GUJARAT TECHNOLOGICAL UNIVERSITY

Program Name: Engineering

Level: Diploma

Branch: Biomedical Engineering

Course / Subject Code: DI02003011

Course/Subject Name: Human Biology-II

w. e. f. Academic Year:	2024-25
Semester:	2
Category of the Course:	PCC

Prerequisite:	**Basic knowledge of Human Biology**
Rationale:	Human biology lies in understanding the structure and function of the human body which provides detailed knowledge of organs, aids in understanding the diseases and disorders. Perceive the knowledge of personal health and encourages informed decisions about diet, exercise, and lifestyle. Investigates how environmental factors like pollution and climate change affect health along with contribute to strategies for preventing epidemics and improving community health.

Course Outcome:

After Completion of the Course, Student will be able to:

No	Course Outcomes	RBT Level
CO-1	Explain the structure & function of the Digestive System.	U
CO-2	Interpret basic structure & function of Excretory System.	U
CO-3	Describe various parts of the Nervous System.	U
CO-4	Identify various parts associated with the Reproductive & Endocrine System.	U
CO-5	Apply Fitness & Wellness concepts to Individual lifestyle.	A

**Revised Bloom's Taxonomy (RBT)*

Teaching and Examination Scheme:

Teaching Scheme (in Hours)			Total Credits L+T+ (PR/2)	Assessment Pattern and Marks				Total Marks
				Theory		Tutorial / Practical		
L	T	PR	C	ESE (E)	PA/CA (M)	PA/CA (I)	ESE (V)	
2	0	4	4	70	30	20	30	150

Course Content:

Unit No.	Content	No. of Hours	% of Weightage
1.	**Digestive System**	06	20%
	1.1 Digestive system: Organs of digestive tract (GI tract) and its associated organs 1.2 Introduction of digestive tract-including basic structural and functional features of esophagus, stomach, small intestine, large intestine, liver, pancreas, gallbladder		
2.	**Excretory System**	07	23%
	2.1 Excretory system- Structure of kidney including microscopic (nephron) and macroscopic structure- Ureter, urinary bladder, urethra. 2.2 Function of Kidney-Urine formation		
3.	**Nervous System**	07	23%
	3.1 Introduction to nervous system- Central nervous system (CNS),Peripheral nervous system (PNS) 3.2 Nerves: Three Kinds: Sensory, Motor and Mixed 3.3 Central nervous system-Brain : basic structure of brain-lobes of cerebrum, cerebellum, pons and medulla oblongata, Spinal cord: basic structure of spinal cord 3.4 Neurons-Structure and Properties of neurons		
4.	**Endocrine and Reproductive system**	05	17%
	4.1 Hormones- Definition and their functions. 4.2 Endocrine System-location of different endocrine glands and name their associated hormones. 4.3 Male and Female Reproductive system		
5.	**Health and Wellness**	05	17%
	5.1 Environment- Clean Air, Clean Water, Nutrition, Sanitation 5.2 Lifestyle–Healthy lifestyle: Physical Activity, Work life balance, Body Mass Index, Stress Management 5.3 First Aid and Vaccination.		
	Total	**30Hrs.**	**100 %**

Suggested Specification Table with Marks (Theory):

Distribution of Theory Marks (in %)					
R Level	**U Level**	**A Level**	**N Level**	**E Level**	**C Level**
35 %	**48 %**	**17 %**	--	--	--

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. Ross and Wilson Anatomy and Physiology in Health and Illness Waugh, Anne; Grant, Allison Churchil Livingstone Elsevier, U.K, 2014,ISBN:978-0702032288
2. Essentials of Medical Physiology Sembulingam, K.; Sembulingam, PremaJaypee Brothers Medical Publishers, 2019 ISBN: 978-9352706921
3. Textbook of Anatomy Singh, Vishram Elsevier,2020 2AT SIN : 0T2TB08LNNK6KH
4. Human Anatomy and Physiology made Easy Sanghani, Padma Akshat,2010
5. Essentials of Human Anatomy and Physiology Marieb, Elaine N.Pearson International New Delhi,2014, ISBN:0321919009
6. BD Chaurasia's Human Anatomy Vol 1,2 Chaurasia, B.D.CBS Publishers, 2019 2AT SIN : 02BT 07TH9BRZQ

(b) Open-source software and website:

a) www.visiblebody.com
b) https://anatomy3datlas.com
c) https://human.biodigital.com
d) https://www.cdc.gov/climateandhealth/effects/default.htm

Suggested Course Practical List:

Sr. No.	Practical Outcomes (PrOs)	Unit No.	Approx. hours required.
1	Label the anatomical structure of the various organs of the digestive system using charts/models.	1	04
2	Identify the various parts of small/Large intestine using charts/models.	1	04
3	Identify various parts of the stomach using charts/model.	1	04
4	Deduce the pathways of food in the GI tract (mouth to the anus) using digestive models.	1	04

5	Identify the organs of the excretory system using charts/models.	2	04
6	Identify the parts of the human kidney using a kidney model.	2	04
7	Recognize the microscopic structure of the kidney using charts/models.	2	04
8	Trace the pathway of filtrate takes through the nephron using Charts/models.	2	04
9	Distinguish peripheral nervous system and central nervous system using charts.	3	04
10	Identify various parts of the brain using charts/models.	3	04
11	Identify various parts of the spinal cord using charts/models	3	04
12	Identify features of nerve cells using charts.	3	04
13	Identify and Locate major endocrine glands of the human body by using an endocrine system model.	4	04
14	Identify various hormones associated with glands using charts.	4	04
15	Identify various organs of male reproductive system using charts.	4	04
16	Identify various organs of the female reproductive system using charts.	4	04
17	Demonstrate first aid kit.	5	04
18	Identify different exercises to increase performance of human Health.	5	04
19	Calculate Body mass index.	5	04

List of Laboratory/Learning Resources Required:

Sr. No.	Equipment Name with Broad Specifications	PrO. No.
1.	**Digestive System Model** This model shows alimentary canal from mouth to rectum in median section and includes buccal cavity, pharynx, esophagus with half of the stomach, the open duodenum, small and large intestine, the opened appendix, the unfolded rectum, the transverse colon, liver and pancreas.	1,2,3, 4
2.	**Urinary System Model** The model shows the structures of retroperitoneal cavity, pelvis with bones and muscles, inferior venacava, aorta with its branches, upper urinary tract, kidney with adrenal gland, ureter, bladder, etc. Dissectible into4parts.	5

3.	**Brain Model** Sensory/Motor1/2BrainNormalRightHalfBrainfeatures:Frontal,Parietal,OccipitalandTemporallobes;Cerebellum;Interthalamic adhesion; Corpus callosum; Pons; Midbrain-central peduncle; Olfactory bulb; Optic nerve; Optic chiasm; Mammillary body; Medulla oblongata. Model size: 15cm - 1.3cm x 13cm x5.1cm - 1.3cm Educational Card size: 15cm - 1.3cm x 13cm -0.6cm Suitable for neurology, general anatomical study, training for surgical dissection, sports medicine, or for patient education/demonstration of procedures.	11
4.	**Human Torso Model** The model by torso, brain(2Parts),heart, esophagus trachea and aorta, lung (4 parts), skull cap, stomach, diaphragm, liver,pancreasandspleen,intestine.Atotalof15indicationarea	1,11
5.	**Kidney Model** The coronal section of the right kidney shows the renal hilus, renal blood vessels, ureter, renal pelvis of the kidney the renal substance is demonstrated by its medulla and cortex, medullary pyramid, papillae. MadeofPVCplastic,2times enlarged. Mounted on a stand.	7
6.	**Male Reproductive System** Made of the Resin for long durability. Upper half part shows the median section of the system showing both internal and external organs of the system. Lower half shows the model of scrotum and contents Along with the penis.	17
7.	**Female Reproductive System** Made Of Advanced Hsp Resin. Upper Half Model Shows Both Ovaries, Left Ovary In Section, Fallopian Tubes With Fimbriae, Uterus, Cut Open To Show Vaginal Folds And Cervix, Bladder With Cut Open Urethra, Labia And Rectum. In Upper Half Model. Lower Half Model Shows Adnexa Of Uterus.Size:40x80Cm.	18
8.	**Endocrine System Model** It should have the following features: Organs of the Endocrine System showing the external structure of the following human endocrine organs: Liver, pancreas, parathyroid gland, ovary. With appropriate Life size.	15
9.	**Vertebral Column Model** This model shows all significant features of each vertebra, including spinal cord, nerve roots, the vertebral artery, herniated disc and vertebral notch etc. Special features include: flexible 29" tall vertebral column complete with pelvis, sacrum, occipital bone, vertebral artery, all nerve branches and herniated lumbar disc.	12

10.	**Kidney Anatomical Chart** ThischartofTheKidneyshowsthenormalanatomyofthekidneyandsurroundingorgans,veins and arteries. All illustrations are clearly labelled eg. sectioned left kidney, right and left kidney, adrenal gland, renal vein and artery, close-up view of pattern of parenchyma of kidney, detail of a nephron, detail of renal corpuscle, close up of fine structure of renal corpuscle, histology of juxtaglomerular apparatus.	6,7,8
11.	**First Aid Kit** First Aid Kit is an all-round kit, which helps addressing your firstaidneedsincaseofemergenciesincludes:CrepeBandage(Unit-1,Size:6cm),Adhesivebandage(Unite-1),Adhesivebandage Round 25mm (Unite-1, Size: 25 mm), Pain Relief Gel(Unite-1),PovidoneIodineOintment(Unite-1),OralClinicalThermometer(Unite-1),AntisepticLiquid(Unite-1),AbsorbentCottonI.P.(Unite-1),MicroporousSurgicaltape(Unite-1),Paracip/Parachoice(Unite-1),GauzeSwab(Unite-1),RollerGauze Unite-1, Size: 7.5 cm), A pair of Scissors (Unite-1, Size: Small),First Aid Leaflet Sticker (Unite-1)	20
12.	**Digestive System Anatomical Chart** This popular chart of The Digestive System clearly illustrates the organs that make up the digestive system. All structures are labelled. The beautiful central image shows the oesophagus, liver, stomach(sectionedtoshowinsidewalls),gallbladder,pancreas,intestines, rectum, arteries and veins. Includes: illustration of the location of the digestive organs in relation to the torso, the oral cavity, wall of the stomach, wall of the jejunum, wall of the colon, arterial supply, pancreas, gallbladder and duodenum, Also includes explanatory text about the parts the various organs play in digestion.	1
13.	**Human Brain Chart** Size70x100cm.LanguageEnglish.Laminated. This chart helps us to learn about the human brain. The chart shows the detailed labelled diagrams of the brain, meninges, venous sinuses, brain stem and different parts of the brain. Printed on Strong Offset Paper, Laminated with 30 micron heat sealable Polyester Film on both the sides so that the chart never catches dirt and stays new forever. Wrinkle Free and water resistant chart to ensure that the chart lasts for long. Double sideforeasyinstallationandmakeitwallsticking.Everythingrequisite for thorough understanding of Human Physiology in its broad outline included.	10,11
14.	**Stadiometer** A stadiometer is a long ruler attached to the wall. It has a sliding horizontal headpiece that's adjusted to rest on top of your head. It's a quick way of accurately measuring your height, the stadio meter measures from4.5in–81inand11.5cm–205cm with 0.125 in / 0.1 cm graduations visible on both sides of the height rod.	22

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Weighing Machine

15. WeighingMachineforBodyFitnessMonitorwithcapacityof120kg and easy readable LED/LCD display.

Suggested Project List:

The projects serve as practical learning experiences for students in the field of Biomedical engineering. These projects integrate theoretical knowledge with hands-on application, fostering competency development across various Course Outcomes (COs). Below are guidelines for designing and executing projects:

- **Project Types:**
  - It can be industry-based, internet-based, workshop-based, laboratory-based, or field-based.
  - Each project should align with specific COs and address real-world challenges.
- **CO Integration:**
  - It should encompass two or more COs.
  - Integration involves aligning Program Outcomes (PrOs), Unit Outcomes (UOs), and Assessment and Design Outcomes (ADOs).
- **Project Duration:**
  - Students are encouraged to maintain a dated work diary to document their individual contributions and sufficient engagement time for each project should be allocated by faculty during the course.
- **Seminar Presentation:**
  - Before submission, students must give a seminar presentation on their project.
  - The presentation should highlight the project's objectives, methodology, results, and relevance to industry-oriented COs.

Following are suggestive projects, and additional ones can be tailored to specific course objectives. Encourage students to explore innovative solutions and apply their engineering skills effectively.

a) **Digestive system**: Build a3DModel.(make it from waste material).
b) **Stomach/liver:** Build a circuit/working model showing the circulation of blood.
c) **Kidney :**Build a working model show the urine formation.
d) **Brain :**Build a3DModel.(make it from waste material).
e) **Endocrine system** :Build a3DModel.(make it from waste material).

Suggested Activities for Students:

In addition to classroom and laboratory learning, students are encouraged to engage in co-curricular activities that enhance their understanding and practical skills. These activities can be conducted in groups and should be documented in 5-page reports. Collecting physical evidence of their work will also contribute to their portfolio, which can be valuable during placement interviews.

a) Prepare charts of different organs of the body.
b) Undertake micro-projects in teams for making working models of different organs.
c) Seminar/Presentation on any relevant topic.
d) Categorizedvariousdiseasesanddisorderscommonlyfoundinvariousorgans.
e) Identify various instruments used for measurement signals associated with different organs.

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