GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Engineering
Subject Code: 3140310
Semester – IV
Subject Name: Human Anatomy & Physiology-II

Type of course: Basic science

Prerequisite: Biology, Basic science, Chemistry.

Rationale: Biomedical Engineering is a branch of engineering which deals with the application of engineering principles in medicine and healthcare. To design anything which is used for the betterment of human health and wellness students must learn human anatomy and physiology. This subject aims to have in-depth knowledge of the anatomy and physiology of the human body. In these subject major systems like nervous, digestive, urinary and reproductive systems are included.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks				Total Marks
L	T	P	C	Theory Marks		Practical Marks		
				ESE (E)	PA (M)	ESE (V)	PA (I)	
4	0	2	5	70	30	30	20	150

Content:

Sr. No.	Content	Total Hrs	% Weightage
1	**Muscular Tissue:** Overview of Muscular Tissue, Skeletal Muscle Tissue, Contraction and Relaxation of Skeletal Muscle Fibers, Muscle Metabolism, Control of Muscle Tension, Types of Skeletal Muscle Fibers, Exercise and Skeletal Muscle Tissue, Cardiac Muscle Tissue, Smooth Muscle Tissue, Regeneration of Muscular Tissue, Development of Muscle, Aging and Muscular Tissue. **The Muscular System:** Skeletal Muscles Produced Movements, Skeletal Muscles, Principal Skeletal Muscles.	**6**	10**%**
2	**Nervous Tissue:** Overview of the Nervous System, Histology of Nervous Tissue, Electrical Signals in Neurons, Signal Transmission at Synapses, Neurotransmitters, Neural Circuits, Regeneration and Repair of Nervous Tissue.	**5**	9**%**
3	**The spinal cord and spinal Nerves:** Spinal Cord Anatomy, Spinal Nerves, Spinal Cord Physiology. **The brain and Cranial nerves**: Brain Organization, Protection, and Blood Supply, Cerebrospinal Fluid, The Brain Stem and Reticular Formation, The Cerebellum, The Diencephalon, The Cerebrum, Functional Organization of the Cerebral Cortex, Cranial Nerves, Development of the Nervous System, Aging and the Nervous System.	**7**	12**%**
4	**The Autonomic Nervous System**: Comparison of Somatic and Autonomic Nervous Systems, Anatomy of Autonomic Motor Pathways, ANS Neurotransmitters and Receptors, Physiology of the ANS, Integration, and Control of Autonomic Functions**. Sensory, motor, and Integrative systems:**	**6**	10**%**

	Sensation, Somatic Sensations, Somatic Sensory Pathways, Somatic Motor Pathways, Integrative Functions of the Cerebrum.		
5	**The Endocrine System**: Comparison of Control by the Nervous and Endocrine Systems, Endocrine Glands, Hormone Activity, Mechanisms of Hormone Action, Control of Hormone Secretion, Hypothalamus and Pituitary Gland, Thyroid Gland, Parathyroid Glands, Adrenal Glands, Pancreatic Islets, Ovaries and Testes, Pineal Gland and Thymus, Other Endocrine Tissues and Organs, Eicosanoids, and Growth Factors, The Stress Response, Development of the Endocrine System, Aging and the Endocrine System.	**6**	10**%**
6	**The Digestive System:** Overview of the Digestive System, Layers of the GI Tract, Neural Innervation of the GI Tract, Peritoneum, Mouth, Pharynx, Esophagus, Deglutition, Stomach, Pancreas, Liver and Gallbladder, Small Intestine, Large Intestine, Phases of Digestion, Development of the Digestive System, Aging and the Digestive System. **Metabolism and Nutrition:** Metabolic Reactions, Energy Transfer, Carbohydrate Metabolism, Lipid Metabolism, Protein Metabolism, Key Molecules at Metabolic Crossroads, Metabolic Adaptations, Heat and Energy Balance, Nutrition.	**6**	10**%**
7	**The Urinary System**: Overview of Kidney Functions, Anatomy and Histology of the Kidneys, Overview of Renal Physiology, Glomerular Filtration, Tubular Reabsorption and Tubular Secretion, Production of Dilute and Concentrated Urine, Evaluation of Kidney Function, Urine Transportation, Storage, and Elimination, Waste Management in Other Body Systems, Development of the Urinary System, Aging and the Urinary System.	**6**	10**%**
8	**The Reproductive Systems:** Male Reproductive System, Female Reproductive System, The Female Reproductive Cycle, Birth Control Methods and Abortion, Development of the Reproductive Systems, Aging and the Reproductive Systems.	**5**	9**%**
9	**Development and Inheritance:** Embryonic Period, Fetal Period, Teratogens, Prenatal Diagnostic Tests, Maternal Changes during Pregnancy, Exercise and Pregnancy, Labor, Adjustments of the Infant at Birth, The Physiology of Lactation, Inheritance.	**4**	7**%**
10	**The Special Senses:** Olfaction: Sense of Smell, Gustation: Sense of Taste, Vision, Hearing and Equilibrium, Development of the Eyes and Ears, Aging and the Special Senses.	**5**	9**%**
	Total	**56**	100%

Suggested Specification table with Marks (Theory): (For BE only)

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
20	**25**	**25**	**10**	**10**	**10**

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from the above table.

Reference Books:

1. Principles of anatomy and physiology, Gerard j. Tortora, Bryan Derrickson, 13th edition, John Wiley & Sons, Inc.
2. Laboratory manual for anatomy and physiology, 3rd edition, Connie Allen, Valerie Harper, John Wiley & Sons, Inc.
3. Hole's human anatomy & physiology, David n. Shier, Jackie l. Butler, Ricki Lewis, ISBN-13: 978-0078024290, McGraw-hill education; 14th Edition.
4. Essentials of medical physiology, sembling, Jaypee brothers' medical publishers; 7th edition (2016), ISBN-10: 9789385999116
5. Guyton and Hall Textbook of Medical Physiology, John E. Hall Ph.D., Saunders; 13th editions, ISBN-10: 1455770051

Course Outcomes:

After Completion of course students

Sr. No.	CO statements	Marks %Weightage
CO-1	Will be able to understand the structure and functions of the muscular system.	20%
CO-2	Will be able to understand the structure and functions of the nervous system.	20%
CO-3	Will be able to understand the structure and functions of the Reproductive system.	20%
CO-4	Will be able to understand the functions of the Endocrine system and location of endocrine glands.	20%
CO-5	Will be able to understand the structure and functions of Digestive, Urinary system and special senses.	20%

List of Experiments:

1. To study the structure of Muscular tissues under a microscope.
2. To study the structure and function of nervous tissues.
3. To study the organization and functions of brain and brain stem.
4. To study the autonomic nervous system.
5. To study the mechanism of hormonal action.
6. To study phases of digestion.

7. To study the structure and function of the kidney.
8. To study the development of the reproductive system.
9. To study the functions of the lymphatic system and immunity.
10. To study embryo development and inheritance.
11. To study the structure and function of Eye, Ear, and Nose.
12. To develop a working model of a physiological system/organ.

Major Equipment: Stained tissue specimens, Compound Microscope, Digital microscope.

List of Open Source Software/learning website:

1. Stanford University, open learning initiative
   https://oli.cmu.edu/jcourse/webui/guest/join.do?section=anatomy
2. http://bioweb.uwlax.edu/aptest/Index.htm
3. https://www.khanacademy.org