

PART I: SEMESTER 1
CORE COURSE-1/GENERAL COURSE-1.
PHYG-CC1/ GEN1-TH

THEORY 60 HOURS; FULL MARKS- 50; CREDIT - 04

Unit 1.

Cellular Basis of Physiology

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

Unit 2.

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
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.

Unit 3.

Digestion

- 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.

Metabolism

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

PHYG-CC1P/GEN1P

PRACTICAL 50 HOURS; FULL MARKS- 30; CREDIT - 02

Unit 1:

Examination and staining of fresh tissues:

- Squamous,
- Ciliated and
- Columnar Epithelium by Methylene Blue stain.

Unit 2:

Qualitative tests for identification of:

- Glucose,
- Fructose,
- Lactose,
- Sucrose,
- Starch,
- Dextrin,
- Lactic acid,
- Hydrochloric acid ,
- Albumin,
- Acetone,
- Glycerol and
- Bile Salts.

Unit 3:**Quantitative estimation of**

- Amino nitrogen by Sorensen's formol titration method (percentage to be done)

PART I: SEMESTER 2
CORE COURSE-2/GENERAL COURSE- 2.
PHYG-CC2/ GEN2-TH

THEORY 60 HOURS; FULL MARKS- 50; CREDIT – 04

Unit 1:**Blood and Body Fluids**

- Blood: composition and functions.
- Plasma proteins: origin and functions.
- Blood cells-- 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.

Unit 2:**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.

Unit 3:

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 in blood
- Transport of carbon dioxide in blood.
- Neural regulation of respiration.
- Chemical regulation of respiration.
- Hypoxia.

PHYG-CC2P/GEN2P

PRACTICAL 50 HOURS; FULL MARKS- 30; CREDIT –02

Unit 1:

- Preparation and staining of human blood film with Leishman's stain and identification of different types of blood cells.
- Preparation of hemin crystals.

Unit 2:

- Demonstration- kymographic recording of the unperfused heart of toad and effects of warm and cold saline.

Unit 3:

- Measurement of systolic and diastolic pressure by sphygmomanometer and determination of pulse and mean pressure.

Unit 4:

- Measurement of peak expiratory flow rate.
- Pneumographic recording of normal respiratory movements and effects of hyperventilation and breath-holding.

PART II: SEMESTER 3
CORE COURSE-3/GENERAL COURSE-3
PHYG-CC3/ GEN3-TH

THEORY 60 HOURS; FULL MARKS- 50; CREDIT – 04

Unit 1:

Nerve 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.

Unit 2:

Muscle Physiology

- 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.

Unit 3:

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

Unit 4: **Special Senses**

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.

Audition:

- Structure of ear,
- auditory pathway,
- mechanism of hearing.

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
- colour blindness.

Skill Enhancement courses (SEC)

SEMESTER 3

SEC-A1/A2 -SEC(A1/A2)-TH

THEORY 30 HOURS; FULL MARKS- 100; CREDIT – 02

SEC-A1

Microbiology & Immunology (SECA1)

- Viruses - DNA virus and RNA virus.
- Viroids and Prions.
- Bacteriophages.
- Bacteria-structure and morphological classification.
- Gram positive and Gram negative and acid-fast bacteria.
- Pathogenic and non-pathogenic bacteria - definition with a few examples.
- Physical and chemical methods used in disinfection, sterilization and pasteurization.

- Nutritional requirement – complex and synthetic media, preparation of media ; physical factors required for growth (temperature, pH and gaseous requirement).
- Bacterial growth curve. Elementary idea of bacteriostatic and bacteriocidal agents.
- Beneficial and harmful microorganisms in food.
- Elementary knowledge of innate and acquired immunity.
- Humoral and cell mediated immunity.
- Toxins and toxoids.
- Vaccination – Passive and active immunisation, types and uses of vaccine.
- Immunological basis of allergy and inflammation.

SEC-A2

Clinical Biochemistry

Pathophysiological significance of the following blood constituents:

- glucose,
- serum protein,
- albumin,
- urea,
- creatinine,
- uric acid,
- bilirubin and
- ketone bodies.
- Lipid profile in health and diseases.

Pathophysiological significance of the following serum enzymes and isozymes:

- Lactate dehydrogenase,
- Creatine kinase,
- Amylase,
- Acid and Alkaline phosphatases,
- β -glucuronidase SGPT and
- SGOT.

PHYG-CC3P/GEN3P

PRACTICAL 50 HOURS; FULL MARKS- 30; CREDIT –02

- Silver Nitrate preparation of nodes of Ranvier.
- Silver nitrate preparation of corneal cell space.

- Examination and staining of skeletal and cardiac muscles by Methylene Blue stain.
- Demonstration : Use of kymograph, induction coil and mercury key. Recording of imple muscle curve with sciatic-gastrocnemius muscle preparation of toad.
- 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.

PART II: SEMESTER 4
CORE COURSE-4/GENERAL COURSE-4
PHYG-CC4/ GEN4-TH

THEORY 60 HOURS; FULL MARKS- 50; CREDIT – 04

Unit 1:

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 (T4T3).
- 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.

Unit 2:

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.

Unit 3:

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.

Unit 4:

Skin & its excretory functions

- 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.

SKILL ENHANCEMENT COURSES (SEC)

SEMESTER 4

SEC-B1/B2 -SEC(B1/B2)-TH

THEORY 30 HOURS; FULL MARKS- 100; CREDIT – 02

SEC-B1

Detection of Food Additives / Adulterants & Xenobiotics

- Definition of food adulterants/ additive.
- Tests for identifying food adulterants—
 - o Metanil yellow,
 - o Rhodamin B,
 - o Saccharin,
 - o Monosodium glutamate,
 - o Aluminium foil ,
 - o Dioxin,
 - o Chicory and
 - o Bisphenol.
- Concept of Xenobiotics- Types, sources and fate.
- Types of reactions in detoxification and their mechanisms oxidation, reduction, hydrolysis and conjugation.

PHYG-CC4P/GEN4P

PRACTICAL 50 HOURS; FULL MARKS- 30; CREDIT –02

Unit 1:

Study and Identification of Stained Sections of Different Mammalian Tissues and Organs:

- Esophagus,
- Stomach,
- Small Intestine,
- Large Intestine,
- Liver,
- Lung,
- Trachea,
- Spinal cord,
- Cerebral cortex,
- Cerebellum,
- Thyroid Gland,
- Adrenal Gland,
- Pancreas,
- Spleen,
- Testes,
- Ovary,
- Kidney,
- Artery and
- Vein.

Unit 2:

Identification of :Normal constituents of urine :

- Chloride,
- Sulphate,
- Phosphate,
- Creatinine and
- Urea;

Abnormal constituents of urine:

- Glucose,
- Protein,
- Acetone,
- Bile pigment and
- Bile Salt.

**PART III: SEMESTER 5
DISCIPLINE SPECIFIC ELECTIVES
PHYG-DSE A1 -TH**

THEORY 60 HOURS; FULL MARKS- 50; CREDIT – 04

Biological Statistics (DSE A1TH)

Basic concepts–

- Variable,
- population,
- parameter,
- sample,
- statistic.

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 of ungrouped data.

Concept of probability,
Null and Alternate Hypotheses,
Characteristics and uses of Normal and

t-distributions.

PHYG-DSE A1 -P
PRACTICAL 60 HOURS; FULL MARKS- 30; CREDIT – 02

DSE A1P

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

DISCIPLINE SPECIFIC ELECTIVES
PHYG-DSE A2 -TH

Haematology (DSE A2TH):

- Blood groups - ABO and Rh.
- Immunological basis of identification of ABO and
- Rh blood groups.
- Biochemical basis of ABO system and Bombay phenotype.
- Blood transfusion - precaution and hazards.
- Concept of blood bank.
- Erythropoietin and thrombopoietin .
- Foetal haemoglobin.
- Abnormal haemoglobins - thalassaemia and sickle-cell anaemia. Definition, determination and significance of
- TC, DC, ESR, Arneth 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

PHYG-DSE A2 -P
PRACTICAL 60 HOURS; FULL MARKS- 30; CREDIT – 02

- DC of WBC,
- Estimation of haemoglobin ,
- Blood group determination,
- Bleeding time
- Clotting time.

PART III: SEMESTER 6
DISCIPLINE SPECIFIC ELECTIVES
PHYG-DSE B1 -TH

THEORY 60 HOURS; FULL MARKS- 50; CREDIT – 04

Work & Exercise Physiology and Ergonomics (DSE B1TH)

- Concept of physical work and physiological work.
- Classification of work loads.
- Energetics of muscular work.
- Measurement of energy cost.
- Cardiovascular and respiratory responses to graded exercise.
- Maximal oxygen consumption and post-exercise oxygen consumption – definition, factors affecting, measurement and significance.
- Muscle fatigue and recovery.
- Physical fitness and its assessment by modified Harvard Step Test.
- Ergonomics. Importance of ergonomics in occupational health and well being.
- Definition of anthropometry.
- Different body dimensions measured in anthropometry and their significance.

PHYG-DSE B1 -P

PRACTICAL 60 HOURS; FULL MARKS- 30; CREDIT – 02

DSE B1P

- Measurement of resting and working heart rate using thirty beats and ten beats methods respectively.
- Measurement of blood pressure before and after exercise.
- Determination of Physical Fitness Index by modified Harvard Step Test.
- Measurement of some common anthropometric parameters- stature, weight, eye height (standing), shoulder height, sitting height, knee height (sitting), arm reach, from wall, mid-arm circumference, waist circumference, hip circumference, neck circumference, head circumference, chest circumference.
- Calculation of BSA and BMI from anthropometric data.

PART III: SEMESTER 6
DISCIPLINE SPECIFIC ELECTIVES
PHYG-DSE B2 -TH

THEORY 60 HOURS; FULL MARKS- 50; CREDIT – 04

Human nutrition and dietetics (DSE B2TH):

- 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.

PHYG-DSE B1 -P

PRACTICAL 60 HOURS; FULL MARKS- 30; CREDIT – 02

DSE B2P:

Diet survey report (hand-written) of a family (as per ICMR specification): Each student has to submit a report.

PROGRAMME OUTCOME

After completion of graduation in Bio-Science general the students have a huge scope to established themselves in different section in biological science. The students have a scope to do the higher studies like Master (M.Sc.) in Environmental Science in different Universities like IGNOU, Vidyasagar University etc. in a distance course as well as regular course. The Students of Bio-science General have in different field of studies and jobs. They can

involve in a different field, like:

- Teacher
- Clinical technician in Hospital management
- Physiotherapist
- Nursing
- Research
- Biomedical Scientist
- Clinical Physiologist,
- Paramedical technician,
- Sports Physiologist
- Job in Pollution control Board
- Lab attendant
- Field Trials Officer
- Marine biologist
- Entrepreneur
- Regulatory Affairs Manager
- Trainee Medical Coder
- Clinical Analyst
- Lab Technician
- Anatomy and Physiology Trainer
- Zoo manager
- Tutor and Demonstrator
- Ecologist
- Join in a civil services
- Etc.