

# Vidyasagar University

## Curriculum for B. Sc (General) in Physiology [Choice Based Credit System]

### Semester-VI

| Course                | Course Code | Name of the Subjects   | Course Type/<br>Nature     | Teaching Scheme<br>in hour per week |   |   | Credit    | Marks      |
|-----------------------|-------------|--|----------------------------|-------------------------------------|---|---|-----------|------------|
|                       |             |  |                            | L                                   | T | P |           |            |
| <b>DSE-1B</b>         |             | Any one from Discipline-1(Physiology)<br><b>DSE1BT:</b> Microbiology, Immunity and Biotechnology<br><b>Or</b> Developmental aspects of embryo and foetus<br><b>Or</b> Clinical Biochemistry<br><b>Or</b> Clinical Hematology | Core Course                | 4                                   | 0 | 0 | 6         | 75         |
|                       |             | <b>DSE1BP:</b> Microbiology, Immunity and Biotechnology (Pr) <b>Or</b> Developmental aspects of embryo and foetus(Pr) <b>Or</b> Clinical Biochemistry (Pr) <b>Or</b> Clinical Hematology (Pr)                                |                            | 0                                   | 0 | 4 |           |            |
| <b>DSE-2B</b>         | TBD         | Other Discipline ( Any one from Discipline-2)/TBD  | Core Course                | 5-1-0/4-0-4                         |   |   | 6         | 75         |
| <b>DSE-3B</b>         | TBD         | Other Discipline ( Any one from Discipline-3)/TBD  |                            | 5-1-0/4-0-4                         |   |   | 6         | 75         |
| <b>SEC-4</b>          |             | <b>SEC4T:</b> Environmental Surveillance <b>Or</b> Health Psychology, Physiology of stress and Stress Management <b>Or</b> Pharmacology and Toxicology   | Skill Enhancement Course-4 | 1-1-0/1-0-2                         |   |   | 2         | 50         |
| <b>Semester Total</b> |             |  |                            |                                     |   |   | <b>20</b> | <b>275</b> |

**L**=Lecture, **T**=Tutorial, **P**=Practical, **DSE**= Discipline Specific Electives, **SEC**= Skill Enhancement Course, **TBD** = To be decided.

**Discipline Specific Electives (DSE)**

**DSE-1B: Microbiology, Immunity and Biotechnology**

**Or**

**DSE-1B: Developmental aspects of embryo and foetus**

**Or**

**DSE-1B: Clinical Biochemistry**

**Or**

**DSE-1B: Clinical Hematology**

**Skill Enhancement Course (SEC)**

**SEC-4: Environmental Surveillance**

**Or**

**SEC-4: Health Psychology, Physiology of stress and Stress Management**

**Or**

**SEC-4: Pharmacology and Toxicology**

**Semester- VI**

### Discipline Specific Electives (DSE)

#### **DSE-1B: Microbiology, Immunity and Biotechnology**

**Credits 06**

#### **DSE1BT: Microbiology, Immunity and Biotechnology**

**Credits 04**

#### **Course Contents:**

##### **Microbiology:**

Viruses: DNA & RNA Viruses. Viroids and Prions. Bacteriophages – structure & morphological classification. Bacteria: structure, classification. Staining :- Principal, procedure, uses. Gram stain, Acid – fast stain, Albert stain. Pathogenic and non - pathogenic bacteria. Nutritional requirements of bacteria, nutritional types culture media. Bacterial Growth curve- Preparation, physiological factors required for growth. Bacterial metabolism: fermentation (ethanol, lactic acid, acetic acid), glyoxalate cycle, Entner – Doudoroff pathway, Phosphoketolase pathway. Bacterial Genetics: elementary idea of transformation, conjugation and transduction. Sterilization, disinfection and pasteurization: Physical and chemical methods used. Antibiotics, Bacteriostatic & Bacteriocidal agents. Bacteriolytic agents. Concepts of antiseptic, probiotics and prebiotics. Basic idea about medical bacteriology, virology and mycology.

**Immunity and Vaccination:** Elementary knowledge of innate and acquired immunity. Humoral and Cell mediated immunity. Toxin and toxoids. Vaccination : Principles and importance. Passive and active immunisation. Types and uses of vaccine.

**Biotechnology:** History and importance. DNA and RNA. Gene, Genome and Genetic code, translation. Recombinant DNA technology : concepts, techniques and application., DNA manipulation. Cloning – concept and significances. Cloning vectors. c DNA libraries. DNA sequencing. Basic concepts of Southern, Northern, Western blot techniques and DNA micro array. Polymerase Chain Reaction (PCR). RT-PCR- Basic concepts. Enzyme immobilization: basic concepts. Tissue culture – basic concepts. Human genome projects. Transgenic animals. Hybridoma techniques- Basic concepts. Monoclonal antibody. Protein interaction technology. DNA technology and gene therapy. DNA technology in diseases diagnosis. Genetic Barcode. Fermentation technology: Fermentation, types, bioreactors, Upstream and downstream processing. Physiology and biotechnology process. Bio-pesticides, bio plastics, biosensors, biochips: concepts and significances. Bio-safety and intellectual property Rights. Genomics and Proteomics.

#### **DSE1BP: Microbiology, Immunity and Biotechnology (Practical)**

**Credits 02**

##### **Practical**

1. Study disinfection and sterilization techniques.
2. Culture procedure and isolation of bacteria.
3. Gram staining techniques of bacteria. Acid- fast staining of bacteria. Spore Staining.
4. Isolation of DNA from blood.

5. Separation of DNA by agarose gel electrophoresis. Extraction of DNA from agarose gel.
6. Prepare SDS-PAGE for protein.
7. Perform immunodiffusion by Ouchterlony methods.
8. Biochemical characterization of microorganisms (**Demonstration**).
9. DNA and Protein quantification (**Demonstration**)
10. Analysis of DNA sequences (**Demonstration**).
11. Application of PCR (**Demonstration**).
12. Prepare ELISA (**Demonstration**).
13. Perform Immunoprecipitation (**Demonstration**).

**Or**

**DSE-1B: Developmental aspects of embryo**

**Credits 06**

**DSE1B T: Developmental aspects of embryo**

**Credits 04**

**Course Structure:**

**Theoretical concepts:**

General concepts of reproductive system. Stem cell : Characteristics and applications.  
 Gametogenesis: Spermatogenesis and Oogenesis. Sperm and Ovum of mammals: ultra structure.  
 Egg membrane. Fertilization in mammals.  
 Cleavage: Cleavage plane, types, role of yolk in cleavage; Cleavage process in mammals.  
 Blastula formation : Mammals. Morphogenetic movements : types and examples.  
 Gastrulation : Mammals general concepts of induction, determination and differentiation.  
 Organogenesis : Development of eye as an example of reciprocal and repeated inductive events.

**DSE1BP: Developmental aspects of embryo (Practical)**

**Credits 02**

**List of Practical**

1. Hematoxylin and Eosin staining of testicular, ovarian tissue sections.
2. Identification of spermatocytes, spermatids, Graafian follicle, Corpus Luteum.
3. Demonstration of preserved mammalian embryo.

**Or**

**DSE-1B: Clinical Biochemistry**

**Credits 06**

**DSE1BT: Clinical Biochemistry**

**Credits 04**

**Course Contents:**

**Unit 1: Introduction:** Organization of clinical laboratory, Introduction to instrumentation and automation in clinical biochemistry laboratories safety regulations and first aid. General

comments on specimen collection, types of specimen for biochemical analysis. Precision, accuracy, quality control, precautions and limitations.

**Unit 2: Evaluation of biochemical changes in diseases:** Basic hepatic, renal and cardiovascular physiology. Biochemical symptoms associated with disease and their evaluation. Diagnostic biochemical profile. Pathophysiological significances of glucose, serum protein, albumin, urea, creatinine, uric acids, ketone bodies. Pathophysiological significances of following enzymes : Lactate dehydrogenase, Creatinine kinase, Amylase, Acid and alkaline phosphatase, beta glucuronidase, SGPT & SGOT.

**Unit 3: Assessment of glucose metabolism in blood:** Clinical significance of variations in blood glucose. Diabetes mellitus. Glycosylated Hb.

**Unit 4: Lipid profile:** Composition and functions of lipoproteins. Clinical significance of elevated lipoprotein. Lipid profile in health and diseases.

**Unit 5: Liver function tests:** Structure of the liver, liver function tests, causes of different liver diseases, liver function tests in the diagnosis of liver diseases. Pathophysiological significance of bilirubin.

**Unit 6: Renal function tests and urine analysis:** Composition of urine. Use of urine strip / dipstick method for urine analysis. Basic ideas on different types of test for renal diseases.

**Unit 7: Tests for cardiovascular diseases:** Involvement of enzymes in diagnostics of heart disease including aspartate transaminase, isoenzymes of creatine kinase and lactate dehydrogenase and troponin.

## **DSE1BP: Clinical Biochemistry (Practical)**

**Credits 02**

### **List of Practical**

1. Collection of blood and storage. Separation and storage of serum.
2. Estimation of blood glucose by glucose oxidase peroxidase method.
3. Estimation of blood glucose by Nelson – Somogyi method.
4. Estimation of blood inorganic phosphates by Fiske- Subbarao method.
5. Estimation of serum total protein by Biurate methods, and determination of albumin globulin ratio.
6. Estimation of triglycerides.
7. Estimation of bilirubin (direct and indirect).
8. Quantitative determination of serum creatinine and urea.
9. Determination of serum amylase by iodometric method.
10. Estimation of creatine kinase.

**Or**

## **DSE-1B: Clinical Hematology**

**Credits 06**

## **DSE1BT: Clinical Hematology**

**Credits 04**

### **Course Contents:**

Anemia and its classification. Laboratory investigation and management of anemia. Iron deficiency anemia, megaloblastic anemia, pernicious anemia- pathogenesis and laboratory investigation. Reticulocytes. Aplastic anemia- laboratory diagnosis. Bone marrow examination. Aspiration techniques.

Hemoglobin - abnormal hemoglobin. Hemolytic anemia and its laboratory investigation. Haemoglobinopathies. Hemoglobin electrophoresis. Sickle cell anemia , Thalassemia- laboratory diagnosis.

Blast cell. Causes and significances of leucocytosis, leucopenia, neutrophilia, eosinophilia, basophilia, monocytosis, lymphocytosis, neutropenia, lymphopenia. Toxic granulation. Leukemia and its classification. HIV on blood cell parameters. LE cells and its significances. Blood parasites.

Hemostasis and Coagulation: Platelet development. Qualitative and quantitative disorders of platelets. Secondary hemostasis. Hemophilia, Willebrand diseases. Disorder of fibrinogen. Fibrinolysis. Bleeding and coagulation disorders.

Blood groups: Immunological basis of identification of ABO and RH blood groups. Biochemical basis of ABO system and Bombay phenotyping. Others blood groups : Kell, Kidd, Duffy, etc. Blood transfusion. Blood banking.

Definition determination and significance of TC, DC ,ESR, Arnth count, PCV, MCV, MHC, MCHC. bleeding time, clotting time, prothrombin time.

## **DSE1BP: Clinical Hematology (Practical)**

**Credits 02**

### **List of Practical**

1. General blood picture
2. Differential Leucocyte Count. Absolute leucocyte count
3. Determination of haemoglobin by various methods.
4. Determination of total RBC count and WBC count.
5. Determination of PCV
6. Determination of red cell indices
7. Determination of ESR.
8. Determination of reticulocyte count.
9. Staining of bone marrow
10. Determination of blood groups.

11. Determination of toxic granulation of neutrophil
12. Determination of total platelet count.
13. Demonstration of thrombin time.(**Demonstration**)
14. Perform sickling test (**Demonstration**)
15. Perform Heinz bodies( **Demonstration**)
16. Demonstration of leukemic slides (**Demonstration**).
17. Determine fibrinogen conc.(**Demonstration**)
18. Demonstrate malarial slide(**Demonstration**)
19. Haemoglobin electrophoresis( **Demonstration**)

### *Skill Enhancement Course (SEC)*

## **SEC- 4: Environmental Surveillance**

**Credits 02**

### **SEC4T: Environmental Surveillance**

#### **Course Contents:**

**UNIT – I:** Environmental Surveillance Monitoring – definition, advantages, disadvantages, scale of observation, GEMS and its goal current and future status of environmental surveillance and monitoring

**UNIT - II:** Types of Environmental surveillance, systematic ground surveys (SGS), soil, surface water and air surveillance – parameters and instruments, standards, sensors and RUSS, Surveillance devices, Social Network Analysis

**UNIT - III:** Water quality surveillance and air, water and health, Water quality and sanitary inspection data collection. Sampling site selection and sample approaches. Systematic aerial reconnaissance flight surveillance, using the surveillance data, Household water and the safe water chain

**UNIT – IV:** Biological surveillance programme for the monitoring of crop pests, Biometric surveillance – aquatic bodies, various invertebrates and vertebrate vectors surveillance, Biomarkers in environmental surveillance

**UNIT - V:** Disease surveillance (of pathogens) – Definition, World Health Organization AIDS surveillance case definition, Anthrax, Avian influenza, Dengue hemorrhagic fever, Hepatitis, Influenza, Plague, Severe Acute Respiratory Syndrome, Smallpox

**Or**

## **SEC-4: Health Psychology, Physiology of stress and Stress Management**

**Credits 02**

### **SEC4T: Health Psychology, Physiology of stress and Stress Management**

#### **Course Contents:**

## **Health Psychology:**

Introduction: Definition, Mind-body relationship, Bio-psychosocial model of Health, Life styles and disease patterns. Behaviour and Health: Characteristics of health behaviour; Barriers to health behaviour; Theories of health behaviour and their implications. Health Enhancing Behaviour: Exercise, nutrition, accident prevention, pain and stress management. Health and Well-being: Happiness; Life satisfaction; Resilience; Optimism and Hope.

## **Physiology of Stress:**

Stress: Definition, Nature of stress, symptoms of stress. Physical and Emotional Stressors. General Adaptation Syndrome. Role of Hypothalamic - Pituitary- Adrenal Axis and Sympatho-adrenal Medullary Axis in coping stress. Effects of chronic stress: Immunological, Cardiovascular, Emotional problem.

## **Stress Management**

Various sources of stress: environmental, social, physiological and psychological. Stress and health: effects of stress on health, eustress, distress. Managing stress: Methods - yoga, meditation, relaxation techniques, Problem focused and emotion focused approaches.

**Or**

## **SEC- 4: Pharmacology and Toxicology**

**Credits 02**

### **SEC4T: Pharmacology and Toxicology**

**Credit 01**

#### **Course Contents:**

### **Unit I: General pharmacology and toxicology**

Nature and source of drugs, routes of drug administration and their advantages, definitions and scope of toxicology. Introduction to eco-toxicology.

### **Unit II: Mechanism of toxicity**

Formation of ultimate toxicant of xenobiotics and its interaction with target molecules.

### **Unit III: Pharmacokinetics**



Membrane transport, absorption, distribution of xenobiotics. Brief introduction to biotransformation, Phase- I reactions including oxidations, hydrolysis, reductions and phase II conjugation reactions and excretion of drugs.

#### **Unit IV: Pharmacodynamics**

Mechanism of drug action, receptors and receptors subtypes, Dose response relationship and combined effect of drugs. Concept of LD50, LC50, TD50 and therapeutic index.

#### **Unit V: Introduction and classification of the drugs acting on:**

- a. Central and autonomic nervous system, neurotoxic agents.
- b. Cardiovascular system and cardiotoxic agents.
- c. Kidney and nephrotoxic agents.

#### **Unit VI: Introduction and classification**

- a. Anti-inflammatory and analgesic drugs and their related toxicity.
- b. Endocrine drugs
- c. Antimicrobial chemotherapeutic drugs

#### **SEC4P: Pharmacology and Toxicology**

**Credits 01**

#### **Practical**

1. To study presence of paracetamol /aspirin in the given sample.
2. Determination of Dissolved water (DO) using Winkler's method.
3. To determine the total hardness of water by complexometric method Using EDTA.
4. To determine Acid value of the given oil sample.
5. Calculation of LD50 value of an insecticide from the data provided.
6. Handling of laboratory animals and various routes of drug administration (**Demonstration**).
7. Separation of a mixture of benzoic acid, beta- naphthol and naphelene by solvent extraction and identification of their functional groups (**Demonstration**).
8. Pharmacodynamics : dose- response curve (**Demonstration**).