with the Colles' fracture presentation. 3. Identify the eight carpal bones and their two-row arrangement, and the scaphoid's vulnerability to fracture and avascular necrosis. 4. Describe the metacarpals and phalanges and their articulations. 5. Apply upper-limb bone landmarks (humeral neck, distal radius, scaphoid) to localize a fracture from a radiograph description.
	Lower limb bones: Coxal Bone and Femur (T-1)	1. Describe the three parts of the coxal bone (ilium, ischium, pubis) and their fusion at the acetabulum. 2. Explain the boundaries of the acetabulum and obturator foramen. 3. Identify femoral landmarks: head, neck, greater/lesser trochanter, linea aspera. 4. Correlate femoral neck anatomy with fracture pattern and avascular-necrosis risk. 5. Apply hip and femur landmarks to describe the location of a proximal femur fracture on imaging.
	Lower limb bones: Tibia, Fibula, Patella, Skeleton of the Foot (T-1)	1. Identify major tibial landmarks (tuberosity, condyles, medial malleolus) and fibular landmarks (head, lateral malleolus). 2. Describe the patella's articulation and role in knee biomechanics. 3. Classify the tarsal, metatarsal and phalangeal bones of the foot. 4. Explain the longitudinal and transverse arches of the foot. 5. Apply tibial and fibular landmarks to classify a malleolar ankle fracture.
	Vertebral Column, Sacral Bone, Coccygeal Bone, Sternum, Ribs (costae) I, II and III (T-3)	1. Classify vertebrae by region and describe the typical vertebra (body, pedicle, lamina, processes), including the distinguishing features of the atlas (C1) and axis (C2). 2. Describe the structure of the sacrum and coccyx and their articulations (sacroiliac joint, sacrococcygeal joint). 3. Describe the three parts of the sternum and classify ribs as true, false and floating. 4. Relate surface landmarks (sternal angle, vertebral levels) to clinical procedures (rib counting, lumbar puncture, caudal epidural block). 5. Apply vertebral, sacral and rib/sternal landmarks to a clinical scenario (e.g., C1-C2 injury mechanism, safe chest-compression hand placement).
	Cranium as a whole, Overview of Skull, Base of Cranium I and II (T-2)	1. Differentiate the neurocranium from the viscerocranium and describe the sutures forming the cranial vault. 2. Describe the boundaries and contents of the anterior, middle and posterior cranial fossae. 3. Identify major skull-base foramina (cribriform plate, foramen ovale, jugular foramen, foramen magnum) and the structures each transmits. 4. Discuss fontanelle location and suture-closure timing relevant to the pediatric exam. 5. Correlate skull-base fracture patterns with their clinical signs (CSF rhinorrhea/otorrhea, cranial nerve palsy) and apply this to interpret a head CT after trauma.

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	Frontal bone, occipital bone, parietal bone, temporal bone (T-1)	1. Identify landmarks of the frontal bone (supraorbital margin, glabella) relevant to palpation. 2. Describe the temporal bone's petrous/squamous/tympanic parts and their contents. 3. Identify the sutures formed by these four bones (coronal, sagittal, lambdoid, squamous). 4. Discuss fontanelle location and closure timing relevant to the pediatric exam. 5. Correlate temporal bone fracture with facial nerve injury and hearing loss.
	Maxilla, Mandible, Zygomatic Bone, Lacrimal Bone, Nasal Bone (T-1)	1. Describe the maxilla's alveolar process and maxillary sinus. 2. Identify mandibular landmarks (body, ramus, condylar/coronoid process, angle). 3. Discuss the Le Fort fracture classification in relation to maxillary anatomy. 4. Correlate mandibular fracture sites (angle, condyle, symphysis) with common trauma patterns. 5. Apply facial skeleton landmarks to assess airway and orbital involvement after midface trauma.
	Sphenoid Bone, Palatine Bone, Vomer Bone, Ethmoid Bone, Hyoid Bone (T-1)	1. Identify the parts of the sphenoid bone (body, greater/lesser wings, pterygoid processes) and the sella turcica. 2. Describe the ethmoid's cribriform plate and its relevance to CSF rhinorrhea after trauma. 3. Explain the vomer's and palatine bones' contribution to the nasal septum and hard palate. 4. Identify the hyoid bone's location and note that it articulates with no other bone. 5. Apply sphenoid and ethmoid anatomy to explain the transsphenoidal surgical corridor to the pituitary gland.
	Introduction to joints (types, structures, basic movements) (T-1)	1. Classify joints structurally (fibrous, cartilaginous, synovial) with one example each. 2. Classify joints functionally (synarthrosis, amphiarthrosis, diarthrosis). 3. Describe the general components of a synovial joint (capsule, synovial membrane/fluid, articular cartilage, ligaments). 4. Relate joint structure to the type and range of movement it permits. 5. Apply joint classification to predict which joint types are most prone to osteoarthritis versus dislocation.
	Shoulder joint, elbow (cubital) joint (T-1)	1. Describe the glenohumeral joint's articulating surfaces, capsule, and stabilizing ligaments. 2. Identify the three articulations that form the elbow joint. 3. Explain shoulder movements and the muscles primarily responsible for each. 4. Correlate shoulder/elbow anatomy with dislocation direction and rotator cuff injury. 5. Apply shoulder joint anatomy to explain why anterior dislocation is far more common than posterior.
	Radioulnar Articulation (Distal+Proximal), Wrist Joints, finger joints (T-1)	1. Describe the proximal and distal radioulnar joints and their role in pronation/supination. 2. Identify the bones and ligaments forming the radiocarpal (wrist) joint. 3. Classify the joints of the hand (CMC, MCP, IP) and their movements. 4. Correlate wrist/finger joint anatomy with common injuries (Colles' fracture, finger dislocation). 5. Apply wrist joint anatomy to interpret the mechanism of a fall-on-outstretched-hand injury.
	Hip joint, knee joint, pelvis: structure, articulations, and diameters I and II (T-2)	1. Identify the bony pelvis and its articulations (sacroiliac joint, pubic symphysis) and describe the pelvic inlet diameters and their obstetric significance. 2. Describe the hip joint's articulating surfaces, labrum and major stabilizing ligaments. 3. Describe the knee joint's compartments, menisci and cruciate/collateral ligaments. 4. Correlate hip joint anatomy with dislocation direction/avascular-necrosis risk, and knee ligament anatomy with common sports injuries (ACL tear, meniscal tear). 5. Apply pelvic, hip and knee anatomy to a clinical scenario (difficult vaginal delivery, positive Ottawa knee rule finding).

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	Talocrural articulation, joints of the foot (T-1)	1. Describe the bones and ligaments forming the ankle (talocrural) joint. 2. Classify the joints of the foot (subtalar, transverse tarsal, tarsometatarsal). 3. Explain dorsiflexion/plantarflexion and inversion/eversion and which joints produce them. 4. Relate ankle ligament anatomy to the mechanism of a common ankle sprain. 5. Apply ankle ligament anatomy to differentiate a high ankle sprain (syndesmosis) from a lateral ankle sprain.
	Temporomandibular joint, Atlanto-occipital joint, median atlantoaxial joint, lateral atlantoaxial joint, intervertebral joint I and II (T-2)	1. Describe the TMJ's articular disc and its bilaminar zone. 2. Identify the movements produced at the atlanto-occipital joint (flexion/extension) and the atlantoaxial joints (rotation), and describe the transverse ligament of the atlas. 3. Describe the intervertebral disc's structure (anulus fibrosus, nucleus pulposus) and the facet (zygapophyseal) joints. 4. Explain the role of the ligamentum flavum and posterior longitudinal ligament in stabilizing the vertebral column. 5. Correlate transverse-ligament rupture with atlantoaxial instability, and intervertebral disc pathology with nerve-root compression, applying this to interpret an MRI finding of disc herniation level.
	Costovertebral joint, sternocostal joint, sternoclavicular joint, acromioclavicular joint, thorax (T-1)	1. Describe the costovertebral and costotransverse joints and their role in rib movement during breathing. 2. Describe the sternoclavicular and acromioclavicular joints and their role in shoulder girdle movement. 3. Explain the skeletal boundaries of the thorax as a whole. 4. Relate thoracic cage joint movement to inspiration/expiration mechanics ('pump-handle'/'bucket-handle'). 5. Distinguish true, false and floating ribs by their sternocostal joint pattern and relate this to variable rib-fracture risk.
	General definitions about muscles and tendons (T-1)	1. Classify muscle attachments (tendon, aponeurosis, direct attachment). 2. Differentiate origin, insertion, and action of a muscle. 3. Classify muscles by shape (fusiform, pennate, circular) with an example each. 4. Explain the roles of prime mover, synergist, antagonist, and fixator in producing movement. 5. Apply muscle-shape classification to predict the force-versus-range-of-motion trade-off of a given muscle.
	General Definitions about Spinal Cord Structures, Formation and Course of Spinal nerves, Cervical Plexus (T-1)	1. Describe the gross anatomy of the spinal cord (cervical/lumbar enlargements, conus medullaris, cauda equina). 2. Explain the formation of a spinal nerve from dorsal and ventral roots. 3. Identify the branches of a typical spinal nerve (dorsal ramus, ventral ramus, rami communicantes). 4. Describe the cervical plexus's formation and one major cutaneous/motor branch. 5. Relate the conus medullaris level to safe lumbar puncture landmarks.
	Brachial plexus I and II (T-2)	1. Describe the formation of the brachial plexus from ventral rami C5-T1 and its organizational levels (roots, trunks, divisions, cords). 2. Identify the five terminal branches (musculocutaneous, axillary, radial, median, ulnar) and their general territory. 3. Relate the plexus's location to interscalene/supraclavicular nerve-block sites. 4. Correlate upper-trunk injury with Erb-Duchenne palsy, lower-trunk injury with Klumpke's palsy, and long thoracic nerve injury with winged scapula. 5. Apply brachial plexus anatomy to localize a birth-related traction injury or predict the deficit from an isolated terminal-branch (e.g., axillary nerve) injury.
	Superficial Muscles of the Back: Spinohumeral muscles, spinocostal muscles (T-1)	1. Identify trapezius and latissimus dorsi attachments and actions. 2. Describe the spinocostal muscles (serratus posterior superior/inferior) and their respiratory role. 3. Differentiate extrinsic from intrinsic back muscles. 4. Correlate trapezius/accessory-nerve injury with shoulder droop. 5. Apply latissimus dorsi anatomy to explain its use as a flap in reconstructive surgery.

	Muscles of the Shoulder, Fossa axillaris; associated nerves; Muscles of the pectoral region (T-1)	1. Identify the deltoid and the four rotator cuff muscles and their individual actions. 2. Describe the boundaries and contents of the axilla. 3. Explain pectoralis major/minor anatomy and its clinical relevance (mastectomy landmarks). 4. Correlate rotator cuff anatomy with impingement/tear presentation. 5. Apply axillary anatomy to explain lymphatic spread patterns relevant to breast cancer staging.
	Posterior compartment of the arm (T-1)	1. Identify the triceps brachii heads and anconeus, and their actions. 2. Describe the radial nerve's course through the radial (spiral) groove. 3. Correlate mid-shaft humeral fracture with radial nerve injury (wrist drop). 4. Describe the triangular and quadrangular spaces of the posterior shoulder/arm and their contents. 5. Apply triceps/radial nerve anatomy to test elbow extension in a nerve-injury exam.
	Posterior compartment of the forearm: superficial and deep muscles, dorsal structures of the hand (T-1)	1. Identify the superficial extensor muscles and their common extensor origin. 2. Describe the deep extensor muscles (supinator, abductor pollicis longus, extensor pollicis longus/brevis). 3. Explain the posterior interosseous nerve's course and motor territory. 4. Relate posterior interosseous nerve injury to finger drop without wrist sensory loss. 5. Apply extensor tendon anatomy to explain the mechanism of de Quervain's tenosynovitis.
	Anterior compartment of the arm, Associated nerves (T-1)	1. Identify biceps brachii, brachialis, coracobrachialis and their actions. 2. Describe the musculocutaneous nerve's course and its cutaneous continuation. 3. Relate the brachial artery's location (medial to biceps tendon) to blood-pressure auscultation. 4. Describe the borders of the cubital fossa and its contents. 5. Apply cubital fossa anatomy to identify a safe site for venipuncture and arterial line placement.
	Anterior compartment of the forearm: superficial and deep muscles, Associated nerves, palmar aspect I and II (T-2)	1. Identify the superficial and deep flexor groups of the forearm and their common origins. 2. Describe the median nerve's course through the forearm and carpal tunnel, and its sensory distribution in the hand. 3. Describe the ulnar nerve's course and Guyon's canal, and its sensory distribution in the hand. 4. Describe the superficial and deep palmar arches and their formation. 5. Apply forearm flexor, median-nerve and ulnar-nerve anatomy to a clinical exam (finger flexion testing, carpal tunnel syndrome, Allen's test before radial artery cannulation).
	Thorax, muscles and fascia I and II (T-2)	1. Describe the external and internal intercostal muscles and their role in quiet versus forced respiration, including the accessory muscles of respiration. 2. Explain the position of the intercostal neurovascular bundle within the intercostal space. 3. Describe the diaphragm's role as the primary muscle of respiration, and the endothoracic fascia's surgical relevance. 4. Discuss surface landmarks of the thoracic wall used in clinical examination (e.g., midclavicular line, intercostal spaces). 5. Apply intercostal neurovascular anatomy to identify a safe site for thoracentesis and for needle decompression of tension pneumothorax.
	Deep muscles of the back, lateral and medial group (T-1)	1. Classify intrinsic back muscles into superficial (erector spinae), intermediate, and deep (transversospinales) layers. 2. Describe the three columns of erector spinae (iliocostalis, longissimus, spinalis). 3. Identify the transversospinales group (semispinalis, multifidus, rotatores). 4. Explain the innervation of intrinsic back muscles by dorsal rami. 5. Apply erector spinae anatomy to explain a common site of mechanical lower back pain and muscle strain.

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	Superficial muscles of the neck (T-1)	1. Identify platysma, sternocleidomastoid and trapezius attachments. 2. Explain accessory nerve (CN XI) innervation and its surgical vulnerability in the posterior triangle. 3. Correlate sternocleidomastoid anatomy with the torticollis presentation. 4. Describe the anterior and posterior triangles of the neck and their boundaries. 5. Apply posterior triangle anatomy to identify a safe biopsy site for a palpable cervical lymph node.
	Deep muscles of the neck (T-1)	1. Identify the prevertebral muscles (longus colli, longus capitis). 2. Describe the anterior, middle, and posterior scalene muscles and their attachments. 3. Explain the scalene triangle's relevance to thoracic outlet syndrome (brachial plexus/subclavian artery compression). 4. Identify the suboccipital triangle muscles and their role in fine head movements. 5. Apply deep neck muscle anatomy to explain the anatomical basis of a stiff neck after prolonged poor posture.
	Anterolateral abdominal wall muscles (T-1)	1. Identify the three flat muscle layers (external oblique, internal oblique, transversus abdominis) and their fiber directions. 2. Describe rectus abdominis and rectus sheath formation above/below the arcuate line. 3. Explain the inguinal canal's walls and the deep/superficial rings. 4. Correlate inguinal canal anatomy with indirect vs. direct hernia pathways. 5. Apply abdominal wall layer anatomy to select the correct surgical approach for an appendectomy incision.
	Posterior abdominal wall muscles (T-1)	1. Identify psoas major, iliacus and quadratus lumborum attachments. 2. Explain the psoas major's relationship to the lumbar plexus. 3. Correlate psoas muscle irritation with the psoas sign in the appendicitis examination. 4. Describe the quadratus lumborum's role in lateral trunk flexion and its relation to the kidney. 5. Apply posterior abdominal wall anatomy to identify a safe surgical approach to the retroperitoneum.
	Lumbosacral plexus (T-1)	1. Describe the formation of the lumbar plexus (L1-L4) and the sacral plexus (L4-S4). 2. Identify the major lumbar plexus branches (femoral, obturator, lateral femoral cutaneous). 3. Identify the major sacral plexus branches (sciatic, superior/inferior gluteal, pudendal). 4. Relate lateral femoral cutaneous nerve entrapment to meralgia paresthetica. 5. Apply lumbosacral plexus anatomy to interpret a straight-leg-raise test finding.
	Gluteal region muscles and obturator canal (T-1)	1. Identify gluteus maximus, medius, minimus and their actions. 2. Describe the deep lateral rotators of the hip (piriformis, obturator internus, gemelli, quadratus femoris). 3. Explain the safe zone for an intramuscular gluteal injection and why it's chosen. 4. Correlate gluteus medius weakness with the Trendelenburg gait. 5. Apply sciatic nerve course anatomy to explain why gluteal injections must avoid the medial lower quadrant.
	Muscles of the Thigh: Posterior Compartment, Associated nerves; adductor canal, femoral triangle (T-2)	1. Identify the hamstring muscles and their shared origin (ischial tuberosity). 2. Describe the femoral triangle's boundaries and contents (NAVEL, lateral to medial). 3. Describe the adductor canal's contents and its exit at the adductor hiatus. 4. Describe the sciatic nerve's course through the posterior thigh and its two divisions. 5. Apply hamstring anatomy to explain the mechanism of a common sprinting injury.
	Muscles of the Thigh: anterior and medial compartment muscles; adductor canal, femoral triangle (T-2)	1. Identify the quadriceps femoris group and sartorius, and their actions. 2. Identify the adductor group (adductor longus/brevis/magnus, gracilis) and their innervation. 3. Relate femoral triangle anatomy to femoral vessel puncture/catheterization landmarks.

		4. Describe the femoral nerve's course and its motor/sensory distribution in the anterior thigh. 5. Apply quadriceps anatomy to test the patellar reflex (L2-L4).
	Muscles of the Leg: Posterior Compartment, Associated nerves, plantar muscles of the foot (T-2)	1. Identify gastrocnemius, soleus and plantaris and their role in plantarflexion. 2. Describe the deep posterior compartment muscles (tibialis posterior, FDL, FHL). 3. Explain the tarsal tunnel's contents and its relevance to tarsal tunnel syndrome. 4. Describe the popliteal fossa's boundaries and contents. 5. Apply the calf muscle pump's anatomy to explain its role in venous return and DVT prevention.
	Muscles of the Leg: anterior and lateral compartment muscles, dorsal muscles of the foot (T-2)	1. Identify the anterior compartment muscles (tibialis anterior, EHL, EDL) and their dorsiflexion action. 2. Identify the lateral compartment muscles (peroneus longus/brevis) and their eversion action. 3. Relate deep peroneal nerve injury to foot drop. 4. Describe the extensor retinaculum and the structures deep to it at the ankle. 5. Apply anterior compartment anatomy to recognize the anatomical basis of anterior compartment syndrome.
	Intrinsic muscles of the Foot (T-1)	1. Describe the four layers of the plantar intrinsic foot muscles. 2. Explain the plantar muscles' role in maintaining the arches of the foot. 3. Identify the innervation territory of the medial and lateral plantar nerves. 4. Describe the plantar aponeurosis and its relationship to the intrinsic foot muscles. 5. Apply plantar muscle/fascia anatomy to differentiate plantar fasciitis from a true intrinsic muscle injury.
	Facial muscles (T-1)	1. Classify the muscles of facial expression by region (orbital, nasal, oral). 2. Explain the facial nerve's (CN VII) branches and their motor distribution. 3. Correlate facial nerve palsy (Bell's palsy) with the pattern of muscle weakness (upper vs. lower motor neuron distinction). 4. Describe the orbicularis oculi and orbicularis oris and their roles in eye closure and lip competence. 5. Apply facial muscle anatomy to test individual facial nerve branches on exam (brow, eye closure, smile, cheek puff).
	Facial muscles, Layers of Scalp (T-1)	1. Identify the four muscles of mastication and their actions on the mandible. 2. Describe the five layers of the scalp using the SCALP mnemonic. 3. Explain why the loose connective tissue layer allows infection/hemorrhage to spread. 4. Relate scalp laceration depth to the layer(s) involved. 5. Apply mastication muscle anatomy to test cranial nerve V3 (trigeminal) motor function on exam.
	SKILLS	
	Upper limb bones: Scapula, Clavicula, Humerus, Radius, Ulna and Skeleton of the Hand (P-2)	1. Identify major landmarks of scapula, clavicle, humerus, radius, ulna, and hand bones on osteological models. 2. Orient each bone in anatomical position using models and articulated skeletons. 3. Locate foramina and grooves transmitting neurovascular structures (e.g., suprascapular notch for suprascapular nerve, radial groove for radial nerve). 4. Verify bony landmarks and joint relations on cadaveric specimens. 5. Correlate palpated surface landmarks (clavicle, olecranon, styloid processes) with their deeper anatomical structures.
	Lower limb bones: Coxal Bone and Femur, Tibia, Fibula, Patella, Skeleton of the Foot (P-2)	1. Identify key features of pelvic and lower limb bones (acetabulum, femoral condyles, tibial plateau, malleoli, calcaneus) on osteological models. 2. Orient pelvic and lower limb bones anatomically and reconstruct articulations using skeletal models. 3. Recognize foramina and canals transmitting nerves/vessels (e.g., obturator canal, greater and lesser sciatic foramina, nutrient foramina of femur and tibia). 4. Confirm anatomical landmarks and joint orientation with cadaver dissection. 5. Demonstrate palpation of surface landmarks (ASIS, tibial tuberosity, medial malleolus) and relate them to underlying structures.

	Vertebral Column, Sacral Bone, Coccygeal Bone, Sternum, Ribs (costae) (P-2)	1. Distinguish cervical, thoracic, and lumbar vertebrae on osteological models by characteristic features. 2. Identify sacrum, coccyx, sternum, and ribs, noting articulations and surface anatomy relations. 3. Locate foramina and canals (vertebral foramina, intervertebral foramina transmitting spinal nerves, sacral hiatus for caudal anesthesia). 4. Demonstrate vertebral curvatures and costovertebral articulations using articulated skeletons. 5. Relate features to surface anatomy landmarks (spinous processes, sternal angle).
	Skull I: Frontal, Occipital, Parietal, Temporal bone; Maxilla, Mandible, Zygomatic, Lacrimal, Nasal bone (P-2)	1. Identify major cranial bones and sutures on skull models and cadaver. 2. Demonstrate landmarks of the mandible (condyle, coronoid, mental foramen) and correlate them with nerves/vessels (inferior alveolar nerve, mental nerve). 3. Locate cranial gateways such as the foramen magnum, jugular foramen, and stylomastoid foramen, relating them to structures transmitted. 4. Demonstrate TMJ anatomy and movements using models and verify relations on cadaver. 5. Correlate external cranial features with surface anatomy (orbit, nasal cavity, zygomatic arch).
	Skull II: Sphenoid, Palatine, Vomer, Ethmoid, Hyoid; Cranium as a whole, Base of Cranium (P-2)	1. Identify major cranial bones and sutures on skull models and cadaver. 2. Demonstrate landmarks of the mandible (condyle, coronoid, mental foramen) and correlate them with nerves/vessels (inferior alveolar nerve, mental nerve). 3. Locate cranial gateways such as the foramen magnum, jugular foramen, and stylomastoid foramen, relating them to structures transmitted. 4. Demonstrate TMJ anatomy and movements using models and verify relations on cadaver. 5. Correlate external cranial features with surface anatomy (orbit, nasal cavity, zygomatic arch).
	Joints of the Upper limb: Shoulder joint, Elbow joint, Radioulnar articulation, Wrist and finger joints (P-2)	1. Identify superficial back muscles (trapezius, latissimus dorsi, rhomboids, levator scapulae) on cadaver. 2. Recognize spinohumeral and spinocostal muscle groups and their attachments. 3. Dissect and demonstrate deep intrinsic back muscles (erector spinae, transversospinalis) and distinguish lateral vs. medial groups. 4. Identify superficial and deep neck muscles on cadaver (sternocleidomastoid, infrahyoids, scaleni, prevertebral muscles). 5. Demonstrate the atlantooccipital and atlantoaxial joints on models/cadaver, explaining movements allowed. 6. Correlate muscular and joint anatomy with posture, head movement, and clinical conditions (torticollis, whiplash).
	Joints of the Lower limb: Hip joint, Knee joint, Talocrural articulation, Joints of the foot; Pelvis (P-2)	1. Identify the bones and major bony landmarks forming the pelvis, hip, knee, ankle, and foot joints on models and cadaveric specimens. 2. Demonstrate the articular surfaces, joint capsules, and major ligaments of the hip and knee joints. 3. Identify the structures forming the talocrural joint and major joints of the foot and demonstrate their anatomical relationships. 4. Demonstrate the main movements of the hip, knee, ankle, and foot joints and relate these movements to their anatomical structure. 5. Identify the major ligaments of the pelvis and explain their role in pelvic stability. 6. Relate the anatomy of the lower limb joints to common clinical conditions such as hip dislocation, knee ligament injuries, meniscal injuries, and ankle sprains.
	Joints of the Vertebral Column and Thorax: TMJ, Atlanto-occipital joint, Atlantoaxial joints, Intervertebral joints, Costovertebral joints, Sternocostal joints, Sternoclavicular joint, Acromioclavicular joint (P-2)	1. Distinguish cervical, thoracic, and lumbar vertebrae on osteological models by characteristic features. 2. Identify sacrum, coccyx, sternum, and ribs, noting articulations and surface anatomy relations. 3. Locate foramina and canals (vertebral foramina, intervertebral foramina transmitting spinal nerves, sacral hiatus for caudal anesthesia). 4. Demonstrate vertebral curvatures and costovertebral articulations using articulated skeletons. 5. Relate features to surface anatomy landmarks (spinous processes, sternal

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		angle).
	Muscles of the Shoulder, Fossa axillaris; associated nerves and vessels; Muscles of the pectoral region; Brachial plexus (P-2)	1. Identify the deltoid, rotator cuff muscles, and their attachments on cadaver. 2. Explore the axillary region, demonstrating its boundaries, contents, and applied importance. 3. Dissect and identify the pectoralis major, pectoralis minor, and subclavius muscles. 4. Trace the cords and major branches of the brachial plexus in relation to axillary structures. 5. Correlate muscle actions with shoulder joint stability and movements. 6. Recognize clinical conditions: axillary nerve injury, brachial plexus trauma, thoracic outlet syndrome.
	Posterior compartment of the arm; Posterior compartment of the forearm; Anterior compartment of the arm; Anterior compartment of the forearm: superficial and deep muscles, Associated nerves and vessels, palmar aspect of the hand, dorsal structures of the hand (P-2)	1. Identify the triceps brachii and anconeus muscles and their functions. 2. Describe the course and branches of the radial nerve in the posterior arm. 3. Explain the arterial supply of the posterior compartment via profunda brachii artery. 4. Correlate anatomy of triceps with elbow extension and shoulder stabilization. 5. Discuss clinical conditions: radial nerve palsy, mid-shaft humerus fracture. 6. Interpret surface anatomy and radiological features of the posterior arm.
	Superficial Muscles of the Back: Spinohumeral muscles, spinocostal muscles; Deep muscles of the back, lateral and medial group; Superficial muscles of the neck; Deep muscles of the neck (P-2)	1. Identify the spinohumeral muscles (trapezius, latissimus dorsi) and describe their attachments and actions. 2. Describe the spinocostal muscles (serratus posterior superior and inferior) and their roles in respiration. 3. Explain the innervation and blood supply of the superficial back muscles. 4. Correlate the movements of the scapula with the action of spinohumeral muscles. 5. Differentiate extrinsic back muscles from intrinsic back muscles.
	Thorax: muscles and fascia (P-2)	1. Identify pleural reflections, recesses, and pleural cavities on cadaver and models. 2. Demonstrate mediastinal subdivisions and locate major contents. 3. Recognize the attachments and openings of the diaphragm. 4. Identify trachea, bronchi, and lung lobes, fissures, and surfaces. 5. Correlate thoracic wall muscles and fascia (intercostals, transversus thoracis) with respiration.
	Anterolateral and posterior abdominal wall muscles (P-2)	1. Identify the muscles of the anterolateral abdominal wall (external oblique, internal oblique, transversus abdominis, and rectus abdominis) on cadaveric specimens and models. 2. Identify the muscles of the posterior abdominal wall (psoas major, psoas minor, iliacus, and quadratus lumborum) and demonstrate their anatomical relationships. 3. Demonstrate the origins, insertions, and fiber directions of the major abdominal wall muscles. 4. Identify the rectus sheath, linea alba, arcuate line, and inguinal ligament and explain their anatomical organization. 5. Demonstrate the main actions of the abdominal wall muscles and relate them to trunk movements, posture, and increased intra-abdominal pressure. 6. Relate the anatomy of the abdominal wall to clinically relevant conditions such as abdominal wall hernias and muscle injuries.
	Gluteal region muscles and canalis obturatorius; Muscles of the Thigh: Posterior Compartment, Associated nerves and vessels; Muscles of the Thigh: anterior and medial compartment muscles; adductor canal, femoral triangle; Lumbosacral plexus (P-2)	1. Identify gluteal muscles (gluteus maximus, medius, minimus, piriformis) and their relations to sciatic nerve. 2. Dissect posterior thigh muscles (hamstrings) and trace their neurovascular supply. 3. Identify anterior and medial thigh compartments (quadriceps, adductors) and key landmarks (adductor canal, femoral triangle). 4. Locate the obturator canal and structures passing through. 5. Trace the major nerves of the lumbosacral plexus in relation to muscles (sciatic, femoral, obturator). 6. Correlate anatomy with common clinical conditions: femoral hernia, hip injections, sciatica.

	Muscles of the Leg: Posterior Compartment, Associated nerves and vessels, plantar muscles of the foot; Muscles of the Leg: anterior and lateral compartment muscles, dorsal muscles of the foot; Intrinsic muscles of the Foot (P-2)	1. Identify the superficial posterior compartment muscles (gastrocnemius, soleus, plantaris) and their role in plantarflexion. 2. Describe the deep posterior compartment muscles (tibialis posterior, flexor digitorum longus, flexor hallucis longus, popliteus) and their functions. 3. Explain the tibial nerve and posterior tibial artery course through the posterior leg and tarsal tunnel. 4. Identify the layers of plantar muscles of the foot and their functional significance. 5. Correlate clinical conditions: tarsal tunnel syndrome, plantar fasciitis. 6. Interpret imaging and surface anatomy of posterior leg and plantar region.
	Facial muscles: Mimic and Mastication muscles (P-2)	1. Identify the major muscles of facial expression on cadaveric specimens and anatomical models. 2. Identify the muscles of mastication (masseter, temporalis, medial pterygoid, and lateral pterygoid) and demonstrate their anatomical relationships. 3. Demonstrate the origins and insertions of the major muscles of facial expression and mastication. 4. Describe the main actions of the muscles of facial expression and relate them to movements of the eyelids, lips, cheeks, and nose. 5. Demonstrate the actions of the muscles of mastication and relate them to movements of the mandible. 6. Identify the motor innervation of the muscles of facial expression and mastication and relate their anatomy to common clinical conditions such as facial nerve palsy and temporomandibular dysfunction.

Biochemistry

At the end of this lesson, the student will be able to:		
KNOWLEDGE		
DEP.	**TOPIC**	**LEARNING OUTCOMES**
BIOCHEMISTRY	Water soluble vitamins (T-2)	1. Classify water-soluble vitamins and explain their biochemical functions and metabolism. 2. Describe the biochemical properties and coenzyme functions of water-soluble vitamins. 3. Explain the biochemical basis and clinical manifestations of water-soluble vitamin deficiencies. 4. Explain the biochemical and clinical consequences of excessive intake of water-soluble vitamins. 5. Interpret the laboratory assessment of selected water-soluble vitamin deficiencies.
	Fat soluble vitamins (T-1)	1. Classify fat-soluble vitamins and explain their biochemical functions and metabolism. 2. Describe the biochemical properties of fat-soluble vitamins and their physiological roles. 3. Explain the biochemical basis and clinical manifestations of fat-soluble vitamin deficiencies. 4. Explain the biochemical and clinical consequences of excessive intake of fat-soluble vitamins.
	Minerals and Trace elements (T-2)	1. Classify minerals into macroelements and trace elements and describe their distribution in the human body. 2. Explain the biochemical functions and physiological roles of major minerals and trace elements. 3. Describe the biochemical properties of clinically important minerals and trace elements. 4. Explain the biochemical basis and clinical manifestations of mineral and trace element deficiencies and toxicities. 5. Interpret the laboratory assessment of selected mineral and trace element disorders.

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	Regulation of enzyme activity (T-2)	1. Explain the major mechanisms regulating enzyme activity, including substrate availability, allosteric regulation, covalent modification, and proteolytic activation. 2. Compare feedback and feed-forward regulation of metabolic pathways. 3. Explain the structural and kinetic properties of allosteric enzymes and the mechanisms of allosteric regulation. 4. Explain the role of reversible covalent modification and proteolytic activation in regulating enzyme activity. 5. Describe the physiological significance of enzyme regulation in metabolic control.
	Clinical Use of Enzymes (T-2)	1. Classify enzymes used in clinical practice and distinguish between functional and non-functional plasma enzymes. 2. Explain the biochemical basis and clinical significance of increased plasma enzyme activities in disease. 3. Describe the principles of enzyme activity measurement, including specimen requirements and analytical considerations. 4. Explain the clinical significance and diagnostic applications of isoenzymes. 5. Explain the diagnostic and therapeutic applications of enzymes in clinical medicine.

Biophysics

At the end of this lesson, the student will be able to:		
KNOWLEDGE		
DEP.	**TOPIC**	**LEARNING OUTCOMES**
BIOPHYSICS	Biophysics of Muscle Contraction: Actin–Myosin Interactions (T-1)	1. Describe the structural organization of skeletal muscle, including muscle fibers, myofibrils, sarcomeres, and connective tissue layers. 2. Identify the main components of the sarcomere, including thick filaments, thin filaments, Z lines, A bands, I bands, H zones, and M lines. 3. Explain the structure and function of the major muscle proteins: myosin, actin, tropomyosin, and troponin. 4. Describe how calcium ions and ATP regulate actin-myosin interaction and cross-bridge cycling. 5. Explain the sliding filament model of muscle contraction and relate sarcomere shortening to skeletal muscle contraction and relaxation. 6. Explain how chemical energy from ATP hydrolysis is converted into mechanical work and force through actin–myosin cross-bridge cycling. 7. Relate alterations in contractile proteins, calcium regulation, and ATP-dependent cross-bridge cycling to impaired skeletal muscle contraction and muscle weakness.
	Stimulation of muscle contraction (T-1)	1. Define the key structures and terms related to neuromuscular transmission, including motor unit, neuromuscular junction, synapse, motor end plate, neurotransmitter, and synaptic cleft. 2. Explain the excitation-contraction coupling mechanism, including action potential propagation, T-tubules, sarcoplasmic reticulum, calcium release, and troponin-tropomyosin regulation. 3. Describe the major events of muscle contraction and relaxation, from acetylcholine release to cross-bridge formation, filament sliding, calcium reuptake, and muscle relaxation. 4. Distinguish between isometric and isotonic contractions, including concentric and eccentric contraction types. 5. Explain the characteristics of a single muscle twitch, including the latent, contraction, and relaxation phases. 6. Explain wave summation, tetanus, motor-unit recruitment, and muscle tone and relate these mechanisms to the regulation of muscle force. 7. Relate alterations in neuromuscular transmission, excitation–contraction coupling, and motor-unit activation to muscle weakness, paralysis, and selected neuromuscular disorders.

	Biophysics of Muscle Energetics and Heat Production (T-1)	1. Describe how a muscle converts chemical energy into mechanical work and heat and explain the physiological importance of muscle heat production. 2. Explain the major phases of heat production during muscle contraction and relaxation and relate muscle heat production to energy utilization and thermoregulation. 3. Compare the energetics of isometric and isotonic contractions using the related energy equations. 4. Explain the force-velocity relationship of muscle and use Hill's equation to relate load, shortening velocity, work, and energy release. 5. Discuss how muscle energetics are related to cross-bridge cycling, ATP hydrolysis, calcium-dependent activation, and the contractile properties of fast and slow muscle fibers.
	Biomechanics of Skeletal Muscle: Force, Work and Length–Tension Relationships (T-1)	1. Classify skeletal muscle fiber types according to their contraction speed, fatigue resistance, metabolic pathway, and functional roles. 2. Explain energy conversion in muscle and calculate muscle work, power, and contraction efficiency. 3. Describe the mechanical components of muscle, including contractile, parallel elastic, and series elastic elements. 4. Explain the length-tension relationship of skeletal muscle and identify the optimal sarcomere length for maximal active tension. 5. Explain the role of the stretch reflex, reciprocal inhibition, and synergistic muscle activity in the regulation of muscle length and posture. 6. Relate alterations in muscle mechanical properties and neuromuscular control to muscle weakness, abnormal muscle tone, and impaired movement.
	Biophysical Principles of Diagnostic Methods in Musculoskeletal and Neuromuscular Disorders (T-2)	1. Explain the physical principles of X-ray production, attenuation, and image formation and relate them to musculoskeletal imaging. 2. Explain the basic principles of CT image formation and its applications in the evaluation of bone, joint, and soft-tissue abnormalities. 3. Explain the basic physical principles of MRI and its advantages in the evaluation of muscles, ligaments, cartilage, and other soft tissues. 4. Compare X-ray, CT, and MRI in terms of their physical principles, tissue contrast, ionizing radiation exposure, and major musculoskeletal applications. 5. Explain the biophysical basis of electromyography (EMG) and its role in evaluating muscle and peripheral nerve function. 6. Select an appropriate diagnostic modality for basic musculoskeletal and neuromuscular clinical scenarios based on its physical principles and diagnostic capabilities.
	Clinical Biomechanics: Forces, Tissues and Human Movement (T-1)	1. Explain the basic mechanical principles governing human movement and muscle action. 2. Explain tissue responses to mechanical loading using the concepts of stress, strain, stiffness, strength, elasticity, and viscoelasticity. 3. Describe the biomechanical properties of bone, muscle, tendons, and ligaments. 4. Explain muscle angle of pull, moment arm, torque, joint contact forces, and segmental interactions during movement. 5. Apply biomechanical principles to selected examples of musculoskeletal injury, movement impairment, and rehabilitation. 6. Relate abnormal mechanical loading and tissue properties to musculoskeletal injury and functional impairment.
	SKILLS	
	Muscle Fatigue Lab (P-1)	1. Define muscle fatigue and explain its physiological and biophysical mechanisms, including metabolic and neuromuscular factors. 2. Measure and record muscle performance parameters (e.g., force, duration, frequency) during repetitive contractions using laboratory equipment. 3. Analyze changes in muscle force and endurance over time to identify patterns of fatigue. 4. Interpret experimental data to distinguish between central and peripheral components of muscle fatigue. 5. Relate laboratory findings on muscle fatigue to clinical conditions such as neuromuscular disorders, exercise intolerance, and rehabilitation processes.

Histology and Embryology

At the end of this lesson, the student will be able to:		
KNOWLEDGE		
DEP.	**TOPIC**	**LEARNING OUTCOMES**
HISTOLOGY AND EMBRYOLOGY	Histology of Muscle Tissue (T-2)	1. Describe the general structural and functional characteristics of muscle tissue. 2. Classify the major types of muscle tissue including their regenerative capacities. 3. Identify the three types of muscle highlighting their distinctive features
	Formation of somites (T-1)	1. Describe the process of somitogenesis from paraxial mesoderm. 2. Explain the differentiation of somites into sclerotome, myotome, and dermatome. 3. Discuss the segmental organization of somites and its relevance to vertebral development. 4. Relate somite development to the formation of axial skeletal and muscular structures.
	Embryonic folding, body walls, and body cavity (T-1)	1. Describe the process of embryonic folding (cephalocaudal and lateral folding). 2. Explain how folding contributes to the formation of the body wall and gut tube. 3. Discuss the development of the intraembryonic coelom and body cavities. 4. Relate abnormal folding or body wall closure to clinical conditions (e.g., gastroschisis, omphalocele).
	Development of Skull, Vertebrae, Muscle and Extremity bones (T-3)	1. Describe the origin of skull bones from neural crest and paraxial mesoderm. 2. Explain the development of the vertebral column from sclerotome-derived mesenchyme. 3. Discuss the development of limb bud skeletal and muscular structures. 4. Relate abnormal skeletal development to congenital limb and axial anomalies.
	SKILLS	
	Histology of Muscle Tissue (P-2)	1. Classify the main types of muscle tissue. 2. Describe the key histological characteristics of muscle tissue observed under the light microscope. 3. Identify the structural organization of muscle, including its connective tissue layers. 4. Compare and contrast the structural and functional differences among muscle tissue types under the light microscope.

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Physiology

At the end of this lesson, the student will be able to:		
KNOWLEDGE		
DEP.	**TOPIC**	**LEARNING OUTCOMES**
PHYSIOLOGY	Overview of nervous system (T-2)	1. Describe the organization of the nervous system by naming subdivisions with their general functions 2. Name the various cell types in the nervous system with their functions 3. Classify neurons as motor, sensory and interneurons based on their functions 4. Distinguish between chemical and electrical synapses 5. Describe ionotropic and metabotropic neurotransmitter receptors with their possible effects on post synaptic neuron 6. Describe the excitatory and the inhibitory postsynaptic potentials with underlying ionic fluxes 7. Explain in which ways the neurotransmitter action terminates
	Molecular mechanism of skeletal muscle contraction (T-1)	1. Categorize muscles based on their structures and functions 2. Define elements of the sarcomere that underlie striated muscle contraction 3. Orders the series of events that takes place during muscle contraction 4. Explain the role of calcium in the contraction of a skeletal muscle 5. List the steps for the skeletal muscle relaxation

	Neuromuscular Junction, Excitation and contraction coupling in skeletal muscle (T-1)	1. Describe the properties of the neuromuscular junction 2. Discuss the possible effects of agents that block different steps of neuromuscular transmission 3. Define the steps of excitation & contraction coupling 4. Describe periods of a muscle twitch 5. Explain the underlying reason of the latent period
	Whole muscle contraction (T-2)	1. Define the components of a motor unit 2. Explain the motor unit recruitment process 3. Explain how wave summation occurs 4. Differentiate isometric and isotonic muscle contractions 5. Explain the active and the passive forces that are generated under different muscle lengths 6. Explain factors that are affecting force generated by the muscle
	Skeletal Muscle Energy Metabolism and muscle fatigue (T-2)	1. List the chemical process related with the energy production by different metabolic process. 2. List exercise depended ATP usage. 3. Explain the concept of muscle fatigue underlying the depletion of energy stores, accumulation of metabolic by products, and the central nervous system contribution on it. 4. Know about local, general and chronic fatigue effects on body. 5. Explain the time needed for recovery, with the onset of energy depletion.
	Smooth muscle (T-2)	1. Define the organization and types of smooth muscles. 2. Describe the stimulation mechanism of smooth muscle and also explain the effect of different stimulation pathways on different types of smooth muscle. 3. Explain the role of calcium ion concentration in smooth muscle contraction and relaxation, define the regulation of calcium ion concentration and the source of calcium ion. 4. Explains the structural properties of contraction proteins of smooth muscle and knows the importance of these properties in terms of their functions. 5. Describe the difference between single-unit and multi-unit smooth muscle. 6. Describe the microanatomy of a smooth muscle cell. 7. Explain the process of smooth muscle contraction. 8. Explain the difference between single-unit and multi-unit smooth muscle 9. Explain the differences between the structure and contractile mechanism between striated muscle and smooth muscle.
	Autonomic Nervous System and Central Regulation of Visceral Functions (T-2)	1. Describe the ways that the ANS contributes to homeostasis 2. Describe the hierarchy of the autonomic control 3. Explain the transmitter released from pre and postganglionic neurons. 4. Explain the types of receptors on autonomic ganglia and on target organs. 5. Explain the location of the cell bodies and axonal trajectories of preganglionic and postganglionic sympathetic and parasympathetic neurons. 6. Compare the overall functions of the parasympathetic and sympathetic nervous system on the regulation of the various organ systems. 7. Discuss the possible effects of the autonomic dysfunction
	Lab: Measurements from skeletal muscle in a simulation platform, (P-2)	1. Describe the effects of an increasing stimulus frequency on the force developed by an isolated skeletal muscle 2. Define how wave summation occurs in a skeletal muscle 3. Discuss differences between treppe and wave summation 4. Describe the effect of initial muscle length on tension developed by the skeletal muscle based on series of experiments that they conducted on isolated muscle in a simulation platform 5. Explain the differences between the active force, the passive force and the total force generated by muscle 6. Explain the molecular basis of the skeletal muscle length-tension relationship
	Galvanic Skin Conductivity Response (P-1)	1. Define the galvanic skin response (GSR) and its physiological basis (sweat gland activity). 2. Explain the role of the sympathetic nervous system in generating GSR. 3. Describe how GSR is measured and its relevance as an autonomic function indicator.

		4. Discuss clinical and research applications of GSR (e.g., stress and arousal measurement).

Clinical Skills

At the end of this lesson, the student will be able to:		
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DEP.	**TOPIC**	**LEARNING OUTCOMES**
CLINICAL SKILLS	Vital Signs I: Temperature Taking, Pulse Measurement (T-1), (P-1)	1. Describe the normal ranges of temperature 2. List and explain the factors affecting the temperature 3. Describe the types of thermometers 4. Describe how to take an axillary, oral, skin and tympanic temperature safely 5. Describe the normal ranges of the heart rate 6. Describe the anatomical places of pulse 7. Describe how to take pulse from different anatomical places

Communication Skills

At the end of this lesson, the student will be able to:		
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DEP.	**TOPIC**	**LEARNING OUTCOMES**
COMMUNICATION SKILLS	Introduction to Communication Skills (P-2)	1. Discuss why communication skills in medicine are important 2. Clarify the feelings that drive human actions 3. Define aggressive, passive and assertive types of behavior 4. Discover that human beings react differently in a given situation depending on their own levels of acceptance 5. Distinguish the necessary action to be taken (listening / self- expression) during communication
	Active Listening and self-expression (P-2)	1. Define the steps of active listening 2. Appraise importance of body language in communication 3. List the sentences that may act as barriers in communication 4. Demonstrates active listening skills when talking to a person in problem 5. Distinguish different forms of self-expression 6. Identify negative effect of judgmental self-expression in interpersonal relationship 7. Describe three steps of self-expression using "ı language" 8.Demonstrate correct self-expression method in role plays
	Self-expression; Conflict Resolution (P-2)	1.Distinguish different forms of self-expression 2. Identify negative effect of judgmental self-expression in interpersonal relationship 3. Describe three steps of self-expression using "ı language" 4. Demonstrate correct self-expression method in role plays 5. Define two different types of conflicts 6. Explain different methods of resolution in necessity based conflicts 7. Comprehends reasons of conflicts in people who has different values 8. Discuss the ways of conflict resolution in people with different values
	Using the basic communication skills in doctor-patient relationship (P-2)	1. Adapts basic communication skills to doctor- patient interaction 2. Uses techniques to build up and maintain rapport with the patient 3. Uses techniques of active listening while talking to the patient 4. Evaluates emotions of the patient and responds in accordance with the emotion 5. Encourages the patient to express his/her concerns

History of Medicine and Ethics

At the end of this lesson, the student will be able to:		
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DEP.	**TOPIC**	**LEARNING OUTCOMES**
HISTORY OF MEDICINE AND ETHICS	Introduction to Ethics and Medical Ethics (T-2)	1. Comprehend the significance of ancient Chinese, Indian, Egyptian, Greek, and Roman medicine; evaluate the medical approaches of different civilizations and explain their distinctive features. 2. Understand certain medical practices and significant events of prehistoric times; compare them with current practices through examples. 3. Define the distinctive features of Chinese, Indus, Mesopotamian, Egyptian, Greek, and Roman civilizations, their medical treatment methods, and the tools used for diagnosis and prognosis of diseases. 4. Learn the contributions of important historical scientists in medicine from the Eastern and Western world. 5. Explain the distinctive features of Medieval Medicine in Europe, the treatment methods used, and the diagnostic tools; explain the scientific level and legacy of this period in Europe. 6. Explain the principles of medical ethics; explain the general terms and principles of modern bioethics; explain the dynamics between ethics and law; explain how contemporary ethical principles are applied by examining the difference between ideas (duties); explain actions (consequences) in relation to ethical principles; explain why ethics may differ across cultures and why this knowledge is important.
	Teaching Ethics and Learning Ethics (T-2)	1. Comprehend the significance of ancient Chinese, Indian, Egyptian, Greek, and Roman medicine; evaluate the medical approaches of different civilizations and explain their distinctive features. 2. Understand certain medical practices and significant events of prehistoric times; compare them with current practices through examples. 3. Define the distinctive features of Chinese, Indus, Mesopotamian, Egyptian, Greek, and Roman civilizations, their medical treatment methods, and the tools used for diagnosis and prognosis of diseases. 4. Learn the contributions of important historical scientists in medicine from the Eastern and Western world. 5. Explain the distinctive features of Medieval Medicine in Europe, the treatment methods used, and the diagnostic tools; explain the scientific level and legacy of this period in Europe. 6. Explain the principles of medical ethics; explain the general terms and principles of modern bioethics; explain the dynamics between ethics and law; explain how contemporary ethical principles are applied by examining the difference between ideas (duties); explain actions (consequences) in relation to ethical principles; explain why ethics may differ across cultures and why this knowledge is important.
	Bad Medicine - Bad Pharma (Pharmaceutical Industry) (T-2)	1. Comprehend the significance of ancient Chinese, Indian, Egyptian, Greek, and Roman medicine; evaluate the medical approaches of different civilizations and explain their distinctive features. 2. Understand certain medical practices and significant events of prehistoric times; compare them with current practices through examples. 3. Define the distinctive features of Chinese, Indus, Mesopotamian, Egyptian, Greek, and Roman civilizations, their medical treatment methods, and the tools used for diagnosis and prognosis of diseases. 4. Learn the contributions of important historical scientists in medicine from the Eastern and Western world. 5. Explain the distinctive features of Medieval Medicine in Europe, the treatment methods used, and the diagnostic tools; explain the scientific level and legacy of this period in Europe. 6. Explain the principles of medical ethics; explain the general terms and principles of modern bioethics; explain the dynamics between ethics and law; explain how contemporary ethical principles are applied by examining the difference between ideas (duties); explain actions (consequences) in relation to ethical principles; explain why ethics may differ across cultures and why this

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"scientific excellence"

		knowledge is important.
	Publication Ethics, Publication Misconduct and Plagiarism (T-2)	1. Comprehend the significance of ancient Chinese, Indian, Egyptian, Greek, and Roman medicine; evaluate the medical approaches of different civilizations and explain their distinctive features. 2. Understand certain medical practices and significant events of prehistoric times; compare them with current practices through examples. 3. Define the distinctive features of Chinese, Indus, Mesopotamian, Egyptian, Greek, and Roman civilizations, their medical treatment methods, and the tools used for diagnosis and prognosis of diseases. 4. Learn the contributions of important historical scientists in medicine from the Eastern and Western world. 5. Explain the distinctive features of Medieval Medicine in Europe, the treatment methods used, and the diagnostic tools; explain the scientific level and legacy of this period in Europe. 6. Explain the principles of medical ethics; explain the general terms and principles of modern bioethics; explain the dynamics between ethics and law; explain how contemporary ethical principles are applied by examining the difference between ideas (duties); explain actions (consequences) in relation to ethical principles; explain why ethics may differ across cultures and why this knowledge is important.
	Problems in Clinical Practice (T-2)	1. Comprehend the significance of ancient Chinese, Indian, Egyptian, Greek, and Roman medicine; evaluate the medical approaches of different civilizations and explain their distinctive features. 2. Understand certain medical practices and significant events of prehistoric times; compare them with current practices through examples. 3. Define the distinctive features of Chinese, Indus, Mesopotamian, Egyptian, Greek, and Roman civilizations, their medical treatment methods, and the tools used for diagnosis and prognosis of diseases. 4. Learn the contributions of important historical scientists in medicine from the Eastern and Western world. 5. Explain the distinctive features of Medieval Medicine in Europe, the treatment methods used, and the diagnostic tools; explain the scientific level and legacy of this period in Europe. 6. Explain the principles of medical ethics; explain the general terms and principles of modern bioethics; explain the dynamics between ethics and law; explain how contemporary ethical principles are applied by examining the difference between ideas (duties); explain actions (consequences) in relation to ethical principles; explain why ethics may differ across cultures and why this knowledge is important.
	Ethics in Clinical Research - Key Points (T-2)	1. Comprehend the significance of ancient Chinese, Indian, Egyptian, Greek, and Roman medicine; evaluate the medical approaches of different civilizations and explain their distinctive features. 2. Understand certain medical practices and significant events of prehistoric times; compare them with current practices through examples. 3. Define the distinctive features of Chinese, Indus, Mesopotamian, Egyptian, Greek, and Roman civilizations, their medical treatment methods, and the tools used for diagnosis and prognosis of diseases. 4. Learn the contributions of important historical scientists in medicine from the Eastern and Western world. 5. Explain the distinctive features of Medieval Medicine in Europe, the treatment methods used, and the diagnostic tools; explain the scientific level and legacy of this period in Europe. 6. Explain the principles of medical ethics; explain the general terms and principles of modern bioethics; explain the dynamics between ethics and law; explain how contemporary ethical principles are applied by examining the difference between ideas (duties); explain actions (consequences) in relation to ethical principles; explain why ethics may differ across cultures and why this knowledge is important.

Philosophy of Science

At the end of this lesson, the student will be able to:		
KNOWLEDGE		
DEP.	**TOPIC**	**LEARNING OUTCOMES**
PHILOSOPHY OF SCIENCE	Scientific Realism (1): The No Miracles Argument and Its Four Theses (T-2)	1. Define the fundamental concepts of scientific research; distinguish between deductive and inductive reasoning and evaluate the validity, soundness, and inductive strength of an argument. 2. Recognize logical fallacies, rhetorical strategies, and cognitive biases encountered in medical texts and clinical claims; question the epistemic basis of a claim in light of the concepts of knowledge, truth, and justification. 3. Apply Bayesian theory and the base-rate fallacy to the interpretation of diagnostic test results and research findings. 4. Compare the main arguments of the scientific realism versus anti-realism debate (No Miracles Argument, Pessimistic Induction) and apply these arguments to theories and hypotheses in medical science. 5. Discuss the concept of evidence in evidence-based medicine and the statistical sources of the replication crisis; evaluate the uses and limitations of neural-network-based AI models in medical research.
	Scientific Realism (2): Application of the No Miracles Argument to Medical Science (T-2)	1. Define the fundamental concepts of scientific research; distinguish between deductive and inductive reasoning and evaluate the validity, soundness, and inductive strength of an argument. 2. Recognize logical fallacies, rhetorical strategies, and cognitive biases encountered in medical texts and clinical claims; question the epistemic basis of a claim in light of the concepts of knowledge, truth, and justification. 3. Apply Bayesian theory and the base-rate fallacy to the interpretation of diagnostic test results and research findings. 4. Compare the main arguments of the scientific realism versus anti-realism debate (No Miracles Argument, Pessimistic Induction) and apply these arguments to theories and hypotheses in medical science. 5. Discuss the concept of evidence in evidence-based medicine and the statistical sources of the replication crisis; evaluate the uses and limitations of neural-network-based AI models in medical research.
	Scientific Anti-Realism: The Pessimistic Induction Argument (T-2)	1. Define the fundamental concepts of scientific research; distinguish between deductive and inductive reasoning and evaluate the validity, soundness, and inductive strength of an argument. 2. Recognize logical fallacies, rhetorical strategies, and cognitive biases encountered in medical texts and clinical claims; question the epistemic basis of a claim in light of the concepts of knowledge, truth, and justification. 3. Apply Bayesian theory and the base-rate fallacy to the interpretation of diagnostic test results and research findings. 4. Compare the main arguments of the scientific realism versus anti-realism debate (No Miracles Argument, Pessimistic Induction) and apply these arguments to theories and hypotheses in medical science. 5. Discuss the concept of evidence in evidence-based medicine and the statistical sources of the replication crisis; evaluate the uses and limitations of neural-network-based AI models in medical research.
	The Concept of Evidence in Medical Science (T-2)	1. Define the fundamental concepts of scientific research; distinguish between deductive and inductive reasoning and evaluate the validity, soundness, and inductive strength of an argument. 2. Recognize logical fallacies, rhetorical strategies, and cognitive biases encountered in medical texts and clinical claims; question the epistemic basis of a claim in light of the concepts of knowledge, truth, and justification. 3. Apply Bayesian theory and the base-rate fallacy to the interpretation of diagnostic test results and research findings. 4. Compare the main arguments of the scientific realism versus anti-realism debate

		(No Miracles Argument, Pessimistic Induction) and apply these arguments to theories and hypotheses in medical science. 5. Discuss the concept of evidence in evidence-based medicine and the statistical sources of the replication crisis; evaluate the uses and limitations of neural-network-based AI models in medical research.
	The Replication Crisis in Medical Research and Statistical Solutions (T-2)	1. Define the fundamental concepts of scientific research; distinguish between deductive and inductive reasoning and evaluate the validity, soundness, and inductive strength of an argument. 2. Recognize logical fallacies, rhetorical strategies, and cognitive biases encountered in medical texts and clinical claims; question the epistemic basis of a claim in light of the concepts of knowledge, truth, and justification. 3. Apply Bayesian theory and the base-rate fallacy to the interpretation of diagnostic test results and research findings. 4. Compare the main arguments of the scientific realism versus anti-realism debate (No Miracles Argument, Pessimistic Induction) and apply these arguments to theories and hypotheses in medical science. 5. Discuss the concept of evidence in evidence-based medicine and the statistical sources of the replication crisis; evaluate the uses and limitations of neural-network-based AI models in medical research.
	Use of Neural Network-Based AI Models in Medical Science (T-2)	1. Define the fundamental concepts of scientific research; distinguish between deductive and inductive reasoning and evaluate the validity, soundness, and inductive strength of an argument. 2. Recognize logical fallacies, rhetorical strategies, and cognitive biases encountered in medical texts and clinical claims; question the epistemic basis of a claim in light of the concepts of knowledge, truth, and justification. 3. Apply Bayesian theory and the base-rate fallacy to the interpretation of diagnostic test results and research findings. 4. Compare the main arguments of the scientific realism versus anti-realism debate (No Miracles Argument, Pessimistic Induction) and apply these arguments to theories and hypotheses in medical science. 5. Discuss the concept of evidence in evidence-based medicine and the statistical sources of the replication crisis; evaluate the uses and limitations of neural-network-based AI models in medical research.

Medical Education

At the end of this lesson, the student will be able to:		
KNOWLEDGE		
DEP.	**TOPIC**	**LEARNING OUTCOMES**
MEDICAL EDUCATION	Body-Mind-Behaviour: Being Human (T-2)	Describe the biological, psychological, social, and existential dimensions of Body-Mind-Behaviour: Being Human; distinguish between the concepts of "body," "disease," and "person"; define basic psychoanalytic concepts such as the conscious and the unconscious, and their relevance to human motivation and behavior.
	Body-Mind-Behaviour: Body-Mind Dualism (T-2)	Explain Descartes' concept of Body-Mind-Behaviour: Body-Mind Dualism (res cogitans vs. res extensa) and its historical context; define embodied cognition and explain how it challenges the Cartesian separation of mind and body; compare Cartesian dualism, embodied cognition, and biomedical/biopsychosocial models.
	Body-Mind-Behaviour: Somatic practices (T-2)	Define somatic experience; describe basic concepts of Breath and Shape-Flow (growing/shrinking, opening/closing patterns) and their role in postural awareness and stress response.

KOMİTE 3 (MED1103) – Cardiovascular, Respiratory Systems, and Blood

MED1103 / KOMİTE 3: CARDIOVASCULAR, RESPIRATORY SYSTEMS, AND BLOOD				
Course Date	February 1 – April 1, 2027			
Exam Dates	Block Committee Exam: April 2, 2027			
Course Coordinator:	Betül Şahin, Assist. Prof			
Academic Unit	**Academic Staff**	**Theoretical**	**Practical**	**Total**
Anatomy	Ahmet Usta, Prof.	**25**	**14**	**39**
Biochemistry	Özlem Unay Demirel, Assoc. Prof. Yeşim Neğiş, Assoc. Prof Merve Karayel, Assist. Prof. İrem Kırış, Assist. Prof	**5**	**2**	**7**
Biophysics	Numan Ermutlu, Prof. Dr. Bircan Dinç, Assist. Prof. İrem Demirkan, Assist. Prof. Duygu Tarhan, Assist. Prof.	**10**	**1**	**11**
Histology and Embryology	Yasemin Çanıllıoğlu, Assoc. Prof. Merjem Purelku, Assist Prof	**12**	**4**	**16**
Physiology	Numan Ermutlu, Assist. Prof. Betilay Topkara Arslan, Assist. Prof. Yasemin Keskin Ergen, Assist. Prof. Elif Bahadır, Assist. Prof.	**26**	**8**	**34**
Clinical Skills	Betilay Topkara Arslan, Assist. Prof	**1**	**2**	**3**
Medical Education	İnanç Sümbüloğlu	**6**	**-**	**6**
TOTAL		**78**	**29**	**107**
History of Medicine and Ethics	Hıdır Kadircan Keskinbora, Prof Aran Arslan, Assist Prof. Yasemin Koçer-Tulgar	**16**	**-**	**16**
Biostatistics	Hüseyin Tunç, Assist. Prof.	**18**	**-**	**18**
Communication Skills and Academic Reporting	Figen Dağlı, Prof.	**8**	**-**	**8**
STUDY TIME				**92**

COURSE AIM:

The aim of this course is to: provide knowledge about the anatomy, histology, biochemistry, biophysics, and physiology of the cardiovascular and respiratory systems and of blood; explain the structure and function of the heart, the systemic and pulmonary circulation, and the mechanisms of respiration and gas exchange; provide a basis for interpreting normal and abnormal cardiovascular and respiratory findings; continue the history of medicine and medical ethics; introduce the fundamentals of research methodology; develop clinical and communication skills, including vital-sign measurement and basic ECG and pulmonary-function assessment.

Anatomy

At the end of this lesson, the student will be able to:		
KNOWLEDGE		
DEP.	**TOPIC**	**LEARNING OUTCOMES**
ANATOMY	Introduction to cardiovascular system, Outer surface of heart, Pericardium, Location and projections of heart I and II (T-2)	1. Describe the fibrous and serous layers of the pericardium and its attachment to the central tendon of the diaphragm. 2. Identify the surfaces and external grooves of the heart (sternocostal, diaphragmatic surfaces; coronary and interventricular sulci). 3. Explain the pericardial sinuses (transverse, oblique) and their surgical relevance. 4. Describe the heart's surface projection on the thoracic wall.

		5. Correlate pericardial effusion with cardiac tamponade and apply heart-border/pericardial anatomy to interpret cardiomegaly on chest X-ray or a pericardial friction rub on auscultation.
	Inner surface of the Heart, cardiac skeleton, valves and locations of auscultation points I and II (T-2)	1. Identify the four cardiac chambers and the interatrial/interventricular septa, including the fossa ovalis as a remnant of fetal circulation. 2. Describe the fibrous cardiac skeleton and its role in electrically isolating the atria from the ventricles. 3. Identify the atrioventricular (tricuspid, mitral) and semilunar (aortic, pulmonary) valves and their auscultation points on the thoracic wall. 4. Correlate valve dysfunction (stenosis vs. regurgitation) with murmur timing and radiation pattern. 5. Apply chamber and valve anatomy to explain the anatomical basis of an atrial septal defect or a valve-specific murmur (e.g., mitral regurgitation radiating to the axilla).
	Vessels of the heart (coronary circulation), nerves and cardiac conduction system I and II (T-2)	1. Describe the origin and course of the right and left coronary arteries and their main branches. 2. Explain right versus left coronary dominance. 3. Describe the venous drainage of the heart via the coronary sinus. 4. Identify the components of the cardiac conduction system (SA node, AV node, bundle of His, bundle branches, Purkinje fibers). 5. Apply coronary artery distribution and conduction-system anatomy to predict ECG changes in a myocardial infarction or explain the basis of a bundle branch block.
	Great vessels of the heart, Pericardium, Arch of aorta, sections of aorta and its branches I and II, Arteries of head and neck (T-2)	1. Identify the great vessels entering and leaving the heart (SVC, IVC, pulmonary trunk, pulmonary veins, aorta) and describe the three branches of the aortic arch, in order. 2. Describe the ligamentum arteriosum as a remnant of the fetal ductus arteriosus and correlate coarctation of the aorta with its classic presentation and chest X-ray '3 sign'. 3. Describe the common carotid artery's course and its bifurcation level (C4). 4. Differentiate the external from the internal carotid artery by branches and territory, and describe the internal carotid artery's course into the cranial cavity. 5. Apply carotid anatomy to the carotid pulse/carotid triangle and to explain the anatomical basis of carotid endarterectomy.
	Thoracic and abdominal aorta, its topography and its branches I and II (T-2)	1. Describe the course of the thoracic aorta from the arch to the aortic hiatus and its parietal and visceral branches. 2. Describe the aortic hiatus at T12 and the structures passing through it. 3. Identify the unpaired visceral branches of the abdominal aorta (celiac trunk, SMA, IMA) and the organs each supplies. 4. Identify the paired branches of the abdominal aorta (renal, gonadal arteries) and the anastomotic connections between the celiac/SMA/IMA territories. 5. Apply thoracic and abdominal aortic branch anatomy to interpret a CT angiogram for aortic dissection or localize an occlusion/aneurysm to the affected organ/territory.
	Vessels of the upper limb I and II (T-2)	1. Describe the course of the subclavian, axillary and brachial arteries and identify the radial and ulnar pulse points. 2. Describe the superficial and deep palmar arches and the collateral network around the scapula and elbow. 3. Describe the superficial venous drainage (cephalic, basilic and median cubital veins) and its use in venipuncture. 4. Describe the deep venous drainage and the dorsal venous network of the hand. 5. Apply upper-limb arterial and venous anatomy to select a blood-pressure cuff/auscultation site or a peripheral IV cannulation site.
	Bifurcation of Aorta, Pelvis arteries, Vessels of the lower limb I and II (T-2)	1. Describe the level and branches of the aortic bifurcation (common iliac arteries) and differentiate internal from external iliac artery territory. 2. Describe the femoral artery's course and its palpation site (mid-inguinal point). 3. Describe the popliteal artery and its division into the anterior and posterior tibial

		arteries, and identify the dorsalis pedis pulse site. 4. Describe the great and small saphenous veins and their clinical relevance (varicose veins, CABG graft harvest). 5. Apply iliac, femoral and distal pulse anatomy to perform a lower-limb vascular exam (femoral-popliteal-dorsalis pedis-posterior tibial) and interpret a claudication distribution.
	Lymphatic system I and II (T-2)	1. Describe the organization of the lymphatic system (capillaries, vessels, nodes, ducts) and the cisterna chyli as the origin of the thoracic duct. 2. Identify the thoracic duct's and right lymphatic duct's drainage territories and sites of termination. 3. Identify the major regional lymph node groups (cervical, axillary, inguinal) and their drainage territories. 4. Explain the concept of a sentinel lymph node and its clinical use (e.g., breast cancer staging). 5. Correlate lymphatic obstruction/lymph-node dissection with lymphedema, and apply thoracic duct anatomy to explain the risk of chylothorax after thoracic surgery.
	Development of respiratory system, Introduction to respiratory system and components of respiratory system I (T-1)	1. Describe the conducting vs. respiratory zones of the respiratory system. 2. List the major organs of the respiratory system in sequence, from nasal cavity to alveoli. 3. Explain the clinical relevance of respiratory development to neonatal respiratory distress syndrome. 4. Describe the maturation stages of fetal lung development (pseudoglandular, canalicular, saccular, alveolar). 5. Apply respiratory development anatomy to explain the rationale for antenatal corticosteroids in preterm labor.
	Pleura, Mediastinum and its contents, diaphragm (T-1)	1. Describe the parietal and visceral pleura and the pleural cavity/recesses. 2. Identify the boundaries of the superior, anterior, middle, and posterior mediastinum. 3. Describe the diaphragm's three major openings and the structures passing through each (caval T8, esophageal T10, aortic T12). 4. Correlate pleural anatomy with pneumothorax and the sites used for pleural effusion drainage. 5. Apply mediastinal anatomy to explain why anterior mediastinal masses classically present with the '4 Ts' (thymoma, teratoma, thyroid, terrible lymphoma).
	Nasal cavity, paranasal sinuses, pharynx II (T-1)	1. Describe the boundaries and mucosal regions of the nasal cavity. 2. Identify the four paranasal sinuses and their drainage pathways into the nasal cavity. 3. Describe the three subdivisions of the pharynx. 4. Correlate maxillary sinus drainage position with its susceptibility to sinusitis. 5. Apply nasal cavity vascular anatomy (Kiesselbach's plexus) to explain the most common site of anterior epistaxis.
	Structure, Components and Functions of Larynx I and II (T-2)	1. Identify the laryngeal cartilages (thyroid, cricoid, arytenoid, epiglottis) and describe the intrinsic muscles controlling vocal-fold position. 2. Describe the cricothyroid membrane and its role as an emergency airway landmark. 3. Describe the recurrent laryngeal nerve's course and motor territory, and the superior laryngeal nerve's two branches. 4. Correlate recurrent laryngeal nerve injury (e.g., after thyroid surgery) with the resulting voice change. 5. Apply laryngeal cartilage and nerve anatomy to identify the cricothyroidotomy site and explain why bilateral vocal-cord paralysis is a surgical emergency.
	Trachea and Lungs I and II (T-2)	1. Describe the trachea's structure and its bifurcation level (carina, T4), and identify the lobes and fissures of the lungs. 2. Explain why an aspirated foreign body is more likely to lodge in the right main bronchus. 3. Describe the bronchopulmonary segment concept and its surgical relevance (segmentectomy). 4. Describe the pulmonary versus bronchial blood supply and the hilum's major

		contents. 5. Apply bronchopulmonary segmental anatomy to guide chest-tube placement, postural drainage positioning, or a lobectomy discussion.
	Thyroid and Parathyroid glands (T-1)	1. Describe the thyroid gland's lobes, isthmus, and pretracheal fascia relations. 2. Identify the superior and inferior thyroid arteries and their origins. 3. Describe the location and typical number of the parathyroid glands. 4. Correlate the inferior thyroid artery's proximity to the recurrent laryngeal nerve with surgical injury risk. 5. Apply parathyroid gland anatomy to explain the risk of postoperative hypocalcemia after total thyroidectomy.
	SKILLS	
	Introduction to cardiovascular system, Outer surface of heart, Location and projections of heart; Inner surface of the Heart, cardiac skeleton, valves and locations of auscultation points; Vessels of the heart (coronary circulation), nerves and cardiac conduction system (P-2)	1. Identify the location, orientation, borders, surfaces, and external landmarks of the heart on cadaveric specimens and anatomical models. 2. Demonstrate the surface projections of the heart and identify the anatomical locations of the cardiac auscultation points. 3. Identify the chambers of the heart and their major internal anatomical features, including septa, papillary muscles, chordae tendineae, and trabeculae carneae. 4. Identify the cardiac skeleton and the atrioventricular and semilunar valves, and relate their structure to the direction of blood flow through the heart. 5. Identify the major coronary arteries, cardiac veins, and coronary sinus and describe the basic pattern of coronary circulation. 6. Identify the major components of the cardiac conduction system and describe the autonomic innervation of the heart. 7.Relate cardiac anatomy to basic clinical applications, including valve auscultation, coronary artery disease, and conduction abnormalities.
	Great vessels of the heart, Pericardium, Arch of aorta, sections of aorta and its branches; Thoracic aorta, its topography and its branches (P-2)	1. Identify fibrous and serous layers of the pericardium and their reflections. 2. Demonstrate the roots of the great vessels (SVC, IVC, pulmonary trunk, aorta) on cadaveric heart. 3. Identify branches of the aortic arch and their topographic relations. 4. Trace thoracic aorta and its visceral/parietal branches.
	Vessels of the upper limb; Vessels of the lower limb (P-2)	1. Identify major arteries of the upper limb (subclavian, axillary, brachial, radial, ulnar) and their course. 2. Demonstrate venous drainage patterns of the upper limb (cephalic, basilic, median cubital vein). 3. Identify main arteries of the lower limb (femoral, popliteal, anterior/posterior tibial, dorsalis pedis). 4. Trace superficial and deep veins of the lower limb (great and small saphenous veins, femoral vein).
	Pleura, Mediastinum and its contents, diaphragm (P-2)	1. Identify pleural reflections, recesses, and pleural cavities on cadaver and models. 2. Demonstrate mediastinal subdivisions and locate major contents. 3. Recognize the attachments and openings of the diaphragm. 4. Identify trachea, bronchi, and lung lobes, fissures, and surfaces. 5. Correlate thoracic wall muscles and fascia (intercostals, transversus thoracis) with respiration.
	Nasal cavity, paranasal sinuses, pharynx; Structure, Components and Functions of Larynx (P-2)	1. Identify the boundaries and structures of the nasal cavity on models and cadaver. 2. Demonstrate paranasal sinus openings and their drainage pathways. 3. Recognize subdivisions of the pharynx and their relations. 4. Identify cartilages and folds of the larynx, including vocal cords.
	Trachea and Lungs (P-2)	1. Identify trachea, bronchi, and lung lobes, fissures, and surfaces. 2. Correlate thoracic wall muscles and fascia (intercostals, transversus thoracis) with respiration.

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	Thyroid and Parathyroid glands: topography, relations, blood supply and innervation (P-2)	1. Identify the thyroid and parathyroid glands on cadaveric specimens and anatomical models. 2. Demonstrate the lobes, isthmus, and major anatomical landmarks of the thyroid gland. 3. Describe the topographic location of the thyroid and parathyroid glands and identify their relationships with surrounding structures. 4. Identify the major arteries and veins supplying and draining the thyroid and parathyroid glands. 5. Describe the autonomic innervation of the thyroid and parathyroid glands. 6. Identify the anatomical relationships of the recurrent and superior laryngeal nerves to the thyroid gland and its vessels. 7. Relate the anatomy of the thyroid and parathyroid glands to basic clinical applications, including thyroid surgery, recurrent laryngeal nerve injury, and parathyroid preservation.

Biochemistry

At the end of this lesson, the student will be able to:		
KNOWLEDGE		
DEP.	**TOPIC**	**LEARNING OUTCOMES**
BIOCHEMISTRY	Introduction to hormones (T-1)	1. Define hormones and describe the basic principles of endocrine regulation. 2. Classify hormones according to their chemical structure and mechanisms of action. 3. Explain the mechanisms of hormone action through cell surface and intracellular receptors. 4. Explain the physiological principles of hormone secretion, transport, and regulation.
	Classification of hormones (T-1)	1. Classify hormones according to their chemical structure and tissue of origin. 2. Compare the synthesis, storage, transport, and half-life of different classes of hormones. 3. Explain the relationship between the chemical structure of hormones and the location of their receptors. 4. Explain how the biochemical properties of hormones determine their mechanisms of action.
	Mechanism of Hormone action (T-1)	1. Classify hormone receptors according to their cellular location and explain the major mechanisms of hormone action. 2. Explain the role of second messenger systems in hormone signaling and identify the major hormones that utilize these pathways. 3. Explain the factors that determine the responsiveness of target cells to hormones. 4. Compare the mechanisms of action of peptide, steroid, and thyroid hormones.
	Lipoproteins (T-2)	1. Explain the structure, composition, classification, and biological functions of plasma lipoproteins. 2. Explain the metabolism of the major plasma lipoproteins, including chylomicrons, VLDL, LDL, and HDL. 3. Describe the biochemical roles of apolipoproteins, lipoprotein receptors, and key enzymes involved in lipoprotein metabolism. 4. Explain the biochemical mechanisms underlying dyslipidemia and hyperlipoproteinemia.
	Introduction to hormones (T-1)	1. Define hormones and describe the basic principles of endocrine regulation. 2. Classify hormones according to their chemical structure and mechanisms of action. 3. Explain the mechanisms of hormone action through cell surface and intracellular receptors. 4. Explain the physiological principles of hormone secretion, transport, and regulation.

	SKILLS	
	Biochemistry Lab: Principles of Spectrophotometry (T-1; P-1)	1. Explain the principles of absorption spectrophotometry and the components of a spectrophotometer. 2. Explain the concepts of absorbance, transmittance, and the Beer–Lambert law in spectrophotometric analysis. 3. Explain the principles of quantitative spectrophotometric analysis, including wavelength selection, blank solutions, and standard curves. 4. Apply spectrophotometric methods to determine the concentration of unknown samples.

Biophysics

At the end of this lesson, the student will be able to:		
KNOWLEDGE		
DEP.	**TOPIC**	**LEARNING OUTCOMES**
BIOPHYSICS	Biophysical Principles of Cardiac Electrical Activity and Conduction (T-1)	1. Explain the biophysical basis of cardiac electrical activity, including ion gradients, membrane potentials, equilibrium potentials, and the role of ion channels. 2. Compare nodal and non-nodal cardiac action potentials and relate each phase to Na+, K+, Ca2+, and Cl− channel activity. 3. Describe how cardiac impulses are generated and conducted through the SA node, AV node, Bundle of His, and Purkinje fibers. 4. Explain how intercalated discs, desmosomes, and gap junctions allow cardiac muscle cells to function as a synchronized electrical and mechanical unit. 5. Relate cardiac action potentials to excitation-contraction coupling, calcium-induced calcium release, troponin C activation, cross-bridge formation, and relaxation.
	Circulatory system dynamics (T-1)	1. Describe the vascular components of the circulatory system, including arteries, capillaries, veins, and their biomechanical roles in blood transport and exchange. 2. Explain the biophysical basis of blood pressure, including cardiac output, systemic vascular resistance, hydrostatic pressure, pulse pressure, and mean arterial pressure. 3. Apply Ohm's law for hemodynamics to relate pressure difference, blood flow, cardiac output, and vascular resistance. 4. Explain the role of vascular compliance and capacitance in arteries and veins, including their effects on pulsatile blood flow and pressure regulation. 5. Describe laminar and turbulent blood flow and relate Reynolds number to the likelihood of turbulence in the circulatory system. 6. Relate alterations in vascular resistance, compliance, pressure, and blood flow to hypertension, hypotension, shock, and vascular stenosis.
	Electrocardiography I-II (T-2)	1. Explain the biophysical origin of surface ECG signals and relate recorded potential differences to the spatial and temporal patterns of myocardial depolarization and repolarization. 2. Correlate ECG waveforms (P, QRS, T) and intervals (PR, QRS, QT) with electrical events and conduction pathways in the heart. 3. Describe how ECG signals are recorded, including electrode placement, ECG graph paper calibration (time and voltage), and sources of recorded electrical activity. 4. Analyze the standard ECG lead systems, including bipolar and unipolar leads, Einthoven's triangle, and Wilson's central terminal as a reference electrode. 5. Explain the formation and function of the Wilson central terminal and its role in generating unipolar (augmented and precordial) leads. 6. Apply basic quantitative methods to ECG interpretation, including heart rate calculation (e.g., rule of 300) and interval measurement. 7. Interpret the direction of cardiac electrical vectors and relate lead orientation to positive and negative deflections on the ECG. 8. Recognize basic ECG abnormalities

		in heart rate, rhythm, and atrioventricular or intraventricular conduction and relate them to alterations in cardiac electrical activity.
	Biophysical Principles of Hemodynamics: Poiseuille, Bernoulli and Laplace Laws (T-2)	1. Explain the concepts of pressure and hydrostatic pressure and their relevance to the cardiovascular system. 2. Apply the continuity equation to blood flow through vessels of different cross-sectional areas. 3. Explain Bernoulli's principle and relate changes in flow velocity to pressure changes in the cardiovascular system. 4. Apply Poiseuille's law to explain the effects of vessel radius, blood viscosity, and vessel length on vascular resistance and blood flow. 5. Calculate equivalent vascular resistance for vessels arranged in series and parallel. 6. Apply Laplace's law to explain the relationship among transmural pressure, vessel radius, and wall tension. 7. Relate basic hemodynamic principles to vascular stenosis, hypertension, and aneurysm formation.
	Blood Pressure, Vascular Resistance and Tissue Perfusion (T-1)	1. Explain the relationships among pressure gradient, blood flow, and vascular resistance in the systemic circulation. 2. Explain the major determinants of arterial blood pressure, including cardiac output and systemic vascular resistance. 3. Explain how changes in vessel radius, vascular tone, and blood viscosity influence vascular resistance and tissue blood flow. 4. Relate alterations in blood pressure and vascular resistance to hypertension, hypotension, shock, and impaired tissue perfusion.
	Biophysical Principles of Respiratory Dynamics and Gas Exchange (T-1)	1. Explain the biophysical principles underlying pulmonary ventilation and gas exchange. 2. Distinguish external and internal respiration and explain the role of partial-pressure gradients in respiratory gas transport. 3. Explain ventilation, perfusion, and ventilation–perfusion matching in the lungs. 4. Apply Dalton's law and relevant gas laws to explain partial pressures and gas exchange in the respiratory system. 5. Explain the mechanical roles of the diaphragm and other respiratory muscles in generating pressure changes required for ventilation. 6. Explain the effects of airway resistance and lung compliance on ventilation. 7. Relate disturbances of ventilation, perfusion, diffusion, airway resistance, and compliance to dyspnea, hypoxemia, and respiratory failure.
	Biophysics of Surface Tension and Alveolar Mechanics (T-1)	1. Explain surface tension and its contribution to alveolar mechanics. 2. Apply Laplace's law to explain the relationships among alveolar radius, surface tension, and pressure. 3. Explain how pulmonary surfactant reduces surface tension and contributes to alveolar stability. 4. Explain lung and chest-wall compliance and interpret basic pressure–volume relationships. 5. Explain airway and tissue resistance and identify the major factors affecting resistance to airflow. 6. Explain how changes in compliance and airway resistance affect ventilation and alveolar volume. 7. Relate alterations in surface tension, surfactant function, compliance, and airway resistance to atelectasis and obstructive or restrictive respiratory disorders.
	Lung Volumes, Pressure Changes and Work of Breathing (T-1)	1. Describe lung volumes and capacities and explain their physiological significance. 2. Explain changes in pulmonary volume, alveolar pressure, pleural pressure, and transpulmonary pressure during the respiratory cycle. 3. Explain the biophysical basis of the work of breathing. 4. Interpret pressure–volume relationships and relate the area of the pressure–volume loop to mechanical work during respiration. 5. Explain the relationship between respiratory frequency, tidal volume, airway resistance, lung compliance, and the work of breathing. 6. Relate alterations in lung volumes and increased work of breathing to

		obstructive and restrictive respiratory disorders.
	SKILLS	
	Biophysics Lab: Surface Tension and Alveolar Stability (P-1)	1. Measure the force required to detach a liquid lamella using an experimental surface-tension measurement system. 2. Calculate surface tension from the measured force. 3. Explain the relationship between surface tension and surface energy. 4. Explain the role of surface tension in alveolar mechanics using Laplace's law. 5. Relate the surface-tension-reducing effect of pulmonary surfactant to alveolar stability and the prevention of alveolar collapse.

Histology and Embryology

At the end of this lesson, the student will be able to:		
KNOWLEDGE		
DEP.	**TOPIC**	**LEARNING OUTCOMES**
HISTOLOGY AND EMBRYOLOGY	Hematopoesis (T-1)	1. Describe prenatal and postnatal hematopoiesis, including primary sites and developmental stages. 2. Classify the stages of hematopoiesis, including erythropoiesis, granulocytopoiesis, monocytopoiesis, platelet formation, and lymphopoiesis, and relate them to relevant clinical correlations.
	Histology of blood and bone marrow (T-2)	1. Describe the components of the circulatory system, including the heart, blood vessels and lymphatic vessels. 2. Explain the basic structure of blood vessels, including the tunica intima, tunica media and tunica adventitia in arteries and veins. 3. Describe the different types of capillaries and sinusoids. 4. Classify arteries and veins primarily according to the cellular and extracellular components of the adventitia and media, as well as according to their size. Explain the histological organisation of lymphatic capillaries and larger lymphatic vessels, their relationship with lymph nodes and the differences between them and blood vessels. 5. Identify the histological features of the epicardium, myocardium and endocardium of the heart. 6. Outline the path of the cardiac impulse from the sinoatrial node to the ventricles and recognise the histological features of Purkinje fibres in the ventricles.
	Development Of Cardiovascular System (T-3)	1. Describe the formation of the primitive heart tube and early cardiac looping. 2. Explain the septation of the heart chambers and great vessels. 3. Discuss the development of the fetal circulation and its transition at birth. 4. Relate abnormal cardiac development to common congenital heart defects.
	Histology of the cardiovascular system (T-2)	1. Describe the histological layers of the heart wall (endocardium, myocardium, epicardium). 2. Describe the histological structure of arteries, veins, and capillaries. 3. Explain the histological differences between elastic and muscular arteries. 4. Relate vascular histology to functional differences between vessel types.

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	Development of Respiratory System (T-2)	1. Identify and describe the histological organization of all layers of the respiratory tract (nasal cavity, larynx, trachea, and lung) under the light microscope. 2. Explain the microscopic structures of these regions, emphasizing epithelium types and supporting tissues such as lamina propria, cartilage, smooth muscle, blood vessels, and glands, highlighting their regional differences. 3. Examine alveoli and the blood-air barrier, identifying the cellular components involved in gas exchange.
	Histology of Respiratory system (T-2)	1. Describe the histological organization of the respiratory system and distinguish the conducting and respiratory portions. 2. Explain the structural and functional characteristics of the respiratory epithelium and its cellular components. 3. Compare the histological features of the trachea, bronchi, and bronchioles and relate these differences to their functions. 4. Describe the cellular and structural organization of the alveoli, including type I and type II pneumocytes and alveolar macrophages. 5. Explain the structural components of the blood–air barrier and their significance in pulmonary gas exchange. 6. Correlate respiratory system histology with normal pulmonary function and selected clinical conditions affecting the airways and alveoli.
	SKILLS	
	Histology of blood and bone marrow & Hematopoesis & Histology of heart and blood vessels (P-2)	1. Identify and differentiate the major blood cell types and describe their characteristic morphological features in peripheral blood smears. 2. Recognize and interpret the histological organization of bone marrow and identify the major stages of hematopoiesis. 3. Differentiate the developmental stages of erythroid and myeloid cell lineages based on their microscopic characteristics. 4. Identify and distinguish the histological layers and characteristic features of arteries, veins, and capillaries. 5. Identify and describe the microscopic organization of the heart, including the endocardium, myocardium, and epicardium.
	Histology of Respiratory system (P-2)	1.Identify and describe the major histological structures of the respiratory system in light microscopic sections. 2. Distinguish the trachea, bronchi, and bronchioles based on their characteristic epithelial, cartilage, glandular, and smooth muscle components. 3. Identify the different regions of the lung, including bronchioles, alveolar ducts, alveolar sacs, and alveoli. 4. Recognize type I and type II pneumocytes, alveolar macrophages, and interalveolar septa in lung sections. 5. Interpret the histological organization of the blood–air barrier in relation to pulmonary gas exchange.

Physiology

At the end of this lesson, the student will be able to:		
KNOWLEDGE		
DEP.	**TOPIC**	**LEARNING OUTCOMES**
PHYSIOLOGY	Introduction to blood physiology (T-1)	1. Explain the process of hematopoiesis. 2. Explain four major roles of blood: transport, hemostasis, homeostasis and immunity. 3. List whole blood components with their properties as plasma and formed elements. 4. Explain how plasma and serum are obtained 5. Explain plasma proteins and their roles.

	Structure and functions of red blood cells (T-1)	1. Explain regulation of erythropoiesis and importance of vitamin B12, folic acid and iron for RBC production. 2. Explain the features of red blood cells (RBC) by describing their life span, count, shape, hemoglobin concentrations. 3. Explain the meaning of mean corpuscular volume (MCV), microcytosis, macrocytosis; mean corpuscular hemoglobin; and the mean corpuscular hemoglobin concentration (MCHC). 4. Describe how we can measure hematocrit value and what it reflects 5. Explain how red blood cells transport oxygen and CO2. 6. Describe the metabolic pathways that RBC are using for energy production. 7. Explain the erythrocyte sedimentation rate (ESR) and the factors affecting ESR 8. Explain the blood groups and how we can identify blood types
	Heart muscle and Rhythmical Excitation of the Heart (T-2)	1. Describe the general characteristics of cardiac muscle 2. Describe the underlying ionic currents which generate pacemaker potential and action potential in autorhythmic cells 3. Describe the mechanisms by which action potentials are generated in myocardial contractile cells 4. Differentiate myocardial contractile cells and myocardial autorhythmic cells by explaining their characteristic feature 5. Explain how the impulses generated by sinoatrial node are distributed to the atria and ventricles 6. Explain the steps of excitation-contraction coupling in cardiac muscle 7. Compare cardiac muscle with skeletal muscle in terms of generation of tension 8. List the steps of events that produce rhythmical excitation of the heart 9. Compare units of conduction system in terms of intrinsic firing rates 10. Compare units of conduction system in terms of conduction velocity
	Heart cycle and heart sounds (T-2)	1. Explain process of atrial and ventricular systole and atrial and ventricular diastole 2. Explain the relationship between ventricular pressure, aortic pressure and atrial pressure during the cardiac cycle 3. Explain the basis of the heart sounds 4. Estimate the results of the abnormal valve functions on phonocardiography 5. Describe the chest areas from which sound of each valve is best heard 6. Explain how systole and diastole are affected by changes in heart rate
	Fundamentals of ECG (T-1)	1. Describe the physiological basis of the electrocardiogram (ECG). 2. Identify the waves, segments, and intervals of a normal ECG and their physiological correlates. 3. Explain the relationship between cardiac electrical activity and the ECG tracing. 4. Discuss the basic clinical uses of the ECG in assessing cardiac function.
	Vectoral Analysis of ECG(T-1)	1. Compare the various waveforms that are generated when recording electrocardiograms with the standard limb leads, augmented limb leads, and precordial leads 2. State the relationship between electrical events of cardiac excitation and the generation of the various waveforms, intervals, and segments that can be observed on ECG 3. Calculate heart rate by using ECG data 4. Explain how the mean electrical axis of the heart can be calculated
	Introduction to Circulation (T-1)	1. Describe the general organization of the circulatory system (pulmonary and systemic circuits). 2. Explain the functional roles of arteries, veins, capillaries, and the heart. 3. Discuss the basic principles of pressure, flow, and resistance in circulation (Ohm's law analogy). 4. Relate circulatory system organization to the delivery of oxygen and nutrients to tissues.
	Functions of Arterial and Venous Systems (T-1)	1. Describe the structural and functional differences between arteries and veins. 2. Explain the role of arterial compliance in maintaining continuous blood flow. 3. Discuss venous return mechanisms (muscle pump, respiratory pump, venous valves). 4. Relate arterial and venous system function to blood pressure regulation.

	Capillary fluid exchange, Lymphatic System (T-1)	1. Define capillary exchange by explaining diffusion, transcytosis and bulk flow 2. Describe the factors that are affecting capillary exchange 3. Define hydrostatic and osmotic pressures 4. Describe how to calculate net filtration pressure that determines the net flow of fluid across the capillary membrane by considering the four Starling forces
	Regulation of blood flow (T-2)	1. Describe the factors responsible for maintaining blood flow throughout the body 2. Describe the structure of microcirculation and name the characteristics of the various vessel types 3. Describe the roles of the smooth muscle cells in the blood vessel wall 4. Name the factors that are responsible for vasoconstriction and vasodilation 5. Relate between changes in the microcirculation and the regulation of systemic blood pressure 6. Describe peripheral resistance in the circulation 7. Explain the relationship between pressure and peripheral resistance 8. Explain the relationship between cardiac function, blood vessel filling, blood pressure and blood flow
	Long-Term Regulation of blood flow (T-1)	1. Define blood pressure 2. Describe location and functions of vasomotor center 3. Name parts of the nervous system that innervate blood vessels and heart 4. Describe the anatomic organization of baroreceptors and their functions 5. Describe the anatomic organization of chemoreceptors and their functions 6. Name all components of renin- angiotensin- aldosterone system and describe function(s) of each component 7. Name atrial natriuretic peptide (ANP) and anti- diuretic hormone (ADH), and describe their roles in regulation of blood pressure
	Coronary Circulation (T-1)	1. Describe the anatomy and physiological regulation of coronary blood flow. 2. Explain the metabolic and neural factors that regulate coronary circulation. 3. Discuss the relationship between myocardial oxygen demand and coronary flow. 4. Relate coronary circulation physiology to clinical conditions such as ischemia and angina.
	Cardiac output, regulation of the cardiac functions (T-2)	1. Define and calculate cardiac output 2. Explain preload and afterload 3. Explain the relationship between the left ventricular volume and pressure by drawing volume-pressure curve 4. Discuss how left ventricular volume-pressure curve is affected with increased preload and afterload 5. Describe factors affecting heart rate (chronotropic effects) 6. Describe factors affecting conduction velocity in the heart (dromotropic effects) 7. Describe factors that are affecting contractility of the heart (inotropic effects)
	Short- and long-term regulation of blood pressure (T-2)	1. Define blood pressure 2. Describe location and functions of vasomotor center 3. Name parts of the nervous system that innervate blood vessels and heart 4. Describe the anatomic organization of baroreceptors and their functions 5. Describe the anatomic organization of chemoreceptors and their functions 6. Name all components of renin- angiotensin- aldosterone system and describe function(s) of each component 7. Name atrial natriuretic peptide (ANP) and anti- diuretic hormone (ADH), and describe their roles in regulation of blood pressure
	Respiratory mechanics; lung volume and capacities (T-2)	1. Define partial pressure and calculate the partial pressure of each of the important gases in the atmosphere at sea level. 2. List the passages through which air passes from the exterior to the alveoli, and describe the cells that line each of them. 3. List the major muscles involved in respiration, and state the role of each. 4. Define the basic measures of lung volume and give approximate values for each in a normal adult.

		5. Define compliance, and give examples of diseases in which it is abnormal. 6. Describe the chemical composition and function of surfactant. 7. List the factors that determine alveolar ventilation.
	Pulmonary Circulation (T-1)	1. Describe the anatomical and functional characteristics of the pulmonary circulation. 2. Explain the low-pressure, low-resistance nature of the pulmonary vascular bed. 3. Discuss the regulation of pulmonary blood flow, including hypoxic pulmonary vasoconstriction. 4. Relate pulmonary circulation physiology to ventilation-perfusion matching.
	Gas Exchange and Gas Transport (T-2)	1. Define the pressure exerted by each gas in a mixture of gases is independent ofthe pressure exerted by the other gases (Dalton's Law) 2. Explain gases in a liquid diffuse from higher partial pressure to lower partial pressure (Henry's Law) 3. Describe the components of the alveolar-capillary membrane 4. Explain the various factors determining gas transfer: -Surface area, thickness, partial pressure difference, and diffusion coefficient of gas 5. State the partial pressures of oxygen and Carbon dioxide in the atmosphere, alveolar gas, at the end of the pulmonary capillary, in systemic capillaries, and at the beginning of a pulmonary capillary 6. Describe the relationship between PO2 and % saturation of hemoglobin with oxygen (Oxygen- hemoglobin dissociation curve), and the significance of the shape of this relationship 7. Define how DPG, temperature, H+ ions and PCO2 affect affinity of O2 for Hemoglobin and the physiological importance of these effects. 8. State the significance of fetal Hb and adult myoglobin. 9. Describe the role of the enzyme carbonic anhydrase, and the CO2 dissociation curve. 10. Describe how H+ is transported in the blood.
	Regulation of Respiration (T-1)	1. Describe the roles of respiratory centers located in the brain stem in determining the basic pattern of respiratory activity 2. Explain the pacemaker activity of medullary inspiratory neurons 3. List factors that could modify the basic breathing pattern 4. Describe the respiratory consequences of alterations seen in PO2, PCO2 and pH 5. Define the locations and roles of central and peripheral chemoreceptors
	Lab: Effect of Blood Pressure on Blood Flow Rate in a simulation platform(P-1)	1. Describe how vessel radius is changed in the body 2. Discuss the effect of blood vessel radius on blood flow rate based on the results of their experiments that they conducted in a simulation platform 3. Describe the sources of blood pressure 4. Discuss the effect of blood pressure on blood flow rate based on the data that they collected during the experiment. 5. Compare the effects of changes in afferent and efferent arteriole radius when changes in blood pressure occur
	Lab: Examining the effect of chemical modifiers on heart rate in a simulation platform(P-1)	1. Define the effects of epinephrine, pilocarpine, atropine, and digitalis on heart rate based on the series of experiment that they conducted in a simulation platform 2. Relate the chemical modifiers of the heart rate to sympathetic and parasympathetic activation 3. Deescribe the potential effect of potassium, sodium, and calcium ions on heart rate based on the series of experiment that they conducted in a simulation platform 4. Define ionotropic and chronotropic effects on heart 5. Discuss how calcium channel blockers might be used pharmaceutically
	Lab: Pulmonary Tests(P-2)	1. Perform and interpret basic pulmonary function tests (e.g., spirometry) in a simulation platform. 2. Explain the physiological basis of measured lung volumes and capacities. 3. Relate pulmonary function test results to respiratory health and disease. 4. Discuss the clinical significance of abnormal spirometry findings.

	Lab: Electrocardiography(P-2)	1. Describe how the electrocardiogram (ECG) is recorded from standard limb leads 2. Explain placement of the electrodes for the standard limb lead recordings 3. Compare the various waveforms that are generated when recording electrocardiograms with the standard limb leads, augmented limb leads, and precordial leads 4. Calculate mean electrical axis of QRS complex under different conditions by using ECG data recorded from limb leads

Clinical Skills

At the end of this lesson, the student will be able to:		
SKILLS		
DEP.	**TOPIC**	**LEARNING OUTCOMES**
	Vital Signs II: Arterial Blood Pressure, Respiratory Rate, Oxygen Saturation Measurement (T-1), (P-2)	1. Describe the blood pressure 2. Describe the Korotkoff sounds 3. Demonstrate the proper technique for taking blood pressure 4. Identify the sources of error in measuring blood pressure and suggest techniques to minimize them 5. Tell the normal ranges of the respiratory rate 6. Describe how to count patient's respiratory rate 7. Describe the working principles of pulse oximetry 8. List the common areas for use of pulse oximetry 9. Describe the limitations of pulse oximetry 10. Tell the normal ranges of oxygen saturation 11. Describe how to measure oxygen saturation with a pulse oximetry

Communication Skills

At the end of this lesson, the student will be able to:		
KNOWLEDGE		
DEP.	**TOPIC**	**LEARNING OUTCOMES**
COMMUNICATION SKILLS	Introduction to Communication Skills (P-2)	1. Discuss why communication skills in medicine are important 2. Clarify the feelings that drive human actions 3. Define aggressive, passive and assertive types of behavior 4. Discover that human beings react differently in a given situation depending on their own levels of acceptance 5. Distinguish the necessary action to be taken (listening / self- expression) during communication
	Active Listening and self-expression (P-2)	1. Define the steps of active listening 2. Appraise importance of body language in communication 3. List the sentences that may act as barriers in communication 4. Demonstrates active listening skills when talking to a person in problem 5. Distinguish different forms of self-expression 6. Identify negative effect of judgmental self-expression in interpersonal relationship 7. Describe three steps of self-expression using "ı language" 8.Demonstrate correct self-expression method in role plays
	Self-expression; Conflict Resolution (P-2)	1.Distinguish different forms of self-expression 2. Identify negative effect of judgmental self-expression in interpersonal relationship 3. Describe three steps of self-expression using "ı language" 4. Demonstrate correct self-expression method in role plays 5. Define two different types of conflicts 6. Explain different methods of resolution in necessity based conflicts 7. Comprehends reasons of conflicts in people who has different values 8. Discuss the ways of conflict resolution in people with different values

	Using the basic communication skills in doctor-patient relationship (P-2)	1. Adapts basic communication skills to doctor- patient interaction 2. Uses techniques to build up and maintain rapport with the patient 3. Uses techniques of active listening while talking to the patient 4. Evaluates emotions of the patient and responds in accordance with the emotion 5. Encourages the patient to express his/her concerns

History of Medicine and Ethics

At the end of this lesson, the student will be able to:		
KNOWLEDGE		
DEP.	**TOPIC**	**LEARNING OUTCOMES**
HISTORY OF MEDICINE AND ETHICS	Medieval European Medicine (T-2)	1. Comprehend the significance of ancient Chinese, Indian, Egyptian, Greek, and Roman medicine; evaluate the medical approaches of different civilizations and explain their distinctive features. 2. Understand certain medical practices and significant events of prehistoric times; compare them with current practices through examples. 3. Define the distinctive features of Chinese, Indus, Mesopotamian, Egyptian, Greek, and Roman civilizations, their medical treatment methods, and the tools used for diagnosis and prognosis of diseases. 4. Learn the contributions of important historical scientists in medicine from the Eastern and Western world. 5. Explain the distinctive features of Medieval Medicine in Europe, the treatment methods used, and the diagnostic tools; explain the scientific level and legacy of this period in Europe. 6. Explain the principles of medical ethics; explain the general terms and principles of modern bioethics; explain the dynamics between ethics and law; explain how contemporary ethical principles are applied by examining the difference between ideas (duties); explain actions (consequences) in relation to ethical principles; explain why ethics may differ across cultures and why this knowledge is important.
	Medicine of Islamic Civilization (T-2)	1. Comprehend the significance of ancient Chinese, Indian, Egyptian, Greek, and Roman medicine; evaluate the medical approaches of different civilizations and explain their distinctive features. 2. Understand certain medical practices and significant events of prehistoric times; compare them with current practices through examples. 3. Define the distinctive features of Chinese, Indus, Mesopotamian, Egyptian, Greek, and Roman civilizations, their medical treatment methods, and the tools used for diagnosis and prognosis of diseases. 4. Learn the contributions of important historical scientists in medicine from the Eastern and Western world. 5. Explain the distinctive features of Medieval Medicine in Europe, the treatment methods used, and the diagnostic tools; explain the scientific level and legacy of this period in Europe. 6. Explain the principles of medical ethics; explain the general terms and principles of modern bioethics; explain the dynamics between ethics and law; explain how contemporary ethical principles are applied by examining the difference between ideas (duties); explain actions (consequences) in relation to ethical principles; explain why ethics may differ across cultures and why this knowledge is important.
	Medicine of Seljuk Civilization (T-2)	1. Comprehend the significance of ancient Chinese, Indian, Egyptian, Greek, and Roman medicine; evaluate the medical approaches of different civilizations and explain their distinctive features. 2. Understand certain medical practices and significant events of prehistoric times; compare them with current practices through examples. 3. Define the distinctive features of Chinese, Indus, Mesopotamian, Egyptian, Greek, and Roman civilizations, their medical treatment methods, and the tools used for diagnosis and prognosis of diseases.

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		4. Learn the contributions of important historical scientists in medicine from the Eastern and Western world. 5. Explain the distinctive features of Medieval Medicine in Europe, the treatment methods used, and the diagnostic tools; explain the scientific level and legacy of this period in Europe. 6. Explain the principles of medical ethics; explain the general terms and principles of modern bioethics; explain the dynamics between ethics and law; explain how contemporary ethical principles are applied by examining the difference between ideas (duties); explain actions (consequences) in relation to ethical principles; explain why ethics may differ across cultures and why this knowledge is important.
	Ottoman Medicine (T-2)	1. Comprehend the significance of ancient Chinese, Indian, Egyptian, Greek, and Roman medicine; evaluate the medical approaches of different civilizations and explain their distinctive features. 2. Understand certain medical practices and significant events of prehistoric times; compare them with current practices through examples. 3. Define the distinctive features of Chinese, Indus, Mesopotamian, Egyptian, Greek, and Roman civilizations, their medical treatment methods, and the tools used for diagnosis and prognosis of diseases. 4. Learn the contributions of important historical scientists in medicine from the Eastern and Western world. 5. Explain the distinctive features of Medieval Medicine in Europe, the treatment methods used, and the diagnostic tools; explain the scientific level and legacy of this period in Europe. 6. Explain the principles of medical ethics; explain the general terms and principles of modern bioethics; explain the dynamics between ethics and law; explain how contemporary ethical principles are applied by examining the difference between ideas (duties); explain actions (consequences) in relation to ethical principles; explain why ethics may differ across cultures and why this knowledge is important.
	Renaissance Medicine (T-2)	1. Comprehend the significance of ancient Chinese, Indian, Egyptian, Greek, and Roman medicine; evaluate the medical approaches of different civilizations and explain their distinctive features. 2. Understand certain medical practices and significant events of prehistoric times; compare them with current practices through examples. 3. Define the distinctive features of Chinese, Indus, Mesopotamian, Egyptian, Greek, and Roman civilizations, their medical treatment methods, and the tools used for diagnosis and prognosis of diseases. 4. Learn the contributions of important historical scientists in medicine from the Eastern and Western world. 5. Explain the distinctive features of Medieval Medicine in Europe, the treatment methods used, and the diagnostic tools; explain the scientific level and legacy of this period in Europe. 6. Explain the principles of medical ethics; explain the general terms and principles of modern bioethics; explain the dynamics between ethics and law; explain how contemporary ethical principles are applied by examining the difference between ideas (duties); explain actions (consequences) in relation to ethical principles; explain why ethics may differ across cultures and why this knowledge is important.
	Organization of Medical Services in the Early Years of the Republic of Turkey (T-2)	1. Comprehend the significance of ancient Chinese, Indian, Egyptian, Greek, and Roman medicine; evaluate the medical approaches of different civilizations and explain their distinctive features. 2. Understand certain medical practices and significant events of prehistoric times; compare them with current practices through examples. 3. Define the distinctive features of Chinese, Indus, Mesopotamian, Egyptian, Greek, and Roman civilizations, their medical treatment methods, and the tools used for diagnosis and prognosis of diseases. 4. Learn the contributions of important historical scientists in medicine from the Eastern and Western world. 5. Explain the distinctive features of Medieval Medicine in Europe, the treatment methods used, and the diagnostic tools; explain the scientific level and legacy of this period in Europe.

		6. Explain the principles of medical ethics; explain the general terms and principles of modern bioethics; explain the dynamics between ethics and law; explain how contemporary ethical principles are applied by examining the difference between ideas (duties); explain actions (consequences) in relation to ethical principles; explain why ethics may differ across cultures and why this knowledge is important.
	The Tuskegee Syphilis Study - Ethical Analysis (T-2)	1. Comprehend the significance of ancient Chinese, Indian, Egyptian, Greek, and Roman medicine; evaluate the medical approaches of different civilizations and explain their distinctive features. 2. Understand certain medical practices and significant events of prehistoric times; compare them with current practices through examples. 3. Define the distinctive features of Chinese, Indus, Mesopotamian, Egyptian, Greek, and Roman civilizations, their medical treatment methods, and the tools used for diagnosis and prognosis of diseases. 4. Learn the contributions of important historical scientists in medicine from the Eastern and Western world. 5. Explain the distinctive features of Medieval Medicine in Europe, the treatment methods used, and the diagnostic tools; explain the scientific level and legacy of this period in Europe. 6. Explain the principles of medical ethics; explain the general terms and principles of modern bioethics; explain the dynamics between ethics and law; explain how contemporary ethical principles are applied by examining the difference between ideas (duties); explain actions (consequences) in relation to ethical principles; explain why ethics may differ across cultures and why this knowledge is important.
	Ethics - Metaethics, Utilitarianism (T-2)	1. Comprehend the significance of ancient Chinese, Indian, Egyptian, Greek, and Roman medicine; evaluate the medical approaches of different civilizations and explain their distinctive features. 2. Understand certain medical practices and significant events of prehistoric times; compare them with current practices through examples. 3. Define the distinctive features of Chinese, Indus, Mesopotamian, Egyptian, Greek, and Roman civilizations, their medical treatment methods, and the tools used for diagnosis and prognosis of diseases. 4. Learn the contributions of important historical scientists in medicine from the Eastern and Western world. 5. Explain the distinctive features of Medieval Medicine in Europe, the treatment methods used, and the diagnostic tools; explain the scientific level and legacy of this period in Europe. 6. Explain the principles of medical ethics; explain the general terms and principles of modern bioethics; explain the dynamics between ethics and law; explain how contemporary ethical principles are applied by examining the difference between ideas (duties); explain actions (consequences) in relation to ethical principles; explain why ethics may differ across cultures and why this knowledge is important.

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Biostatistics

At the end of this lesson, the student will be able to:		
KNOWLEDGE		
DEP.	**TOPIC**	**LEARNING OUTCOMES**
BIOSTATISTICS	Foundations of Biostatistics and Study Design (T-2)	1. Distinguish population, sample, parameter, and statistic. 2. Classify clinical variables by type and measurement level. 3. Identify bias, confounding, randomization, and blinding in study designs.
	Descriptive Statistics I: Tables and Graphical Displays (T-2)	1. Construct frequency tables for clinical data. 2. Select appropriate bar, histogram, box, and time plots. 3. Detect misleading displays and summarize distribution shape.

	Descriptive Statistics II: Center, Variation, Position, and Outliers (T-2)	1. Calculate and interpret mean, median, mode, and weighted mean. 2. Quantify variability with range, variance, standard deviation, and IQR. 3. Use z-scores, percentiles, and outliers to compare clinical measurements.
	Probability (T-2)	1. Apply addition, multiplication, and conditional probability rules. 2. Distinguish independent from mutually exclusive events. 3. Interpret sensitivity, specificity, predictive values, risk, and odds.
	Discrete Probability Distributions (T-2)	1. Define random variables and probability distributions. 2. Calculate expected value and variability for binomial outcomes. 3. Use binomial and Poisson models for clinical counts and events.
	Normal Distributions (T-2)	1. Standardize observations with z-scores and obtain normal probabilities. 2. Explain sampling distributions and the central limit theorem. 3. Assess normality and interpret reference intervals and normal approximations.
	One-Sample Estimation and Sample Size (T-2)	1. Construct confidence intervals for a mean and a proportion. 2. Interpret confidence level, precision, and margin of error. 3: Determine sample size from precision and variability requirements.
	One-Sample Hypothesis Tests (T-2)	1. Formulate null and alternative hypotheses for one-sample questions. 2. Interpret p-values, alpha, Type I/II errors, and power. 3. Perform and report one-sample tests for means and proportions.

Medical Education

At the end of this lesson, the student will be able to:		
KNOWLEDGE		
DEP.	**TOPIC**	**LEARNING OUTCOMES**
MEDICAL EDUCATION	Body-Mind-Behaviour: Being Human (T-2)	Describe the biological, psychological, social, and existential dimensions of Body-Mind-Behaviour: Being Human; distinguish between the concepts of "body," "disease," and "person"; define basic psychoanalytic concepts such as the conscious and the unconscious, and their relevance to human motivation and behavior.
	Body-Mind-Behaviour: Body-Mind Dualism (T-2)	Explain Descartes' concept of Body-Mind-Behaviour: Body-Mind Dualism (res cogitans vs. res extensa) and its historical context; define embodied cognition and explain how it challenges the Cartesian separation of mind and body; compare Cartesian dualism, embodied cognition, and biomedical/biopsychosocial models.
	Body-Mind-Behaviour: Somatic practices (T-2)	Define somatic experience; describe basic concepts of Breath and Shape-Flow (growing/shrinking, opening/closing patterns) and their role in postural awareness and stress response.

KOMİTE 4 (MED1104) – Gastrointestinal Systems

MED1104 / KOMİTE 4: GASTROINTESTINAL SYSTEMS				
Course Date	April 5 – June 10, 2027			
Exam Dates	Block Committee Exam: June 11, 2027			
Course Coordinator:	Betül Şahin, Assist. Prof			
Academic Unit	**Academic Staff**	**Theoretical**	**Practical**	**Total**
Anatomy	Ahmet Usta, Prof.	**13**	**8**	**21**
Biochemistry	Özlem Unay Demirel, Assoc. Prof. Yeşim Neğiş, Assoc. Prof. Merve Karayel, Assist. Prof. İrem Kırış, Assist. Prof.	**33**	**0**	**33**
Biophysics	Serdar Durdağı, Prof. Bircan Dinç, Assist. Prof. Duygu Tarhan, Assist. Prof İrem Demirkan, Assist. Prof.	**1**	**1**	**2**
Histology and Embryology	Yasemin Çanıllıoğlu, Assoc. Prof. Merjem Purelku, Assist Prof	**12**	**9**	**21**
Physiology	Numan Ermutlu, Prof. Dr. Elif Bahadır, Assist. Prof. Betilay Topkara Arslan, Assist. Prof. Yasemin Keskin Ergen, Assist. Prof.	**15**	**0**	**15**
Clinical Skills	Yasemin Keskin Ergen, Assist. Prof. Serkan Tulgar, Prof.	**1**	**2**	**3**
Medical Education	İnanç Sümbüloğlu	**6**	**-**	**6**
TOTAL		**74**	**18**	**98**
History of Medicine and Ethics	Hıdır Kadircan Keskinbora, Prof Aran Arslan, Assist Prof. Yasemin Koçer-Tulgar	**10**	**-**	**10**
Biostatistics	Hüseyin Tunç, Assist. Prof	**8**	**-**	**8**
Communication Skills and Academic Reporting	Figen Dağlı, Prof.	**8**	**-**	**8**
STUDY TIME				**170**

COURSE AIM:

The aim of this course is to: provide knowledge about the anatomy, histology, biochemistry, biophysics, and physiology of the gastrointestinal system, including the mouth, esophagus, stomach, small and large intestine, liver, biliary tract, and pancreas; explain the processes of digestion, absorption, and metabolism; provide a basis for interpreting normal and abnormal gastrointestinal structure and function, including the radiological anatomy of the digestive system; conclude the history of medicine and medical ethics; continue the fundamentals of research methodology; develop clinical and communication skills.

Anatomy

At the end of this lesson, the student will be able to:		
KNOWLEDGE		
DEP.	**TOPIC**	**LEARNING OUTCOMES**
ANATOMY	Mouth (T-1)	1. Describe the boundaries and subdivisions of the oral cavity. 2. Identify the three major salivary glands and their duct openings. 3. Describe the extrinsic and intrinsic tongue muscles and their innervation. 4. Correlate tongue deviation on protrusion with the side of hypoglossal nerve injury. 5. Apply salivary gland duct anatomy to explain the location of a submandibular duct stone (sialolithiasis).

	Pharynx (T-1)	1. Describe the three subdivisions of the pharynx and their boundaries. 2. Identify the three pharyngeal constrictor muscles and their role in swallowing. 3. Explain pharyngeal innervation via the pharyngeal plexus (CN IX, X). 4. Relate constrictor muscle dysfunction to dysphagia. 5. Apply pharyngeal anatomy to explain the gag reflex's afferent (CN IX) and efferent (CN X) limbs.
	Oesophagus, Stomach (T-1)	1. Describe the esophagus's three anatomical constrictions and their clinical relevance. 2. Identify the stomach's parts (cardia, fundus, body, pylorus) and curvatures. 3. Explain the lower esophageal sphincter's role and its relevance to GERD. 4. Describe the arterial supply of the stomach (celiac trunk branches). 5. Apply gastric anatomy to explain the surgical basis of a partial versus total gastrectomy.
	Duodenum, Jejunum, Ileum (T-1)	1. Describe the four parts of the duodenum and their relations. 2. Differentiate jejunum from ileum by structural/vascular features (vasa recta, arcades, wall thickness). 3. Explain the ligament of Treitz as the duodenojejunal landmark separating upper from lower GI bleeding. 4. Identify the superior mesenteric artery's territory. 5. Apply duodenal anatomy to explain why the second part is a common site of perforated posterior ulcer bleeding (gastroduodenal artery).
	Large intestines, Rectum, Anus (T-1)	1. Identify the subdivisions of the large intestine (cecum, colon, rectum, anal canal). 2. Describe the distinguishing features of the colon (taeniae coli, haustra, omental appendices). 3. Explain the internal vs. external anal sphincter (involuntary vs. voluntary control). 4. Correlate the pectinate line with the change in blood supply, innervation, and lymphatic drainage above/below it. 5. Apply the arterial watershed at the splenic flexure to explain its vulnerability to ischemic colitis.
	Peritoneum (T-1)	1. Differentiate parietal from visceral peritoneum. 2. Classify abdominal organs as intraperitoneal, retroperitoneal, or secondarily retroperitoneal, with one example each. 3. Describe the relationship between the greater and lesser peritoneal sacs. 4. Correlate peritoneal fluid accumulation with ascites and the localization of peritonitis. 5. Apply peritoneal reflection anatomy to identify the pouch of Douglas as the most dependent site for fluid collection.
	Peritoneum, Omentum (T-1)	1. Describe the greater omentum's attachments and its 'abdominal policeman' function. 2. Describe the lesser omentum's two ligaments (hepatogastric, hepatoduodenal) and their contents. 3. Explain the omental bursa (lesser sac) boundaries and the epiploic foramen (of Winslow) as its entry point. 4. Describe the transverse mesocolon and its division of the abdominal cavity into supracolic and infracolic compartments. 5. Apply omental anatomy to explain how the greater omentum can wall off a perforated appendix.
	Portal Vein, Portal System (T-1)	1. Describe the formation of the hepatic portal vein from the splenic and superior mesenteric veins. 2. Identify the major sites of portosystemic anastomosis (esophageal, rectal, umbilical). 3. Correlate portal hypertension with esophageal varices and caput medusae. 4. Describe the portal vein's formation posterior to the neck of the pancreas. 5. Apply portosystemic anastomosis anatomy to identify the anatomical basis of hemorrhoids as a portal hypertension sign.

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	Biliary tract, Pancreas (T-1)	1. Describe the components of the biliary tree (gallbladder, cystic duct, common hepatic/bile duct). 2. Describe the parts of the pancreas (head, body, tail) and its relation to the duodenum and spleen. 3. Explain the union of the bile and pancreatic ducts at the ampulla of Vater. 4. Correlate gallstone impaction sites with biliary colic vs. gallstone pancreatitis. 5. Apply pancreatic anatomy to explain why cancer in the head of the pancreas commonly presents with painless jaundice.
	Radiological Anatomy of GIS-1 (T-1)	1. Identify normal esophagus, stomach, and duodenum landmarks on a barium swallow/meal study. 2. Describe the expected contrast pattern of a normal upper GI series. 3. Relate an abnormal upper GI imaging finding to a common pathology (e.g., 'bird's beak' sign in achalasia). 4. Identify the duodenal C-loop and ligament of Treitz on an upper GI contrast study. 5. Apply upper GI radiological landmarks to recognize a hiatal hernia on a barium study.
	Radiological Anatomy of GIS-2 (T-1)	1. Identify normal small/large intestine landmarks on contrast and cross-sectional imaging. 2. Describe the normal appearance of the liver and biliary tree on ultrasound/CT/cholangiography. 3. Relate an abnormal lower GI/hepatobiliary imaging finding to a common pathology (e.g., dilated ducts in obstruction). 4. Identify haustral markings distinguishing colon from small bowel on a plain film. 5. Apply cross-sectional GI imaging anatomy to localize a bowel obstruction's transition point.
	SKILLS	
	Mouth, Pharynx (P-2)	1. Identify the boundaries and structures of the nasal cavity on models and cadaver. 2. Demonstrate paranasal sinus openings and their drainage pathways. 3. Recognize subdivisions of the pharynx and their relations. 4. Identify cartilages and folds of the larynx, including vocal cords.
	Oesophagus,Stomach, Small and large intestines (P-2)	1. Identify the oesophagus, stomach, small intestine, and large intestine on cadaveric specimens and anatomical models. 2. Demonstrate the anatomical parts, curvatures, surfaces, and major landmarks of the stomach. 3. Identify the parts of the small intestine (duodenum, jejunum, and ileum) and distinguish their characteristic anatomical features. 4. Identify the parts of the large intestine and demonstrate the caecum, appendix, colon, rectum, and their major external features. 5. Describe the topographic relationships of the oesophagus, stomach, small intestine, and large intestine with surrounding structures. 6. Identify the major arterial supply and venous drainage of the gastrointestinal tract. 7.Relate gastrointestinal anatomy to basic clinical conditions such as appendicitis, peptic ulcer disease, and intestinal obstruction.
	Liver, Biliary tract, Pancreas, Peritoneum (P-2)	1. Identify the liver, gallbladder, biliary tract, and pancreas on cadaveric specimens and anatomical models. 2. Demonstrate the surfaces, lobes, borders, and major anatomical landmarks of the liver, including the porta hepatis. 3. Identify the gallbladder and major components of the extrahepatic biliary tract and trace the pathway of bile to the duodenum. 4. Identify the head, neck, body, and tail of the pancreas and demonstrate its anatomical relationships with surrounding structures. 5. Identify the main pancreatic duct and its relationship with the common bile duct and duodenum. 6. Demonstrate the parietal and visceral peritoneum, greater and lesser omenta, mesenteries, and major peritoneal spaces. 7. Relate the anatomy of the hepatobiliary system, pancreas, and peritoneum to basic clinical conditions such as gallstones, pancreatitis, and peritoneal fluid accumulation.

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"science to examine virtue"

	Portal Vein, Portal System (P-2)	1. Identify the hepatic portal vein and its major tributaries on cadaveric specimens, anatomical models, and diagrams. 2. Demonstrate the formation of the portal vein and trace its course toward the liver. 3. Identify the major organs and regions drained by the hepatic portal system. 4. Demonstrate the anatomical relationship of the portal vein to the structures of the hepatoduodenal ligament and porta hepatis. 5. Identify the major sites of portosystemic (portocaval) anastomoses. 6. Explain the basic anatomical organization of portal and systemic venous circulation. 7. Relate portal venous anatomy to clinically relevant conditions such as portal hypertension, oesophageal varices, caput medusae, and haemorrhoidal varices.

Biochemistry

At the end of this lesson, the student will be able to:		
KNOWLEDGE		
DEP.	**TOPIC**	**LEARNING OUTCOMES**
BIOCHEMISTRY	Introduction to metabolism (T-1)	1. Define metabolism and distinguish between anabolic and catabolic pathways. 2. Explain the major types of metabolic reactions and the role of activated carriers in metabolism. 3. Explain the principles of energy transfer and metabolic integration. 4. Explain the mechanisms that regulate metabolic pathways.
	Glycolysis and its regulation (T-2)	1. Describe the purpose, cellular localization, tissue distribution, and overall reactions of glycolysis. 2. Explain the biochemical pathway of glycolysis, including the key enzymes and the metabolic consequences of enzyme deficiencies. 3. Compare aerobic and anaerobic glycolysis and explain their physiological significance in different tissues. 4. Explain the regulation of glycolysis, including allosteric, hormonal, and covalent mechanisms. 5. Explain the role of glucose transporters (GLUTs) and the contribution of glycolysis to whole-body glucose homeostasis.
	Fates of Lactate, Pyruvate and NADH (T-1)	1. Explain the metabolic fates of pyruvate under aerobic and anaerobic conditions. 2. Explain the roles of lactate dehydrogenase and lactate metabolism, including the Cori cycle and metabolic cooperation between tissues. 3. Explain the role of cytosolic NADH and the shuttle systems linking glycolysis to mitochondrial oxidative metabolism. 4. Describe how major dietary carbohydrates enter the glycolytic pathway.
	The Citric Acid Cycle and its Regulation (T-2)	1. Explain the structure, function, regulation, and cofactor requirements of the pyruvate dehydrogenase (PDH) complex. 2. Describe the purpose, cellular localization, major reactions, and energy yield of the citric acid cycle. 3. Explain the roles of the key enzymes and intermediates of the citric acid cycle and the biochemical consequences of their deficiencies. 4. Explain the amphibolic role of the citric acid cycle and its integration with carbohydrate, lipid, and amino acid metabolism. 5. Explain the hormonal and allosteric regulation of the pyruvate dehydrogenase complex and the citric acid cycle. 6. Explain the biosynthetic significance of citric acid cycle intermediates.
	Electron transport chain and oxidative phosphorylation (T-2)	1. Describe the organization and components of the electron transport chain in the inner mitochondrial membrane. 2. Explain electron transport, proton translocation, and ATP synthesis through oxidative phosphorylation, including the chemiosmotic theory. 3. Explain the regulation of oxidative phosphorylation and the role of the malate–aspartate and glycerol 3-phosphate shuttle systems. 4. Explain the mechanisms and biochemical effects of inhibitors and uncouplers of the electron transport chain and oxidative phosphorylation. 5. Explain the integration of oxidative phosphorylation with cellular energy

		metabolism.
	Gluconeogenesis and its regulation (T-2)	1. Describe the purpose, tissue distribution, subcellular localization, and physiological significance of gluconeogenesis. 2. Explain the biochemical pathway of gluconeogenesis, including the bypass reactions, key enzymes, cofactors, and energy requirements. 3. Describe the major substrates for gluconeogenesis, their metabolic entry points, and the physiological conditions in which they are utilized. 4. Compare gluconeogenesis with glycolysis and explain their reciprocal regulation. 5. Explain the hormonal and metabolic regulation of gluconeogenesis and its role in maintaining blood glucose homeostasis.
	Biosynthesis and breakdown of glycogen (T-1)	1. Describe the structure, biological functions, and tissue distribution of glycogen. 2. Explain the biochemical pathways of glycogen synthesis and degradation, including the key enzymes and their regulation. 3. Explain the physiological regulation of glycogen metabolism and its role in maintaining blood glucose homeostasis. 4. Explain the biochemical basis and clinical consequences of glycogen metabolism disorders.
	Regulation of Glycogen Metabolism (T-1)	1. Explain the hormonal and allosteric regulation of glycogen synthesis and glycogen breakdown. 2. Compare the regulation and physiological roles of glycogen metabolism in the liver and skeletal muscle. 3. Explain the integration of glycogen metabolism with whole-body glucose homeostasis.
	Biosynthesis of fatty acids and Regulation (T-2)	1. Describe the purpose, cellular localization, tissue distribution, substrates, products, and physiological significance of fatty acid biosynthesis. 2. Explain the biochemical pathway of fatty acid biosynthesis, including the roles of acetyl-CoA, the fatty acid synthase complex, NADPH, and the citrate shuttle. 3. Explain the role of acetyl-CoA carboxylase in fatty acid biosynthesis. 4. Explain the hormonal and allosteric regulation of fatty acid biosynthesis. 5. Explain the integration of fatty acid biosynthesis with carbohydrate metabolism.
	Biosyntesis of triacylgliserol and Regulation (T-2)	1. Describe the structure, biological functions, cellular localization, and tissue distribution of triacylglycerol biosynthesis. 2. Explain the biochemical pathway of triacylglycerol biosynthesis, including the roles of glycerol 3-phosphate, acyl-CoA synthetase, phosphatidic acid, and the key enzymes involved. 3. Explain the hormonal and metabolic regulation of triacylglycerol biosynthesis. 4. Explain the triacylglycerol cycle and its role in lipid metabolism. 5. Explain the integration of triacylglycerol biosynthesis with carbohydrate metabolism.
	Biosynthesis of eicosanoids (T-1)	1. Explain the biosynthesis of eicosanoids, including their precursors, cellular localization, and tissue distribution. 2. Explain the roles of cyclooxygenase (COX) and lipoxygenase (LOX) pathways in eicosanoid biosynthesis. 3. Explain the relationship between essential fatty acids, arachidonic acid, and eicosanoid synthesis. 4. Describe the biological functions of major eicosanoids.
	Biosynthesis of membrane phospholipids (T-1)	1. Describe the biosynthesis of membrane phospholipids, including their precursors, cellular localization, tissue distribution, and key enzymes. 2. Explain the relationship between triacylglycerol and membrane phospholipid biosynthesis. 3. Explain the biosynthesis and biological significance of major phospholipids and sphingolipids. 4. Describe the biological functions of clinically important membrane phospholipids, including phosphatidylcholine, phosphatidylinositol, and cardiolipin.

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"scientia et amore vitae"

	Biosynthesis of cholesterol (T-2)	1. Describe the structure, biological functions, cellular localization, and tissue distribution of cholesterol biosynthesis. 2. Explain the biochemical pathway of cholesterol biosynthesis, including the major intermediates and key enzymes. 3. Explain the role of 3-hydroxy-3-methylglutaryl-CoA (HMG-CoA) reductase in cholesterol biosynthesis. 4. Explain the hormonal, nutritional, and feedback regulation of cholesterol biosynthesis. 5. Explain the physiological significance of cholesterol as a precursor of biologically important molecules.
	Oxidation of fatty acids and ketone body formation (T-2)	1. Describe the biochemical pathway of fatty acid β-oxidation, including its cellular localization, substrates, products, and energy yield. 2. Explain the oxidation of saturated, unsaturated, and odd-chain fatty acids. 3. Explain the regulation of fatty acid β-oxidation, including the role of carnitine palmitoyltransferase I (CPT I) and its integration with fatty acid biosynthesis. 4. Compare fatty acid β-oxidation with fatty acid biosynthesis. 5. Explain the biosynthesis and utilization of ketone bodies, including the role of acetyl-CoA. 6. Explain the physiological significance and regulation of ketone body metabolism.
	Pathways of Sugar Metabolism: Pentose Phosphate Pathway, Fructose, and Galactose Metabolism (T-2)	1. Describe the purpose, cellular localization, major reactions, and regulation of the pentose phosphate pathway. 2. Explain the roles of NADPH and ribose-5-phosphate in cellular metabolism. 3. Explain the biochemical basis of glucose-6-phosphate dehydrogenase deficiency and its clinical consequences. 4. Describe the uronic acid pathway and its biological significance. 5. Explain the metabolic pathways of fructose and galactose, including the key enzymes involved. 6. Explain the biochemical basis and clinical consequences of disorders of fructose and galactose metabolism.
	Biosynthesis of nonessential amino acids (T-2)	1. Describe the free amino acid pool, nitrogen balance, and the classification of amino acids according to their nutritional and metabolic properties. 2. Explain the synthesis of nonessential amino acids and their metabolic precursors derived from glycolysis, the citric acid cycle, and the pentose phosphate pathway. 3. Explain the role of transamination reactions and the central functions of glutamate and glutamine in amino acid metabolism. 4. Explain the role of one-carbon metabolism, including folate, vitamin B12, and S-adenosylmethionine (SAM), in amino acid biosynthesis. 5. Explain the metabolic significance of glucogenic and ketogenic amino acids.
	Conversion of amino acids to specialized products (T-1)	1. Explain the role of amino acids as precursors of biologically important molecules. 2. Describe the biosynthesis of heme, creatine, nitric oxide, and polyamines from amino acid precursors. 3. Explain the biosynthesis of neurotransmitters and hormones derived from amino acids, including catecholamines, serotonin, histamine, and thyroid hormones. 4. Explain the role of tetrahydrobiopterin (BH4) and other essential cofactors in the biosynthesis of specialized amino acid derivatives. 5. Explain the physiological significance of specialized products derived from amino acids.
	Catabolism of proteins and amino acid nitrogen (T-1)	1. Explain the major pathways of amino acid nitrogen metabolism, including transamination and oxidative deamination. 2. Explain the role of aminotransferases, glutamate dehydrogenase, and their cofactors in amino acid catabolism. 3. Explain the metabolic role of glutamate and glutamine in the transport and disposal of amino groups. 4. Describe the mechanisms of ammonia transport in different tissues. 5. Explain the integration of amino acid nitrogen metabolism with the urea cycle.

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	Catabolism of the carbon skeletons of amino acids (T-1)	1. Classify amino acids according to the metabolic fate of their carbon skeletons as glucogenic, ketogenic, or both. 2. Explain the metabolic pathways by which amino acid carbon skeletons are converted into pyruvate, acetyl-CoA, α-ketoglutarate, succinyl-CoA, fumarate, and oxaloacetate. 3. Explain the catabolism of branched-chain amino acids and its metabolic significance. 4. Explain the metabolism of phenylalanine and tyrosine and their metabolic products. 5. Explain the integration of amino acid carbon skeleton catabolism with the citric acid cycle and energy metabolism.
	Urea cycle and its regulation (T-2)	1. Explain the physiological role, cellular localization, tissue distribution, and overall reactions of the urea cycle. 2. Explain the biochemical pathway of the urea cycle, including the reactants, enzymes, cofactors, and energy requirements. 3. Explain the integration of the urea cycle with amino acid catabolism and the citric acid cycle, including the aspartate–argininosuccinate shunt. 4. Explain the regulation of the urea cycle, including the roles of carbamoyl phosphate synthetase I (CPS I) and N-acetylglutamate. 5. Explain the metabolic significance of nitrogen disposal and the role of the urea cycle in maintaining nitrogen homeostasis. 6. Explain the biochemical basis and clinical consequences of disorders of the urea cycle.
	Integration of carbohydrate and lipid metabolism (T-2)	1. Explain the fundamental principles of metabolic integration and the coordination of anabolic and catabolic pathways. 2. Explain the central roles of glucose-6-phosphate, pyruvate, and acetyl-CoA in integrating carbohydrate, lipid, and protein metabolism. 3. Compare the major metabolic pathways of carbohydrate, lipid, and protein metabolism in different tissues, including the liver, skeletal muscle, heart, adipose tissue, and brain. 4. Explain the hormonal regulation of integrated metabolism by insulin, glucagon, epinephrine, and cortisol. 5. Explain the metabolic adaptations that occur during the well-fed state, fasting, and starvation.

Biophysics

At the end of this lesson, the student will be able to:		
KNOWLEDGE		
DEP.	**TOPIC**	**LEARNING OUTCOMES**
BIOPHYSICS	SKILLS	
	LAB: Differential Scanning Calorimeter (T-1)	1. Explain the basic principle of differential scanning calorimetry and describe how DSC measures heat capacity differences between a sample and a reference solution. 2. Perform basic thermal calibration and sample measurement steps for a DSC experiment. 3. Interpret DSC thermograms by identifying baseline, unfolding peak, melting temperature (Tm), onset/endset temperatures, and differential heat capacity changes. 4. Determine the enthalpy change of protein unfolding from the area under the DSC peak. 5. Analyze DSC data to relate protein unfolding to thermodynamic parameters, including ΔH, ΔS, ΔG, Tm, and protein thermal stability.

Histology and Embryology

At the end of this lesson, the student will be able to:		
KNOWLEDGE		
DEP.	**TOPIC**	**LEARNING OUTCOMES**
HISTOLOGY AND EMBRYOLOGY	Development Of Gastrointestinal System (T-3)	1. Describe the embryological development of the gastrointestinal tract from the primitive gut and its major subdivisions. 2. Explain the development and differentiation of the foregut, midgut, and hindgut and their principal derivatives. 3. Describe the processes of gut tube rotation, elongation, and repositioning during gastrointestinal development. 4. Explain the development of the major accessory digestive organs, including the liver, gallbladder, pancreas, and spleen. 5. Describe the embryological development of the enteric nervous system and its contribution to gastrointestinal function. 6. Correlate the normal embryological development of the gastrointestinal system with common congenital anomalies and their clinical significance.
	Histology of Upper GIS (T-2)	1. Describe the histological organization of the oral cavity, pharynx, tongue, and esophagus, highlighting the main layers. 2. Identify the different types of oral mucosa and tongue papillae, noting key structural differences. 3. Outline the developmental stages of the tooth. 4. Recognize the histological features of the adult tooth and the cells responsible for enamel, dentin, and cementum formation. 5. Compare histological differences along the pharynx and upper, middle, and lower esophagus.
	Histology of Lower GIS (T-3)	1 Describe the layers in the wall of the digestive tract (mucosa, submucosa, muscularis externa, and adventitia/serosa). 2. Identify the regional histological differences in the lower gastrointestinal tract from the stomach to the anus, and correlate structure with function. 3. Recognize gastric glands and intestinal glands, identify simply their constituent cells, and define their secretory products along with their functions. 4. Differentiate between gastric glands, cardiac glands, and pyloric glands.
	Histology of liver, bile ducts, gall bladder and pancreas (T-2)	1. Describe the basic histological architecture and blood supply of the liver. 2. Recognize the structure of portal triads, hepatic lobules, and hepatic sinusoids, and identify their main components. 3. Identify the cells of liver tissue, including hepatocytes, Kupffer cells, endothelial cells, and Ito cells. 4. Describe the histological features and main components of the gallbladder. 5. Identify the histological features of the pancreas, distinguishing its exocrine (acini, ducts) and endocrine (islets of Langerhans) components, and relate them to their functions.
	Histology of Salivary glands (T-2)	1. Classify the salivary glands. 2. Describe the general histological features of exocrine glands and relate these to the major and minor salivary glands. 3. Identify the parenchyma (functional units and ducts of the salivary glands) and correlate the structural features of their constituent cells with the functions of these ducts. 4. Describe the stroma of the salivary glands, including cells such as myoepithelial cells and nerves, in relation to acinar cells and their role in secretory functions.
	SKILLS	
	Histology of Upper GIS (P-2)	1. Distinguish the histological features of the oral cavity, tongue, and teeth under the light microscope. 2. Compare oral mucosa types and lip, and differentiate the various tongue papillae, highlighting their similarities and differences. 3. Demonstrate the histological layers of the esophagus and identify their organization. 4. Identify regional microscopic variations along the esophagus.

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"scientia ac labore vitae"

	Histology of Lower GIS (P-2)	1. Identify the major histological layers of the lower gastrointestinal tract, including the mucosa, submucosa, muscularis externa, and adventitia/serosa. 2. Distinguish the histological differences between regions of the lower GI tract, such as the small intestine (duodenum, jejunum, ileum), large intestine (colon), rectum, and anal canal. 3. Recognize histological features that correlate with the absorptive and secretory functions of different segments of the lower GI tract. 4. Identify regional microscopic specializations of the lower GI tract
	Histology of Salivary glands, liver, pancreas, gall bladder (P-2)	1. Describe the histological characteristics of major salivary glands, including parenchyma, stroma. 2. Identify the key structures of the liver, including portal triads, classical lobules, and main liver cell types. 3. Distinguish the exocrine and endocrine components of the pancreas, including acini, ducts, and islets of Langerhans. 4. Describe the histological features of the gallbladder, including all layers of its wall.

Physiology

At the end of this lesson, the student will be able to:		
KNOWLEDGE		
DEP.	**TOPIC**	**LEARNING OUTCOMES**
PHYSIOLOGY	General principles of regulation in the GI tract (T-2)	1. Explain the basic functions of the gastrointestinal system (GIS) including immune, digestive, reflexive responses. 2. Identify the segments of the gastrointestinal tract and the specialized functions attributed to each. 3. Explain the cellular specialization; mucosa, submucoza, muscularis externa and seroza. 4. Define gastrointestinal motility by means of smooth muscle contraction and releases Ca2+ as a result of different stimulations. 5. Explain the role of Cajal cells and electrical activity of GI smooth muscle (slow waves and spikes) on GI motility 6. Describe the neural regulation of GIS by explaining the special features of the enteric nervous system (myenteric and submucosal) and its relation with autonomic nervous system. 7. Explain the regulation of splanchnic blood circulation during the postprandial and fasting time. 8. List the factors that control different mechanisms of GI functions (hormonal, neural, paracrine effects)
	Cephalic, Oral and Esophageal phases of digestion (T-2)	1. Explain secretory changes that occur on different segments of the gastrointestinal tract during cephalic, gastric, and intestinal phases. 2. Explain the cephalic phase stimulus such as thinking about the consumption of food, olfactory, visual inputs and auditory inputs effects on secretion from the glandular cells. 3. Explain how the brain centers (limbic system, hypothalamus, cortex) influence secretion and the motility of the GI tract 4. Explain the structures of the salivary glands, and their secretory elements; primary and secondary steps of secretion 5. Explain why the saliva is hypotonic comparing to plasma. 6. Define the regulation of saliva under both parasympathetic and sympathetic stimulation. 7. Give example for the effect of the impaired salivary secretion; Sjögren's syndrome. 8. Define working mechanisms of upper and lower esophageal sphincters. 9. Explain swallowing mechanism and the peristaltic movement of esophagus (primary and secondary peristalsis). 10. Give examples with the paralysis of the swallowing mechanism; under anesthesia, damage to cranial nerves or muscular dystrophies.

	Gastric phase of digestion (T-2)	1. Explain the role of stomach on digestion. 2. Explain different stimulus which influence the secretion of gastric acid. 3. Explain the role of other gastric secretory products including intrinsic factor and mucus. 4. Describe the motor activity to mix the secretions and propulsion towards the pyloric sphincter. 5. Explain the coordinated motor activity that regulates the emptying of gastric content into the duodenum (i.e. the enterogastric reflex) 6. Explain the role of the following hormones on gastric acid secretion and motility: gastrin, somatostatin, histamine, gastrin releasing peptides, motilin, CCK, secretin 7. Describe the migrating myoelectric complexes activities during fasting. 8. Describe the structure of parietal cell type and the formation of HCl-mechanism. 9. Describe the meaning of 'Achlorhydria and Hypochlorhydria'.
	Digestive Functions of the liver and pancreas (T-2)	1. Explain the major functions of the liver on digestion. 2. Explain the characteristics of the hepatic circulation between canalicular lumen and sinosoids. 3. Explain blood flow properties with the related zone on liver. 4. Explain the bile acid synthesis and enterohepatic circulation of bile salts. 5. Describe the hormonal and neural mechanisms that coordinate gallbladder emptying. 6. Explain the role of the pancreas on digestion. 7. Understand how and when the digestive enzymes of the pancreas become active. 8. Explain the effects CCK and secretin hormones on sphincter of oddi, on gallbladder secretions and gastric& duodenal motility.
	Intestinal phase of digestion (T-1)	1. Describe the motility of the small intestine and colon. 2. Explain the effects of hormones, paracrines, and neural pathways on digestion, secretions, and the motility of small intestine 3. Explain the haustration, segmentation, propulsion, mass movement. 4. Explain digestion process of carbohydrate, protein and fat molecules in small intestine 5. Describe the roles of bacterial colonization of colon in digestion and absorption of nutrients 6. Explain the reflex responses in GI tract. 7. Explain the defecation mechanism.
	Absorption of nutrients and water (T-2)	1. Describe the absorptive process of monosaccharides that are formed as a result of digestion of carbohydrates 2. Describe mechanisms of absorption of amino acids 3. Describe the role of bile acids in absorption of fats 4. Describe the role of emulsification and micelle formation in absorption of fats 5. Define role of lymphatic system in the absorption of fats 6. Describe mechanisms of nucleic acid absorption 7. Describe mechanisms of vitamins absorption 8. Describe absorptive process of vitamin B12 and name the related proteins 9. Define the role of intestinal flora in the synthesis of vitamin K. 10. Describe mechanisms of mineral (calcium, iron, magnesium) absorption 11. Describe major absorptive processes that take place in the colon 12. Describe the mechanisms of water absorption
	Colonic Phase of Digestion (T-1)	1. Explain the role of stomach on digestion. 2. Explain different stimulus which influence the secretion of gastric acid. 3. Explain the role of other gastric secretory products including intrinsic factor and mucus. 4. Describe the motor activity to mix the secretions and propulsion towards the pyloric sphincter. 5. Explain the coordinated motor activity that regulates the emptying of gastric content into the duodenum (i.e. the enterogastric reflex) 6. Explain the role of the following hormones on gastric acid secretion and motility: gastrin, somatostatin, histamine, gastrin releasing peptides, motilin, CCK, secretin

		7. Describe the migrating myoelectric complexes activities during fasting. 8. Describe the structure of parietal cell type and the formation of HCl-mechanism. 9. Describe the meaning of 'Achlorhydria and Hypochlorhydria'.
	Regulation of food intake (T-2)	1. Explain how food intake is regulated by hypothalamic centers 2. Name the hypothalamic nuclei that regulates food intake 3. List the factors that regulate food intake 4. Explain how hormones released from gastrointestinal system regulates food intake 5. Explain the role of leptin in food intake regulation 6. Discuss what would happen when the food intake regulation system fails 7. Define basal metabolic rate (BMR) and how we can measure BMR
	Thermoregulation (T-1)	1. Name the parts of the hypothalamus involved in thermoregulation 2. List the heat loss and heat production mechanisms by giving examples 3. Describe how the body responds to changes in core or environmental temperatures 4. Explain what fever is and how the body responds to fever 5. Describe the process by which sweat is produced

Clinical Skills

At the end of this lesson, the student will be able to:		
KNOWLEDGE		
DEP.	**TOPIC**	**LEARNING OUTCOMES**
CLINICAL SKILLS	Basic Life Support, Defibrillation (T-1) (P-2)	1. Define how to assess the patient 2. Describe the aim of each step in the chain of survival 3. Define the contents of Basic Life Support 4. Describe how to perform chest compression and rescue breathing 5. Describe how to perform Automated External Defibrillator 6. Define the precautions of Automated External Defibrillation 7. List the sequence of Cardiopulmonary, Resuscitation and Automated External Defibrillation

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Communication Skills

At the end of this lesson, the student will be able to:		
KNOWLEDGE		
DEP.	**TOPIC**	**LEARNING OUTCOMES**
COMMUNICATION SKILLS	Introduction to Communication Skills (P-2)	1. Discuss why communication skills in medicine are important 2. Clarify the feelings that drive human actions 3. Define aggressive, passive and assertive types of behavior 4. Discover that human beings react differently in a given situation depending on their own levels of acceptance 5. Distinguish the necessary action to be taken (listening / self- expression) during communication
	Active Listening and self-expression (P-2)	1. Define the steps of active listening 2. Appraise importance of body language in communication 3. List the sentences that may act as barriers in communication 4. Demonstrates active listening skills when talking to a person in problem 5. Distinguish different forms of self-expression 6. Identify negative effect of judgmental self-expression in interpersonal relationship 7. Describe three steps of self-expression using "ı language" 8.Demonstrate correct self-expression method in role plays

	Self-expression; Conflict Resolution (P-2)	1.Distinguish different forms of self-expression 2. Identify negative effect of judgmental self-expression in interpersonal relationship 3. Describe three steps of self-expression using "ı language" 4. Demonstrate correct self-expression method in role plays 5. Define two different types of conflicts 6. Explain different methods of resolution in necessity-based conflicts 7. Comprehends reasons of conflicts in people who has different values 8. Discuss the ways of conflict resolution in people with different values
	Using the basic communication skills in doctor-patient relationship (P-2)	1. Adapts basic communication skills to doctor- patient interaction 2. Uses techniques to build up and maintain rapport with the patient 3. Uses techniques of active listening while talking to the patient 4. Evaluates emotions of the patient and responds in accordance with the emotion 5. Encourages the patient to express his/her concerns

History of Medicine and Ethics

At the end of this lesson, the student will be able to:		
KNOWLEDGE		
DEP.	**TOPIC**	**LEARNING OUTCOMES**
HISTORY OF MEDICINE AND ETHICS	Medieval European Medicine (T-2)	1. Comprehend the significance of ancient Chinese, Indian, Egyptian, Greek, and Roman medicine; evaluate the medical approaches of different civilizations and explain their distinctive features. 2. Understand certain medical practices and significant events of prehistoric times; compare them with current practices through examples. 3. Define the distinctive features of Chinese, Indus, Mesopotamian, Egyptian, Greek, and Roman civilizations, their medical treatment methods, and the tools used for diagnosis and prognosis of diseases. 4. Learn the contributions of important historical scientists in medicine from the Eastern and Western world. 5. Explain the distinctive features of Medieval Medicine in Europe, the treatment methods used, and the diagnostic tools; explain the scientific level and legacy of this period in Europe. 6. Explain the principles of medical ethics; explain the general terms and principles of modern bioethics; explain the dynamics between ethics and law; explain how contemporary ethical principles are applied by examining the difference between ideas (duties); explain actions (consequences) in relation to ethical principles; explain why ethics may differ across cultures and why this knowledge is important.
	Medicine of Islamic Civilization (T-2)	1. Comprehend the significance of ancient Chinese, Indian, Egyptian, Greek, and Roman medicine; evaluate the medical approaches of different civilizations and explain their distinctive features. 2. Understand certain medical practices and significant events of prehistoric times; compare them with current practices through examples. 3. Define the distinctive features of Chinese, Indus, Mesopotamian, Egyptian, Greek, and Roman civilizations, their medical treatment methods, and the tools used for diagnosis and prognosis of diseases. 4. Learn the contributions of important historical scientists in medicine from the Eastern and Western world. 5. Explain the distinctive features of Medieval Medicine in Europe, the treatment methods used, and the diagnostic tools; explain the scientific level and legacy of this period in Europe. 6. Explain the principles of medical ethics; explain the general terms and principles of modern bioethics; explain the dynamics between ethics and law; explain how contemporary ethical principles are applied by examining the difference between ideas (duties); explain actions (consequences) in relation to ethical principles; explain why ethics may differ across cultures and why this knowledge is important.

	Medicine of Seljuk Civilization (T-2)	1. Comprehend the significance of ancient Chinese, Indian, Egyptian, Greek, and Roman medicine; evaluate the medical approaches of different civilizations and explain their distinctive features. 2. Understand certain medical practices and significant events of prehistoric times; compare them with current practices through examples. 3. Define the distinctive features of Chinese, Indus, Mesopotamian, Egyptian, Greek, and Roman civilizations, their medical treatment methods, and the tools used for diagnosis and prognosis of diseases. 4. Learn the contributions of important historical scientists in medicine from the Eastern and Western world. 5. Explain the distinctive features of Medieval Medicine in Europe, the treatment methods used, and the diagnostic tools; explain the scientific level and legacy of this period in Europe. 6. Explain the principles of medical ethics; explain the general terms and principles of modern bioethics; explain the dynamics between ethics and law; explain how contemporary ethical principles are applied by examining the difference between ideas (duties); explain actions (consequences) in relation to ethical principles; explain why ethics may differ across cultures and why this knowledge is important.
	Ottoman Medicine (T-2)	1. Comprehend the significance of ancient Chinese, Indian, Egyptian, Greek, and Roman medicine; evaluate the medical approaches of different civilizations and explain their distinctive features. 2. Understand certain medical practices and significant events of prehistoric times; compare them with current practices through examples. 3. Define the distinctive features of Chinese, Indus, Mesopotamian, Egyptian, Greek, and Roman civilizations, their medical treatment methods, and the tools used for diagnosis and prognosis of diseases. 4. Learn the contributions of important historical scientists in medicine from the Eastern and Western world. 5. Explain the distinctive features of Medieval Medicine in Europe, the treatment methods used, and the diagnostic tools; explain the scientific level and legacy of this period in Europe. 6. Explain the principles of medical ethics; explain the general terms and principles of modern bioethics; explain the dynamics between ethics and law; explain how contemporary ethical principles are applied by examining the difference between ideas (duties); explain actions (consequences) in relation to ethical principles; explain why ethics may differ across cultures and why this knowledge is important.
	Renaissance Medicine (T-2)	1. Comprehend the significance of ancient Chinese, Indian, Egyptian, Greek, and Roman medicine; evaluate the medical approaches of different civilizations and explain their distinctive features. 2. Understand certain medical practices and significant events of prehistoric times; compare them with current practices through examples. 3. Define the distinctive features of Chinese, Indus, Mesopotamian, Egyptian, Greek, and Roman civilizations, their medical treatment methods, and the tools used for diagnosis and prognosis of diseases. 4. Learn the contributions of important historical scientists in medicine from the Eastern and Western world. 5. Explain the distinctive features of Medieval Medicine in Europe, the treatment methods used, and the diagnostic tools; explain the scientific level and legacy of this period in Europe. 6. Explain the principles of medical ethics; explain the general terms and principles of modern bioethics; explain the dynamics between ethics and law; explain how contemporary ethical principles are applied by examining the difference between ideas (duties); explain actions (consequences) in relation to ethical principles; explain why ethics may differ across cultures and why this knowledge is important.

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	Organization of Medical Services in the Early Years of the Republic of Turkey (T-2)	1. Comprehend the significance of ancient Chinese, Indian, Egyptian, Greek, and Roman medicine; evaluate the medical approaches of different civilizations and explain their distinctive features. 2. Understand certain medical practices and significant events of prehistoric times; compare them with current practices through examples. 3. Define the distinctive features of Chinese, Indus, Mesopotamian, Egyptian, Greek, and Roman civilizations, their medical treatment methods, and the tools used for diagnosis and prognosis of diseases. 4. Learn the contributions of important historical scientists in medicine from the Eastern and Western world. 5. Explain the distinctive features of Medieval Medicine in Europe, the treatment methods used, and the diagnostic tools; explain the scientific level and legacy of this period in Europe. 6. Explain the principles of medical ethics; explain the general terms and principles of modern bioethics; explain the dynamics between ethics and law; explain how contemporary ethical principles are applied by examining the difference between ideas (duties); explain actions (consequences) in relation to ethical principles; explain why ethics may differ across cultures and why this knowledge is important.
	The Tuskegee Syphilis Study - Ethical Analysis (T-2)	1. Comprehend the significance of ancient Chinese, Indian, Egyptian, Greek, and Roman medicine; evaluate the medical approaches of different civilizations and explain their distinctive features. 2. Understand certain medical practices and significant events of prehistoric times; compare them with current practices through examples. 3. Define the distinctive features of Chinese, Indus, Mesopotamian, Egyptian, Greek, and Roman civilizations, their medical treatment methods, and the tools used for diagnosis and prognosis of diseases. 4. Learn the contributions of important historical scientists in medicine from the Eastern and Western world. 5. Explain the distinctive features of Medieval Medicine in Europe, the treatment methods used, and the diagnostic tools; explain the scientific level and legacy of this period in Europe. 6. Explain the principles of medical ethics; explain the general terms and principles of modern bioethics; explain the dynamics between ethics and law; explain how contemporary ethical principles are applied by examining the difference between ideas (duties); explain actions (consequences) in relation to ethical principles; explain why ethics may differ across cultures and why this knowledge is important.
	Ethics - Metaethics, Utilitarianism (T-2)	1. Comprehend the significance of ancient Chinese, Indian, Egyptian, Greek, and Roman medicine; evaluate the medical approaches of different civilizations and explain their distinctive features. 2. Understand certain medical practices and significant events of prehistoric times; compare them with current practices through examples. 3. Define the distinctive features of Chinese, Indus, Mesopotamian, Egyptian, Greek, and Roman civilizations, their medical treatment methods, and the tools used for diagnosis and prognosis of diseases. 4. Learn the contributions of important historical scientists in medicine from the Eastern and Western world. 5. Explain the distinctive features of Medieval Medicine in Europe, the treatment methods used, and the diagnostic tools; explain the scientific level and legacy of this period in Europe. 6. Explain the principles of medical ethics; explain the general terms and principles of modern bioethics; explain the dynamics between ethics and law; explain how contemporary ethical principles are applied by examining the difference between ideas (duties); explain actions (consequences) in relation to ethical principles; explain why ethics may differ across cultures and why this knowledge is important.
	Ethics in Clinical Research - Key Points (T-2)	1. Comprehend the significance of ancient Chinese, Indian, Egyptian, Greek, and Roman medicine; evaluate the medical approaches of different civilizations and explain their distinctive features. 2. Understand certain medical practices and significant events of prehistoric times; compare them with current practices through examples.

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		3. Define the distinctive features of Chinese, Indus, Mesopotamian, Egyptian, Greek, and Roman civilizations, their medical treatment methods, and the tools used for diagnosis and prognosis of diseases. 4. Learn the contributions of important historical scientists in medicine from the Eastern and Western world. 5. Explain the distinctive features of Medieval Medicine in Europe, the treatment methods used, and the diagnostic tools; explain the scientific level and legacy of this period in Europe. 6. Explain the principles of medical ethics; explain the general terms and principles of modern bioethics; explain the dynamics between ethics and law; explain how contemporary ethical principles are applied by examining the difference between ideas (duties); explain actions (consequences) in relation to ethical principles; explain why ethics may differ across cultures and why this knowledge is important.
	Clinical Ethics - Misconduct (T-2)	1. Comprehend the significance of ancient Chinese, Indian, Egyptian, Greek, and Roman medicine; evaluate the medical approaches of different civilizations and explain their distinctive features. 2. Understand certain medical practices and significant events of prehistoric times; compare them with current practices through examples. 3. Define the distinctive features of Chinese, Indus, Mesopotamian, Egyptian, Greek, and Roman civilizations, their medical treatment methods, and the tools used for diagnosis and prognosis of diseases. 4. Learn the contributions of important historical scientists in medicine from the Eastern and Western world. 5. Explain the distinctive features of Medieval Medicine in Europe, the treatment methods used, and the diagnostic tools; explain the scientific level and legacy of this period in Europe. 6. Explain the principles of medical ethics; explain the general terms and principles of modern bioethics; explain the dynamics between ethics and law; explain how contemporary ethical principles are applied by examining the difference between ideas (duties); explain actions (consequences) in relation to ethical principles; explain why ethics may differ across cultures and why this knowledge is important.
	Ethical Dilemma (T-2)	1. Comprehend the significance of ancient Chinese, Indian, Egyptian, Greek, and Roman medicine; evaluate the medical approaches of different civilizations and explain their distinctive features. 2. Understand certain medical practices and significant events of prehistoric times; compare them with current practices through examples. 3. Define the distinctive features of Chinese, Indus, Mesopotamian, Egyptian, Greek, and Roman civilizations, their medical treatment methods, and the tools used for diagnosis and prognosis of diseases. 4. Learn the contributions of important historical scientists in medicine from the Eastern and Western world. 5. Explain the distinctive features of Medieval Medicine in Europe, the treatment methods used, and the diagnostic tools; explain the scientific level and legacy of this period in Europe. 6. Explain the principles of medical ethics; explain the general terms and principles of modern bioethics; explain the dynamics between ethics and law; explain how contemporary ethical principles are applied by examining the difference between ideas (duties); explain actions (consequences) in relation to ethical principles; explain why ethics may differ across cultures and why this knowledge is important.
	Professional and Ethical Responsibilities (T-2)	1. Comprehend the significance of ancient Chinese, Indian, Egyptian, Greek, and Roman medicine; evaluate the medical approaches of different civilizations and explain their distinctive features. 2. Understand certain medical practices and significant events of prehistoric times; compare them with current practices through examples. 3. Define the distinctive features of Chinese, Indus, Mesopotamian, Egyptian, Greek, and Roman civilizations, their medical treatment methods, and the tools used for diagnosis and prognosis of diseases. 4. Learn the contributions of important historical scientists in medicine from the Eastern and Western world.

		5. Explain the distinctive features of Medieval Medicine in Europe, the treatment methods used, and the diagnostic tools; explain the scientific level and legacy of this period in Europe. 6. Explain the principles of medical ethics; explain the general terms and principles of modern bioethics; explain the dynamics between ethics and law; explain how contemporary ethical principles are applied by examining the difference between ideas (duties); explain actions (consequences) in relation to ethical principles; explain why ethics may differ across cultures and why this knowledge is important.

Biostatistics

At the end of this lesson, the student will be able to:		
KNOWLEDGE		
DEP.	**TOPIC**	**LEARNING OUTCOMES**
BIOSTATISTICS	Two-Sample Inference: Means, Proportions and paired Data (T-2)	1. Distinguish independent samples from paired observations. 2. Compare means and proportions with confidence intervals and tests. 3.Interpret effect estimates, odds ratios, and clinical importance.
	Correlation and Linear Regression (T-2)	1. Create and interpret scatterplots. 2. Quantify linear association with Pearson correlation. 3. Fit simple linear regression and evaluate assumptions and predictions.
	Categorical Data Analysis (T-2)	1. Organize categorical outcomes in contingency tables. 2. Perform and interpret chi-square and Fisher exact tests. 3. Distinguish goodness-of-fit, independence, and homogeneity questions.
	One-Way ANOVA and Multiple Comparisons (T-2)	1. Explain the logic and assumptions of one-way ANOVA. 2. Interpret the F statistic and omnibus p-value. 3. Use post-hoc comparisons while controlling multiplicity.
	Two-Sample Inference: Means, Proportions and paired Data (T-2)	1. Distinguish independent samples from paired observations. 2. Compare means and proportions with confidence intervals and tests. 3. Interpret effect estimates, odds ratios, and clinical importance.
	Correlation and Linear Regression (T-2)	1. Create and interpret scatterplots. 2. Quantify linear association with Pearson correlation. 3. Fit simple linear regression and evaluate assumptions and predictions.

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Medical Education

At the end of this lesson, the student will be able to:		
KNOWLEDGE		
DEP.	**TOPIC**	**LEARNING OUTCOMES**
MEDICAL EDUCATION	Body-Mind-Behaviour: Being Human (T-2)	Describe the biological, psychological, social, and existential dimensions of Body-Mind-Behaviour: Being Human; distinguish between the concepts of "body," "disease," and "person"; define basic psychoanalytic concepts such as the conscious and the unconscious, and their relevance to human motivation and behavior.

	Body-Mind-Behaviour: Being Human (T-2)	Explain Descartes' concept of Body-Mind-Behaviour: Body-Mind Dualism (res cogitans vs. res extensa) and its historical context; define embodied cognition and explain how it challenges the Cartesian separation of mind and body; compare Cartesian dualism, embodied cognition, and biomedical/biopsychosocial models.
	Body-Mind-Behaviour: Somatic practices (T-2)	Define somatic experience; describe basic concepts of Breath and Shape-Flow (growing/shrinking, opening/closing patterns) and their role in postural awareness and stress response.

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