



# UNIVERSITY OF CALCUTTA

**GURUPADA SAREN**

**SECRETARY**

COUNCILS FOR UNDERGRADUATE STUDIES,  
UNIVERSITY OF CALCUTTA.

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**SENATE HOUSE**

Kolkata – 700 073.

Phone : 2241-0071-74,  
2241-0077-78, 2241-4989-90,  
2241-2850-51, 2241-2859

Fax : 91-033-2241-3222

E-mail : u.g.councilsc.u@gmail.com

Website : www.caluniv.ac.in

To  
The Principals/T.I.C.  
of all the Undergraduate Colleges  
offering B.Sc. (Honours & General) in Physiology  
affiliated to the University of Calcutta

Sir/Madam,

The undersigned is to inform you that the proposed **corrected version of semester wise draft Syllabus for Physiology (General) Courses of Studies under CBCS has been uploaded in the Calcutta University website (www.caluniv.ac.in).**

The said syllabus has been prepared by the **U.G. Board of Studies in Physiology, C.U.**, suppose to be implemented from the academic session 2018-2019

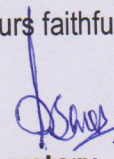
You are requested kindly to go through it and send your feedback within 30<sup>th</sup> April, 2018.

In this regard you may send your observation/ suggestion to the **Department of U.G. Councils, C.U.** or through email (u.g.councilsc.u@gmail.com), and you also may contact **Prof. Debasish Bandyopadhyay**, Department of Physiology through e-mail (debasish63@gmail.com).

Your cooperation in this regard will be highly appreciated. Kindly treat the matter as urgent.

Thanking you,

Yours faithfully,

  
**Secretary** 23/04/18



**University of Calcutta**  
**PHYSIOLOGY (GENERAL) SYLLABUS FOR CBCS**  
**REVISED DRAFT SYLLABUS**

**Core Courses**

1. Cellular Basis of Physiology
2. Biophysical Principles, Enzymes and Chemistry of Bio-molecules
3. Digestion, Absorption & Metabolism
4. Blood and Body Fluids
5. Cardiovascular System
6. Respiratory System
7. Nerve-muscle Physiology
8. Nervous System
9. Special Senses
10. Endocrinology
11. Reproductive Function
12. Excretory Physiology

**Discipline Specific Electives (DSE)**

1. Biostatistics
2. Microbiology & Immunology
3. Work Physiology and Ergonomics
4. Exercise and Sports Physiology
5. Human Nutrition and Dietetics
6. Haematology
7. Community and Public Health
8. Environmental Pollutions and Human Health Hazards

### **Ability Enhancement Course (AEC) (Compulsory)**

1. Environmental Science
2. English/MIL Communication

### **Skill Enhancement Course (SEC)**

1. Detection of Food Additives /Adulterants
2. Histopathological Techniques
3. Clinical Biochemistry
4. Hematological Techniques
5. Bio-Medical Technology
6. Diet Survey and formulation of Diet Chart

## Outline of Courses and Credits in Each Semester

### Semester I

#### (A) Core Courses (CC).Theoretical (T)

##### **CC1T. Cellular Basis of Physiology**

Structure and functions of plasma membrane, nucleus and different cell organelles – Endoplasmic reticulum, Golgi bodies, Mitochondria, Lysosome and Peroxisome.

##### **CC2T. Biophysical Principles, Enzymes and Chemistry of Bio-molecules**

Physiological importance of the following physical processes: Diffusion , Osmosis and Surface tension. pH and Buffers – Significance in human body and maintenance of pH in the blood. Colloids - Classification and physiological importance.

Enzymes: Classification, factors affecting enzyme action. Concept of coenzymes and isozymes.

**Carbohydrates** : Definition and classification.

*Monosaccharides* – Classification, structure, physiological importance.

*Disaccharides* – Maltose, Lactose and Sucrose: Structure, occurrence and physiological importance.

*Polysaccharides* – Starch, Glycogen, Dextrin, Cellulose.

**Lipids** : Definition and classification. Fatty acids – Classification.

Definition and importance of, Saponification number and, Iodine number.. Phospholipids, Cholesterol & its ester – physiological importance.

**Amino acids, Peptides and Proteins:** Classification and structure.

Structure of peptide bonds.

Nucleic acids: Structure of DNA and RNA.

### **CC3T. Digestion, Absorption & Metabolism**

Structure in relation to functions of alimentary canal and digestive glands.

Composition, functions and regulation of secretion of digestive juices

including bile. Digestion and absorption of carbohydrate, protein and

lipid. Movements of the stomach and small intestine.

Glycolysis, TCA cycle, Importance of Glycogenesis, Glycogenolysis and. Gluconeogenesis. Beta oxidation of saturated fatty acid. Importance of Ketone bodies . Deamination & Transamination. Formation of urea . ( 4)

## **Semester II**

### **(A) Core Courses (CC). Theoretical (T)**

CC4T. Blood and Body Fluids

Blood: composition and functions. Plasma proteins: origin and functions.. Formed elements of blood - their morphology and functions. Erythropoiesis. Hemoglobin : different types of compounds and derivatives. Coagulation of blood: mechanism, procoagulants, anticoagulants.. Lymph and tissue fluids: composition, formation, and functions.

### **CC5T. Cardiovascular System**

Anatomy and histology of the heart. Properties of cardiac muscle. Origin and propagation of cardiac impulse. Cardiac cycle : Events. Heart sounds. Heart rate. Cardiac output: Determination by following Fick principle, factors affecting.

Pulse - arterial and venous. Blood pressure and factors controlling. Baro- and chemoreceptors. Vasomotor reflexes. Peculiarities of regional circulations: coronary and cerebral.

### **CC6T. Respiratory System**

Anatomy and histology of the respiratory passage and organs. Role of respiratory muscles in breathing. Lung volumes and capacities. Exchange of respiratory gases between lung and blood and between blood and tissues. Transport of oxygen and carbon dioxide in blood. Regulation of respiration - neural and chemical. Hypoxia. (4)

## **Semester III**

### **(A)Core Courses (CC). Theoretical (T)**

#### CC7T. Nerve-muscle Physiology

Structure of neurons. Origin and propagation of nerve impulse. Velocity of impulse in different types of nerve fiber. Properties of nerve fibers: all or none law, rheobase and chronaxie, refractory period. indefatigability. Synapses: structure, mechanism of synaptic transmission. Motor unit. Myoneural junction: structure, mechanism of impulse transmission. Degeneration and regeneration in nerve fibers.

Different types of muscle and their structure. Red and white muscle. Muscular contraction: structural, mechanical and chemical changes in skeletal muscle during contraction and relaxation. Isotonic and isometric contractions. Properties of muscle: all or none law, beneficial effect, summation, refractory period, tetanus, fatigue.

## CC8T. Nervous System

and A brief outline of organization and basic functions (sensory, motor

association) of the nervous system, central and peripheral nervous system. Ascending tracts carrying touch, kinaesthetic, temperature and pain sensations. Descending tracts: pyramidal tract and brief outline of the extra-pyramidal tracts. Reflex action - definition, reflex arc, classification, properties. Functions of the spinal cord. Outline of functions of brain stem.

A brief idea of the structure, connections and functions of cerebellum. Different nuclei and functions of thalamus and hypothalamus.

Cerebral cortex: histological structure and localization of functions.

CSF : composition, formation, circulation and functions. A brief description of the organization of the autonomic (sympathetic and parasympathetic) nervous system. Functions of sympathetic and parasympathetic nervous system. A brief idea of speech, aphasia, conditioning, learning and memory.

## CC9T. Special Senses

- (a) *Olfaction and Gustation*: Structure of sensory organ, neural pathway of olfactory and gustatory sensation. Mechanism of olfactory and gustatory sensation. Olfactory and gustatory adaptation. After-taste.
- (b) *Audition*: Structure of ear, auditory pathway, mechanism of hearing.
- (c) *Vision*: Structure of the eye. Histology of retina. Visual pathway. Light reflex. Chemical changes in retina on exposure to light. Accommodation - mechanism. Errors of refraction. Light and dark adaptation. Elementary idea of colour vision and colour blindness.

**(4)**

## Semester IV

### (A)Core Courses (CC). Theoretical (T)

#### **CC10T. Endocrinology**

Hormones - classification. Elementary idea of mechanism of hormone action.

*Hypothalamus:* Basic concept of neurohormone.

Hypothalamo-hypophyseal tract and portal system.

*Pituitary:* Histological structure, hormones, functions. Hypo and hyper active states of pituitary gland.

*Thyroid:* Histological structure. Functions of thyroid hormones ( $T_4T_3$ ). Thyrocalcitonin. Hypo and hyper-active states of thyroid.

*Parathyroid:* Histological structure, functions of parathyroid hormone. Tetany.

*Adrenal Cortex:* Histological structure and functions of different hormones. Hypo and hyper-active states of adrenal cortex.

*Adrenal Medulla:* Histological structure and functions of medullary hormones. The relation of adrenal medulla with the sympathetic nervous system.

*Pancreas:* Histology of islets of Langerhans. Origin and functions of pancreatic hormones. Diabetes mellitus.

Brief idea of the origin and functions of renin-angiotensin, prostaglandins, erythropoietin and melatonin. Elementary idea of gastrointestinal hormone.

#### **CC11T. Reproductive Physiology**

Primary and accessory sex organs and secondary sex characters.

Testis: histology, spermatogenesis, testicular hormones and their functions.

Ovary: histology, oogenesis, ovarian hormones and their functions.



Menstrual cycle and its hormonal control.

Maintenance of pregnancy – role of hormones. Development of mammary gland and lactation - role of hormones.

### **CC12T. Excretory Physiology**

Structure and function relationship of kidney. Mechanism of formation of urine. Normal and abnormal constituents of urine. Physiology of micturition. Renal regulation of acid-base balance. Non-excretory functions of kidney.

Structure and functions of skin. Insensible and sensible perspiration Regulation of body temperature — physical and physiological processes involved in it. Physiology of sweat secretion and its regulation. (4)

## **Practicals for core courses (2 Credits Each)**

### **Semester-I**

#### **CC1P:**

1. Examination and staining of fresh tissues: Squamous and Cornified epithelium by Methylene Blue stain.
2. Qualitative tests for identification of: Glucose, Fructose, Lactose, Sucrose, Starch, Dextrin, Lactic acid, Hydrochloric acid.

#### **CC2P**

1. Examination and staining of fresh tissues : Ciliated and Columnar Epithelium by Methylene Blue stain.
2. Qualitative tests for identification of: Albumin, Gelatin, Peptone, Urea, Acetone, Glycerol and Bile Salts.

#### **CC3P**

Quantitative estimation of amino nitrogen (Sorensen's formol titration method [percentage as well as total quantity to be done]). (2)

## **Semester-II**

**CC4P:** 1.Preparation and staining of human blood film with Leishman stain and identification of different types of blood cells.  
2.Preparation of hemin crystals.

### **CC5P:**

1. Demonstration- kymographic recording of the unperfused heart of toad and effects of warm and cold saline.
2. Measurement of systolic and diastolic pressure by sphygmomanometer and determination of pulse and mean pressure.

**CC6P:** 1.Measurement of peak expiratory flow rate.  
2. Pneumographic recording of respiratory movements. (2)

## **Semester-III**

**CC7P:** 1. Silver Nitrate preparation of Node of Ranvier.  
2. Examination and staining of skeletal and cardiac muscles by Methylene Blue stain.

**CC8P:** 1. Demonstration : Use of kymograph, induction coil and mercury key. Recording of simple muscle curve with sciatic-gastrocnemius muscle preparation of toad.  
2. Effects of load and summation of stimuli.

### **CC9P:**

Determination of visual acuity by Snellen's chart / Landolt's C chart.

Determination of colour blindness by Ishihara chart.

Exploration of conductive and perceptive deafness by tuning fork method. **(2)**

### **Semester-IV**

#### **CC10P:**

Study and Identification of Stained Sections of Different

Mammalian Tissues and Organs: Salivary Glands, Esophagus, Stomach, Small Intestine, Large Intestine, Tongue, Liver, Lung, Trachea, Spinal cord, Cerebral cortex, Cerebellum,.

#### **CC11P:**

Study and Identification of Stained Sections of Different Mammalian Tissues and Organs: Thyroid Gland, Adrenal Gland, Pancreas, Spleen, Lymph Gland, Testes, Ovary, Kidney, Ureter, Skin, Artery and Vein.

#### **CC12P.**

Identification of normal and abnormal constituents of urine. **(2)**

### **Discipline Specific Electives (DSE)**

**(Any three courses in each Semester. Credit for 3Th-4 & 3P-2)**

#### **Biological Statistics (DSE1T)**

##### **Biostatistics**

Basic concepts– Variable, population, parameter, sample, statistics.

Classification of data – qualitative and quantitative, continuous and discontinuous.

Presentation of data–frequency distribution, bar diagram, pie diagram, frequency polygon and histogram. Mean, median, mode, standard deviation and standard error.

### **Biological statistics practical (DSE 1P)**

Computation of mean, median, mode, standard deviation and standard error of the mean with physiological data like body temperature, pulse rate, respiratory rate, height and weight of human subjects. Graphical representation of data in frequency polygon and histogram.

### **Microbiology & Immunology (DSE 2T)**

#### **Microbiology**

Virus - DNA virus and RNA virus. Bacteriophage.  
Bacteria-structure and morphological classification. Gram positive and Gram negative and acid-fast bacteria. Pathogenic and non-pathogenic bacteria - definition with a few examples. Sterilization and Pasteurization. Bacterial growth curve. Elementary idea of bacteriostatic and bacteriocidal agents.

#### **Immunology**

Elementary knowledge of innate and acquired immunity. Humoral and cell mediated immunity. Vaccination – Principles, types and importance of immunization. Basic principle of immunological detection of pregnancy.

### **Microbiology & Immunology Practical (DSE 2P)**

Gram staining of bacteria and identification of Gram positive and Gram negative bacteria.

#### **Agglutination test: Blood group determination**

#### **Immunoprecipitation test(TU)**

### **Work Physiology and Ergonomics (DSE 3T)**

#### **Ergonomics**

Importance of ergonomics in occupational health and well being.

Classification of Physiological work load. Concept of work rest cycle. Physical work environment :

- (a) Thermal environment, its' effect, Heat stress indices,
- (b) Noise and vibration, its' effect on workers.
- (c) Anthropometry and its uses.

### **Work Physiology and Ergonomics (DSE 3P)**

1. Measurement of working heart rate by ten beats methods.
  2. Measurement of blood pressure before and after different grades of exercise.
  3. Measurement of some common anthropometric parameters.
- Calculation of BSA and BMI from anthropometric data.

### **Exercise and Sports Physiology (DSE 4T)**

Energy sources during exercise (ATP-CP System, Anaerobic system and Aerobic system).

Cardio-respiratory responses during different grades of exercise.

Concept of excess post exercise oxygen consumption (EPOC), physiological fatigue and recovery.

Aerobic work Capacity: Measurement, physiological factors and applications.

Physical fitness and its assessment by modified Harvard Step Test.

### **Exercise and Sports Physiology (DSE 4P):**

- (a) Measurement of blood pressure before and after different grades of exercise.
- (b) Recording of recovery heart-rate after standard exercise.
- (c) Determination of Physical Fitness Index by modified Harvard Step Test.
- (d) Measurement of body fat percentage.

### **Human nutrition and dietetics (DSE 5T)**

Basic constituents of food and their nutritional significance. Vitamins classification, functions, deficiency symptoms and daily requirements. Hypervitaminosis. Mineral metabolism - Ca, P, Fe. BMR: definition, factors affecting. Respiratory quotient: definition, factors affecting and significance. Biological value of proteins. Essential and non-essential amino acids. Nitrogen balance. SDA : definition and importance. Body calorie requirements – adult consumption unit. Dietary requirements of carbohydrate, protein, lipid and other nutrients. Dietary fibres. Principles of diet survey. Composition and nutritional value of common food stuffs.

**Nutrition and Dietetics - Diet Survey (Field Study Record) (DSE 5P):** Diet survey report (hand-written) of a family (as per ICMR specification) : Each student has to submit a report on his/her own family.

**Haematology (DSE 6T):** Blood groups - ABO and Rh. Blood transfusion - precaution and hazards. Immunological basis of identification of ABO and Rh blood groups. Functions and estimation of haemoglobin. Abnormal haemoglobins - thalassaemia and sickle-cell anaemia. Definition, determination and significance of TC, DC, ESR, Arneht count, PCV, MCV, MHC, MCHC, bleeding time, clotting time and prothrombin time. Anaemia - types (definition and causes). Leucocytosis, leucopenia and leukaemia. Purpura. Disorders of coagulation.

**Haematology (DSE 56P):** DC of WBC, Estimation of haemoglobin, Blood group determination, Bleeding time and Clotting time.

**Community and Public Health (DSE 7T):** Basic idea about community health and public health issues, Malnutrition in a community, overnutrition, issues of obesity; possible remedial measures. Basic idea on PCM, marasmus, kwashiorkor and their prevention. Iron and iodine deficiency. Arsenic in ground water. Sound pollution as a community health issue; definition, concept of noise.

**Community and Public Health (DSE 7P):** Formulation of diet chart of growing children, pregnant & lactating women and Diabetic patients.

### **Environmental Pollutions and Human Health Hazards (DSE 8T)**

**Definition:** hygiene, health and public health.

Air, Water, Food Borne Diseases: causes, symptoms and control.

Food Additives and Adulterants: definition, examples and human health hazards.

**Air Pollution:** definition, sources, air pollutants, effects of air pollution on human health, concept of ozone hole, green house effects and global warming.

**Water Pollution:** definition, types, health hazards, water pollutants, biochemical oxygen demand (BOD), thermal pollution, concept of safe drinking water standards.

**Sound Pollution:** definition, concept of noise, source of sound pollution, effects of sound pollution on human health, noise index (noise standards).

### **Environmental Pollutions and Human Health Hazards (DSE 8P)**

Determination of BOD & COD in water from different sources

### **Ability Enhancement Course (AEC) (Compulsory) 2 Credits each (1 in each Sem.)**

1. Environmental Science
2. English/MIL Communication

**Environmental Science (AEC 1T)**  
**English / MIL Communication (AEC 2T):**

**Skill Enhancement Course (SEC) 2 credits each (1 in each Sem.)**

1. Detection of Food Additives /Adulterants
2. Histopathological Techniques
3. Clinical Biochemistry
4. Pathological Microbiology/Bio-Medical Technology
5. Diet Survey and formulation of diet chart.
6. Biotechnology

**1. Detection of Food Additives / Adulterants (SEC 1):**

Qualitative tests for identifying Food Adulterants in some food samples: Metanil yellow, Saccharin, Aluminium foil, Margarine, Dioxin etc in turmeric powder.

**2. Histopathological Techniques (SEC 2):**

Preparation of tissue sections, H&E staining of tissue sections.

**3. Clinical Biochemistry (SEC 3):**

Photo-colorimetric estimation of blood constituents. Measurement of serum total protein by Biuret method and determination albumin globulin ratio.

**4. Pathological Microbiology / Bio-Medical Technology (SEC 4):**

Staining of gram positive and gram negative bacteria. Demonstration of an ECG machine at work. Handling of Doctor's centrifuge. Handling of colorimeter / spectrophotometer.

**5. Diet survey and formulation of diet chart (SEC 5):**



Survey of dietary status of people in the nearby area by the students, analysis of survey results, and, formulation of diet chart.

6. **Biotechnology(SEC6):** Definition, history of biotechnology, importance of biotechnology. Cloning, Gene therapy, Transgenic animals, Hybridoma Technology.

**Credit Distribution Across Courses  
For Physiology (General) Course**

COURSE TYPE	TOTAL PAPERS	CREDITS
		THEORY+ PRACTICAL
Core Courses	12	12X4=48 12X2=24
Discipline Specific Electives	6	6X4=24 6X2=12
Ability Enhancement Language Courses	2	2X2=4
Skill Enhancement Courses	4	4X2=8
<b>TOTALS</b>	<b>24</b>	<b>120</b>