



GUJARAT TECHNOLOGICAL UNIVERSITY

Program Name: Bachelor of Engineering

Level: UG

Branch: Biomedical Engineering

Subject Code : BE04003011

Subject Name : Human anatomy & physiology II

w. e. f. Academic Year:	2024-25
Semester:	4 th
Category of the Course:	PCC

Prerequisite:	Human anatomy & physiology – I, Basic science, Chemistry, Biology.
Rationale:	The study of human anatomy and physiology is fundamental for biomedical engineering students to bridge the gap between engineering principles and biological systems. The rationale behind the course content is to provide students with a comprehensive understanding of the human body's structure and function, enabling them to design and innovate medical devices, diagnostic tools, and healthcare technologies.

Course Outcome:

After Completion of the Course, Student will able to:

No	Course Outcomes	RBT Level
01	Explain the organization and function of the central and peripheral nervous systems, including neuron anatomy, synaptic transmission, and reflex arcs, and analyze the physiology of special senses such as vision, hearing, taste, and smell in relation to their neural pathways and clinical relevance.	R,U,A,A
02	Describe the structure and function of the endocrine system, including major glands and hormone types, and analyze the regulation of hormonal activity and the impact of disorders such as diabetes, Cushing's syndrome, and hypothyroidism.	R,U,A,A
03	Explain the anatomy and physiology of the digestive system, including the processes of digestion and nutrient absorption, and evaluate disorders such as GERD, ulcers, and celiac disease in relation to their anatomical and functional implications.	R,U,A,A
04	Describe the anatomy and physiology of the urinary and reproductive systems, including nephron function, urine formation, and hormonal regulation of reproduction, while analyzing clinical conditions such as kidney stones, UTIs, renal failure, and reproductive health issues.	R,U,A,A
05	Explain the components and mechanisms of the immune system, including innate and adaptive immunity, lymphoid organs, and immune responses, and evaluate disorders such as autoimmune diseases and immunodeficiencies in relation to their physiological basis.	R,U,A,A



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*Revised Bloom's Taxonomy (RBT)

Teaching and Examination Scheme:

Teaching Scheme (in Hours per Semester)					Total Credits	Assessment Pattern and Marks					Total Marks
L	T	PR	PBL*	TH	C	Theory		Tutorial / Practical			
						ESE (E)	PA /(M)	PA (I)	PBL (I)	ESE (V)	
45	0	30	45	120	4	70	30	20	30	50	200

* Problem Based Learning (PBL) aims to accommodate learning beyond syllabus as per clause 9.4 of NBA manual.

Course Content:

Unit No.	Content	No. of Hours	% of Weightage
1.	Nervous System: Organization - Central nervous system (CNS): brain, spinal cord, Peripheral nervous system (PNS): nerves, ganglia. Neuron Anatomy - Structure: cell body, dendrites, axon. Types of neurons: sensory, motor, interneurons. Reflexes - Reflex arc: components and examples. Synaptic Transmission - Types: chemical and electrical synapses. Neurotransmitters. CNS Details - Brain regions: cerebrum, cerebellum, brainstem. Spinal cord anatomy and functions. Peripheral Nervous System - Somatic and autonomic nervous systems. Cranial and spinal nerves. Special Senses - Vision: eye anatomy, photoreceptors. Hearing: ear anatomy, sound transduction. Taste and smell: receptors and pathways.	13	29%
2.	Endocrine System: Overview - Endocrine vs. exocrine Glands. Hormone types: steroids, peptides, amines. Major Glands - Pituitary, thyroid, adrenal, pancreas, gonads. Hormones: functions and regulation. Disorders - Diabetes, Cushing's syndrome, hypothyroidism.	7	15%
3.	Digestive System: Anatomy - Mouth, Pharynx, Esophagus, Deglutition, Stomach, Pancreas, Liver and Gallbladder, Small Intestine, Large Intestine, Phases of Digestion - Mechanical and chemical processes. Absorption of nutrients. Disorders - GERD, ulcers, celiac disease.	8	18%
4.	Urinary System: Kidney Structure - Nephron anatomy and function. Urine Formation - Filtration, reabsorption, secretion. Clinical Aspects - Kidney stones, UTIs, renal failure.	7	15%



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5.	Reproductive System: Male Reproductive System anatomy and physiology- Testes, ducts, glands. Female Reproductive System anatomy and physiology - Ovaries, fallopian tubes, uterus. Reproductive Physiology - Hormonal regulation, Fertilization and pregnancy.	6	13%
6.	Immune System: Components - Innate and adaptive immunity, Lymphoid organs: lymph nodes, spleen. Mechanisms - Antibodies, T-cells, B-cells. Disorders - Autoimmune diseases, immunodeficiencies.	4	10%
Total		45	100

Suggested Specification Table with Marks (Theory):

Distribution of Theory Marks (in %)					
R Level	U Level	A Level	N Level	E Level	C Level
20	20	10	10	10	10

Where R: Remember; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create (as per Revised Bloom's Taxonomy)

References/Suggested Learning Resources:

(a) Books:

1. Guyton and Hall Textbook of Medical Physiology, John E. Hall PhD, and Saunders; 13th Edition, ISBN-10: 1455770051.
2. Principles of anatomy and physiology, Gerard j. Tortora, Bryan derrickson, 13th Edition, John Wiley & sons, Inc.
3. Human Anatomy & Physiology, Global Edition, 12th edition, Elaine N. Marieb Holyoke Community College Katja Hoehn Mount Royal University, Pearson.
4. Review of Medical Physiology, 22nd Edition (A Lange Medical book series) McGraw –Hill (International Ed.) 2003.
5. Waugh, Anne and Allison Grant “Ross and Wilson Anatomy and Physiology in Health and Illness”, 12th Edition, Churchill –Livingstone / Elsevier, 2014.
6. Essentials of medical physiology, Sembulingam, Jaypee brothers medical publishers; seventh edition (2016), ISBN-10: 9789385999116

(b) Open source software and website:

1. Khan academy
2. Coursera
3. MIT open courseware
4. OpenStax
5. Human BioDigital



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6. National Center for Biotechnology Information (NCBI)

Suggested Course Practical List:

1. To study the structure and function of nervous tissues.
2. To study the organization and functions of brain and brain stem.
3. To study the autonomic nervous system.
4. To study the mechanism of hormonal action.
5. To study phases of digestion.
6. To study the structure and function of the kidney.
7. To study the development of the reproductive system.
8. To study the functions of the lymphatic system and immunity.
9. To study the structure and function of Eye, Ear, and Nose.

List of Laboratory/Learning Resources Required: Anatomical and physiological models, computer, digital software or resources for understanding the concepts of human anatomy and physiology.

Suggested Project List:

1. Make anatomical models for various systems listed in the syllabus.
2. Make charts/illustrations on a drawing sheet to understand and visualize anatomical and physiological aspects of the body systems.
3. Make charts/illustrations on diseases/ disorders associated to the body systems listed in the syllabus.

Suggested Activities for Students:

1. Make computerized presentation on various topics listed in the syllabus and related to the syllabus. (Student wise (Individual) activity).
2. Arrange the question answer session for each students to participate in the presentation.

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