SYLLABUS
FOR
BACHELOR OF SCIENCE
IN
PHYSIOLOGY HONOURS
UNDER
CHOICE BASED CREDIT SYSTEM

UNIVERSITY OF NORTH BENGAL

:EFFECTIVE FROM ACADEMIC SESSION - 2018 - 19:
Framework of CBCS in Physiology Honours (B.Sc., Hons. In Physiology)

<table>
<thead>
<tr>
<th></th>
<th>Core course (14)</th>
<th>Ability Enhancement Compulsory Course (AECC) (2)</th>
<th>Skill Enhancement Course (SEC) (2)</th>
<th>Elective: Discipline Specific (DSE) (4)</th>
<th>Elective: Generic (GE) (4)</th>
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<tr>
<td>I</td>
<td>C1</td>
<td>Environmental Sciences/(English Communication/MIL)</td>
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<td>GE-1(paper-1)</td>
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<td>VI</td>
<td>C13</td>
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<td>DSE-4</td>
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**Implementation**

An undergraduate degree with honours in Physiology may be awarded if a student completes 14 Core Courses (CC) or Core Papers in Physiology, 2 Ability Enhancement Compulsory Courses (AECC), minimum 2 Skill Enhancement Courses (SEC) and 4 Courses each from a list of Discipline Specific Elective (DSE) and Generic Elective (GE) Courses, respectively.

### Courses of B.Sc. Honours Physiology under CBCS

<table>
<thead>
<tr>
<th>Core Courses</th>
<th>Disciplin Specific Electives (Any four)</th>
<th>Ability Enhancement Course (AEC) (Compulsory)</th>
<th>Skilled Enhancement Courses (any two)</th>
</tr>
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<tbody>
<tr>
<td>7. Functions of Nervous system</td>
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<tr>
<td>8. Energy Balance, Metabolism and Nutrition</td>
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<td>9. Gastrointestinal Function</td>
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<td>10. Respiration</td>
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<td>11. Special Senses</td>
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<td>12. Endocrinology</td>
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<tr>
<td>13. Reproductive Function</td>
<td></td>
<td></td>
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<tr>
<td>14. Formation and Excretion of Urine</td>
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### Summary of the Syllabus

1. Each semester will consist of 15-18 weeks of academic work equivalent to 90 actual teaching days.
2. One Credit is equivalent to one (1) hour of teaching (lecture) or two hours of Practical work per week.
3. Numbers in parentheses indicate value of credit.

#### Semester I

<table>
<thead>
<tr>
<th>(A) Core Courses (CC)</th>
<th>Theoretical (T)</th>
<th>Practical (P)</th>
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</thead>
<tbody>
<tr>
<td>CC1T. Cellular Basis of Physiology (4)</td>
<td></td>
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<tr>
<td>CC2T. Biological Physics and Enzymes (4)</td>
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<table>
<thead>
<tr>
<th>(B) Ability Enhancement Courses (AEC)</th>
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<tbody>
<tr>
<td>AEC1A. Environmental Science (1)</td>
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<tr>
<td>AEC 2A. English/MIL Communication (1)</td>
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<thead>
<tr>
<th>(C) Generic Elective (GE)</th>
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<tbody>
<tr>
<td>GE1T (Paper-1)…... (4)</td>
<td></td>
<td>GE1P……………. (2)</td>
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</tbody>
</table>

Total credits in Semester I: \[(4\times2)+(2\times2)+2+6 = 20\]

#### Semester II

<table>
<thead>
<tr>
<th>(A) Core Courses (CC)</th>
<th>Theoretical (T)</th>
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</thead>
<tbody>
<tr>
<td>CC3T. Physiology of Nerve and Muscle Cells (4)</td>
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<tr>
<td>CC4T. Chemistry of Bio-molecules (4)</td>
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<tr>
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<tbody>
<tr>
<td>GE1T(Paper-2)………………. (4)</td>
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<td>GE2P……………… (2)</td>
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</table>

Total credits: \[(4\times2)+(2\times2)+2+6+6 = 26\]

#### Semester III

<table>
<thead>
<tr>
<th>(A) Core Courses (CC)</th>
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<th>Practical (P)</th>
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<tbody>
<tr>
<td>CC5T. Circulating Body Fluids (4)</td>
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<tr>
<td>CC6T. Circulation (4)</td>
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<tr>
<td>CC7T. Functions of Nervous System (4)</td>
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<table>
<thead>
<tr>
<th>(B) Skill Enhancement Courses (SEC)</th>
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<tbody>
<tr>
<td>SEC 1…………………………………… (2)</td>
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</table>

<table>
<thead>
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<th>(C) Generic Elective (GE)</th>
<th>Theoretical (T)</th>
<th>Practical (P)</th>
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</thead>
<tbody>
<tr>
<td>GE2T(Paper-1)…………….. (4)</td>
<td></td>
<td>GE2P……………… (2)</td>
</tr>
</tbody>
</table>

Total credits: \[(12+6)+2+(4+2) = 26\]

#### Semester IV

<table>
<thead>
<tr>
<th>(A) Core Courses (CC)</th>
<th>Theoretical (T)</th>
<th>Practical (P)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CC8T. Nutrition (4)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CC9T. Gastrointestinal Function (4)</td>
<td></td>
<td></td>
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<tr>
<td>CC10T. Respiration (4)</td>
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</table>

<table>
<thead>
<tr>
<th>(B) Ability Enhancement Courses (AEC)</th>
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<tr>
<th>(C) Generic Elective (GE)</th>
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<th>Practical (P)</th>
</tr>
</thead>
<tbody>
<tr>
<td>GE2T(Paper-1)…………….. (4)</td>
<td></td>
<td>GE2P……………… (2)</td>
</tr>
</tbody>
</table>

Total credits: \[(4\times2)+(2\times2)\]
(B) Skill Enhancement Courses (SEC)
SEC2T. ………………………………… (1)
SEC 2P…………………………...………(1)

(C) Generic Elective (GE)
Theoretical (T) Practical (P)
GE2T(Paper-2)………. (4) GE2P …………………… (2)
Total credits:[12+6]+2+(4+2) =26

Semester V

(A) Core Courses (CC)
Theoretical (T) Practical (P)
CC11T. Special Senses (4) CC11P. Special Senses (2)
CC12T. Endocrinology (4) CC12P. Endocrinology (2)

(B) (B) Discipline Specific Electives(DSE)
Theoretical (T) Practical (P)
DSE1T. ………………………………… (4) DSE 1P………………… (2)
DSE2T………………………………….. (4) DSE 2P………………… (2)
*Dissertation/ Project Work in place of one DSE paper (6 Credits) may be adopted.
Total credits:[8+4]+(6X2) =24

Semester VI

(A) Core Courses (CC)
Theoretical (T) Practical (P)
CC13T. Reproductive Function (4) CC13P. Reproductive Function (2)
CC14T. Formation and Excretion of Urine (4) CC14P. Formation and Excretion of Urine (2)

(B) (B) Discipline Specific Electives(DSE)
Theoretical (T) Practical (P)
DSE3T. ………………………………… (4) DSE 3P………………… (2)
DSE4T………………………………….. (4) DSE 4P………………… (2)
. Total credits:[8+4]+(6X2) =24

Credit Distribution Across Courses

<table>
<thead>
<tr>
<th>COURSE TYPE</th>
<th>TOTAL PAPERS</th>
<th>CREDITS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>THEORETICAL</td>
<td>PRACTICAL</td>
</tr>
<tr>
<td>Core Courses</td>
<td>14</td>
<td>14X4=56, 14X2=28</td>
</tr>
<tr>
<td>Discipline Specific Electives</td>
<td>4</td>
<td>4X4=16, 4X2=8</td>
</tr>
<tr>
<td>Generic Electives</td>
<td>4</td>
<td>4X4=16, 4X2=8</td>
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<td>AECC</td>
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<tr>
<td>Skill Enhancement Courses</td>
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<td>2X2=4</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>26</strong></td>
<td><strong>140</strong></td>
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</table>
# Details of Courses and Components Core Courses

## CC1T: Cellular Basis of Physiology


## CC2T: Biological Physics and Enzymes


## CC1P: Cellular Basis of Physiology

**Histology:** Study on compound microscope. Study and Identification of Stained Sections of Different Mammalian Tissues and Organs: Bone, Cartilage, Trachea, Lungs, Spleen, Lymph gland, Esophagus, Stomach, Duodenum, Ileum, Jejunum, large Intestine, Liver, Kidney, Ureter, Salivary glands, Pancreas, Adrenal gland, Thyroid gland, Testes, Ovary, Spinal Cord, Cerebral cortex, Cerebellum, Skin, Cardiac muscle, Skeletal muscle, Smooth muscle, Artery, Vein, Tongue, Uterus. (Five slides to be identified 5*2=10 marks)

Preparation & Staining of squamous & Cornified epithelium, Skeletal & cardiac muscle. (5 marks)

( viva Voce-2 marks+ Lab Note Book-3 Marks)

## CC2P: Biological Physics and Enzymes

Determination of oncotic pressure of colloidal solutions; Determination of pulse rate and heart rate under resting condition and the effect of exercise on it. Determination of respiratory rate under resting and exercise condition. Determination of Systolic & Diastolic blood pressure in resting condition. Determination of Pulse and Mean Blood Pressure by non-invasive methods (Auscultatory Methods). Determination of enzyme activities (e.g., SOD, CAT, Amylase, Transaminase etc.). (Two experiments to be set 8+7=15)

( viva Voce-2 marks+ Lab Note Book-3 Marks)

## CC3T: Physiology of Nerve & Muscle Cells

### 1. Excitable Tissue: Nerve


### 2. Excitable Tissue: Muscle

Introduction, Muscle proteins, Skeletal Muscle Morphology, Electrical Phenomena & Ionic Fluxes, Contractile Responses, Changes during muscular contraction, Energy Sources &
Metabolism, Properties of Muscle in the Intact Organism, Cardiac Muscle Morphology, Properties, Metabolism, Pacemaker Tissue, Smooth Muscle Morphology, Mechanism of contraction, Multi-Unit Smooth Muscle, Sarco tubular system, Red and white muscle.

3. **Synaptic & Functional Transmission**


4. **Initiation of Impulses in Sense Organs**: Introduction, Sense Organs & Receptors The Senses, Biological Transducer, Electrical & Ionic Events in Receptors, “Coding” of Sensory Information.

### CC4T: Chemistry of Biomolecules

Classification, structure, Properties and Functions of Carbohydrates, Proteins and lipids. Structure, types and Functions of DNAs and RNAs. Metabolic Pathways, energetic and Regulations- glycogenesis, Glycogenolysis, Glycolysis, TCA cycle, HMP pathway, Neoglucogenesis, Cori Cycle, Glucose Alanine cycle, Beta Oxidation, Alpha Oxidation, Omega Oxidation, Ketogenesis, Fatty acid Synthesis, Cholesterol Biosynthesis, Urea cycle.

TCA cycle- the final common Pathway, Deamination, Transamination, Glucogenic and Ketogenic amino acid, Inborn error of metabolism.

### CC3P: Physiology of Nerve & Muscle Cells

**Histological Study, Experiment of Nerve and Muscle:** Isolation and Staining of nerve fibres with node(s) of Ranvier (AgNO3). Adipose tissue, Cornea, Preparation of sciatic nerve innervated gastrocnemius muscle of toad. Study of Kymograph, Induction coil, Key and other instruments used to study mechanical responses of skeletal muscle. Kymographic recording of mechanical responses of gastrocnemius muscle to a single stimulus and two successive stimuli. Kymographic recording of the movements of unperfused heart of toad & effect of hot and cold saline. Calculation of work done by the muscle. Determination of nerve conduction velocity. (8 marks)

( viva Voce-2 marks+ Lab Note Book-3 Marks)

### CC4P: Chemistry of Biomolecules

**Biological Chemistry:**
Qualitative tests for the identification of physiologically important substances: Hydrochloric acid, lactic Acid, Uric Acid, Glucose, Galactose, Fructose, Sucrose, Lactose, Albumin, Gelatin, Peptone, Starch, Dextrin, Urea, Glycerol, Bile salts, Acetone, Cholesterol. (8 marks)

( viva Voce-2 marks+ Lab Note Book-3 Marks)

### CC5T: Circulating Body Fluids

CC6T: Circulation

1. **Origin of the Heartbeat & the Electrical Activity of the heart**
   Introduction, Properties of heart muscle, Special Junctional tissues, Origin & Spread of Cardiac Excitation, The Electrocardiogram, Cardiac Arrhythmias, Electrocardiographic Findings in Other Cardiac & Systemic Diseases, hypertrophy and cardiac myopathy.

2. **The Heart as a Pump**
   Introduction, Mechanical Events of the Cardiac Cycle, Cardiac Output, Heart sound, Heart rate.

3. **Dynamics of Blood & Lymph Flow**

4. **Cardiovascular regulatory Mechanisms**
   Introduction, Local Regulatory Mechanisms, Substances Secreted by the Endothelium, Systemic Regulation by Hormones, Systemic Regulation by the Nervous System, Blood pressure-Types, Measurement & Regulation.

5. **Circulation Through special Regions**

6. **Cardiovascular Homeostasis in Health & Disease**
   Introduction, Compensation for Gravitational Effects, Exercise, Inflammation & Wound Healing, Shock, Hypertension, Heart Failure, stroke.

CC7T: Functions of the Nervous System

1. **Reflexes**

2. **Cutaneous, Deep & Visceral Sensation**
   Introduction, Pathways Touch, Proprioception, Temperature, Pain, Other Sensations.

3. **Arousal Mechanisms, Sleep, & the Electrical Activity of the Brain**

4. **Control of Posture & Movement**

5. **The Autonomic Nervous System**

6. **Central Regulation of Visceral Function**
   Introduction, Medulla Oblongata, thalamus, Hypothalamus & Cerebellum- Anatomic Considerations, Nucleus, connections and functions.

7. **Neural Basis of Instinctual Behavior & Emotions**
   Introduction, Anatomic Considerations, Limbic Functions, Sexual Behavior, Fear & Rage, Motivation.

8. **Higher Functions of the Nervous System**
   Conditioned Reflexes, Learning, & Related Phenomena: Introduction, Methods, Learning & Memory, Functions of the Neocortex, Disorders relating learning and memory.

CC5P: Circulating Body Fluids


(Two experiments to be set 8+7=15) (viva Voce-2 marks+Lab Note Book-3 Marks)
CC6P: Circulation


(One experiment to be set 15) (viva Voce marks+ Lab Note Book-3 Marks)

CC7P: Functions of the Nervous System

Neurological Experiments: Experiments on superficial (plantar) and deep (knee jerk) reflex. Measurement of grip strength. Reaction time by stick drop test. Short term memory test (shape, picture word). Two point discrimination test. Study of the effects of changes in acetylcholine & adrenaline on the movement of unperfused heart. Study of the effects of changes in perfusion fluid pressure, changes in temperature, excess calcium and potassium ion concentration, acetylcholine, adrenaline on the movement of heart. Determination of heart rate with static work load. Determination of blood pressure at different body postures.

(One experiment to be set 15) (viva Voce-2 marks+ Lab Note Book-3 Marks)

CC8T: Nutrition

Introduction. Fuel value, Composition and nutritional value of common Indian foodstuffs, rice, wheat, pulses, egg, meat, fish and milk, vegetables & fruits.


Caloric requirement, Dietary fibre, Protein energy malnutrition, Food groups, Malnutrition, BMR, RQ, RDA, SDA, NPU, Biological value of proteins, vitamins- A,D,E,K, Bcomplex, C - Sources, Daily requirements, actions, deficiency symptoms, Hypervitaminosis and Hypovitaminosis and minerals- Sources, functions & Deficiency symptoms. Clinical implications.


CC9T: Gastrointestinal system

1. Anatomy & Histology: Organs- Mouth; tongue, oesophagus liver, stomach, intestine, Deglutition, Defaecation.
2. Digestion & Absorption
   Introduction, Carbohydrates, Proteins & Nucleic Acids, Lipids, Digestion & Absorption, Absorption of Vitamins & Minerals
3. Regulation of Gastrointestinal Function

CC10T: Respiration

3. Regulation of Respiration: Introduction, Neural control of Breathing, Chemical Control of Breathing, Nonchemical Influences on Respiration.
**CC8P: Nutrition**

**Biochemical Estimation:** Quantitative estimation of glucose and sucrose by Benedict’s method. Quantitative estimation of amino nitrogen [Sorensen’s formol titration method (percentage as well as total quantity to be done)]. Estimation of percentage quantity of lactose in milk by Benedict’s method.

(One experiment to be set -15) (viva Voce-2 marks+ Lab Note Book-3 Marks)

**CC9P: Gastrointestinal Function**

a. Study on principles and procedure of Kymographic recording. Study on Smooth muscular movements. Kymographic recording of normal movements of rat’s intestine in Dale’s apparatus. Effects of hypoxia on normal intestinal movements. (10 Marks)

b. A report (hand-written) on the basis of field survey from ONE of the followings: (1) Physiological parameters of human (at least four parameters). (2) Anthropometric measurements on human (at least four parameters). (3) Epidemiological studies on human. (5 Marks)

( viva Voce-2 marks+ Lab Note Book-3 Marks)

**CC10P: Respiration**

**Respiratory Human Experiments:**

(One experiment to be set 15) (viva Voce-2 marks+ Lab Note Book-3 Marks)

**CC11T: Special Senses**


3. **Smell & Taste:** Introduction, Smell, Receptors & Pathways, Physiology of Olfaction, Taste, Receptor Organs & Pathways, Physiology of Taste.

**CC12T: Endocrinology**

1. **The Thyroid Gland:** Introduction, Anatomic Considerations, Formation & Secretion of Thyroid Hormones, Transport of Thyroid Hormones, Effects of Thyroid Hormones, Regulation of Thyroid Secretion, Clinical Correlates.

2. **Endocrine Functions of the Pancreas & the Regulation of Carbohydrate Metabolism:** Introduction, Islet Cell Structure, Structure, Biosynthesis, & Secretion of Insulin, Effects of Insulin, Mechanism of action, Insulin Excess, Regulation of Insulin Secretion, Glucagon, Other Islet Cell Hormones, Hypoglycemia & Diabetes Mellitus in Humans.


4. **Hormonal Control of Calcium Metabolism & the Physiology of Bone:** Introduction, Calcium &
Phosphate Metabolism, Bone Physiology, Vitamin D & the Hydroxycholecalciferols, The Parathyroid Glands, Calcitonin, Effects of Other Hormones & Humoral Agents on Calcium Metabolism.


7. **Human chronobiology**: Biological rhythms; basic concepts and implications. Temperature & Hormonal Biorhythm, Zeitgebers, Master Clock.

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**CC11P: Special Senses**

**Histological and Human Experiments:**
Principles of fixation and staining. Staining and identification of tissues - tongue & skin. Determination of visual acuity by Snellen’s chart / Landolt’s C chart. Determination of colour blindness by Ishihara chart. Perimeter. (Two experiments to be set 8+7=15) (viva Voce-2 marks+ Lab Note Book-3 Marks)

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**CC12P: Endocrinology**

Endocrinological assay / Experiments related to experimental Physiology:
Study of the effects of oxytocin on uterine contraction. Growth chart of school and college students & interpretation. Study of the effects of adrenaline/ acetylcholone on intestinal/ uterine movements. (One experiment to be set 15) (viva Voce-2 marks+ Lab Note Book-3 Marks)

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**CC13T: Reproductive Function**


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**CC14T: Formation and Excretion of Urine**


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**CC13P: Reproductive Function**

Reproductive Histology and Biochemistry:

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**CC14P: Formation and Excretion of Urine**

Renal Biochemistry:
Identification of normal and abnormal constituents of urine. Microscopic observation of RBC, Pus Cell and Cast
in urine. Serum Creatinine test, Kidney function tests. Assessment of nutritional status of infant (birth to 36 month) from the standard growth curve and determination of stage of malnutrition. (Two experiments to be set 8+7=15) (viva Voce-2 marks+ Lab Note Book-3 Marks)

**Discipline Specific Electives (DSE)(Any Four) (Courses of Serial no.1,2,3&4 will be selected)**

1. Biological Statistics
2. Sports Exercise and Ergonomics and Occupational Physiology
3. Microbiology and Immunology
4. Environmental Physiology
5. Genetics and Molecular Biology
6. Nano-biotechnology and Bioinformatics

**DSE 1T : Biological Statistics**


**DSE 1P : Biological Statistics**

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. Student’s ‘t’ test for significance of difference between means. Demonstration: Statistical analysis and graphical representation of biological data with computer using One way ANOVA. (One experiment to be set 15) (viva Voce-2 marks+ Lab Note Book-3 Marks)

**DSE 2T : Sports, Exercise, Ergonomics and Occupational Physiology**


**DSE 2P : Work, sports, Ergonomics and Occupational Physiology**


(Two experiments to be set 8+7=15) (viva Voce-2 marks+ Lab Note Book-3 Marks)

**DSE 3T : Microbiology and Immunology**


Immunization programme - immunization against Polio, Hepatitis-B, Tetanus, Measles, Whooping cough, Tuberculosis, Rabies through vaccine, AIDS- causative virus, mode of transmission, effects on human body, preventive measures, and principles of diagnostic test for AIDS (ELISA).

Immunopathology - basic principles of autoimmune disease and transplantation immunology.

DSE 3P : Microbiology and Immunology
Types of culture media, Principles and description of Laminar flow, Preparation of Culture media, Sterilisation procedure, Pasturisation procedure, Gram staining of bacteria and identification of Gram positive and Gram negative bacteria Demonstration: Spore Staining, Radial immuno-diffusion.

(Two experiments to be set 8+7= 15) ( viva Voce-2 marks+ Lab Note Book-3 Marks)

DSE 4T : Environmental Physiology
Toxicology
Toxins and Toxicology. Factors Affecting toxicity. LD 50, LOD50, ED50, NOEL, LOEL. Concept of Acute and Chronic Effects. Birth defects and Teratogens. Concepts of Biomagnification and Bioconcentration. Prevention of Food Adulteration Act, 1954. Other Food Toxicants: BPA, BPS, Pesticides, PAH, Dioxin, PCB, Heavy Metals: Pb, Hg, Cd, As etc.

Environmental Pollutions and Health Hazards

DSE 4P : Environmental Physiology
Determination of sound levels by sound level meter and noise index. Determination of dissolve oxygen in the supplied water samples-supplied water, ground water extracted by shallow and deep tube wells, stream waters, pond water etc. Detection of food additives in different food samples. Kymographic recording of the effects of food additives on the movement of perfused heart of toad and intestinal movements of rat in Dale's bath. Biochemical estimation of serum glucose, total proteins, SGPT and SGOT in chronically exposed rats.

(One experiment to be set 15) ( viva Voce-2 marks+ Lab Note Book-3 Marks)

DSE 5T: Genetics and Molecular Biology
Genetics: Basic principles of Mendelian genetics - monohybrid and dihybrid, test and back crosses, Bacterial genetics-transformation, transduction, conjugation. Extension of Mendelism - Epistasis and its different types present in plants and animals. Penetration, expressivity, pleiotropism. Crossing over and Gene mapping.

Molecular Biology:
Genes - definition. DNA- structure, DNA replication, transcription of RNA in prokaryotes, Genetic code– properties and wobble hypothesis, translation in prokaryotes, regulation of gene expression – operon concept: lac operon, gene mutation, DNA repairing processes. Basic idea of Recombinant DNA technology and its applications, Polymerase chain reaction (PCR) - basic concepts.

DSE 5P: Genetics and Molecular Biology

DNA gel electrophoresis (agarose gel). (One experiment to be set 15) (viva Voce-2 marks+ Lab Note Book-3 Marks)

DSE 6T : Nanobiothechnology and Bioinformatics

Introduction to nanoscience and nanobiotechnology. Definition of a Nano system. Types of Nanostructures; Types of Nanocrystals-One Dimensional (1D)-Two Dimensional (2D) - Three Dimensional (3D) nanostructured materials - Quantum dots - Quantum wire; Core/Shell structures.
Synthesis of Nanomaterials. Characterization techniques for Nanomaterials: X-ray diffraction; Scanning Electron Microscope (SEM); Atomic force microscopy (AFM); scanning tunnelling microscopy (STM), scanning near field optical microscopy (SNOM); Transmission Electron Microscopy (TEM); Infrared spectroscopy (IR).
Properties of Nanomaterials: Size dependent properties - Mechanical, Physical and Chemical properties. Types of Nanomaterials: Carbon Nanotubes (CNT) - Metals (Au, Ag) - Metal oxides (TiO2, CeO2, ZnO) – Semiconductors (Si, Ge, CdS, ZnSe) - Ceramics and Composites. Applications of Nanomaterials in Biology: Biochemical sensors; Imaging; Cancer treatment etc. Toxicity of nanomaterials in the environment – Health threats.

DSE 6P : Nanobiothechnology and Bioinformatics

To be decided by respective universities board of studies based on the availability of infrastructure.
Skill Enhancement Course (SEC) (Any two) (Courses of Serial no.1 &2 will be selected)

1. Clinical Biochemistry
2. Diet Survey
3. Hematological Techniques
4. Detection of Food Additives /Adulterants
5. Histopathological Techniques

**SEC 1: Clinical Biochemistry**

Photo-colorimetric estimation of blood constituents. Measurement of blood glucose by Folin Wu/ Nelson-Somogyi method, measurement of blood inorganic phosphate by Fiske – Subbarow method, measurement of serum total protein by Biuret method and determination albumin globulin ratio, determination of serum amylase by iodometric method. (One experiment to be set- 15) (viva Voce-2 marks+ Lab Note Book-3 Marks)

**SEC 2: Excursion cum survey on diet & Preparation of project report**

A complete project report (hand written) has to be prepared on the basis of survey work of a locality (20 families each) by the students- Report should have Introduction, Review of literature, Materials& Methods, Results, Discussion and Conclusion—- Covering - BMI, Dietary intake, Nutritional intake, Nutritional requirement, Energy deficiency/excess, vitamin deficiency/excess, mineral deficiency/excess, malnutrition and Formulation of balanced diet chart for any one of the followings- school going children, college students, pregnant woman & Lactating women based on the availability in the study area. The report should not be less than 30 A4 size typed pages and the maximum size of the report should not generally exceed 40 pages (A4 size) 

(15+2(viva)+3(LNB)=20)

**SEC 3: Hematological Techniques**

Total count of WBC, Total count of RBC, Determination of haematocrit, MCV, MCH, MCHC. Preparation of serum, Detection of blood group. Estimation of SGOT and SGPT.

(Two experiments to be set 8+7=15) (viva Voce-2marks+ Lab Note Book-3 Marks)

**SEC 4: Detection of Food Additives / Adulterants**

Qualitative tests for identifying Food Adulterants in some food samples: Metanil yellow, Rhodamin- B, Saccharin, Monosodium glutamate, Aluminum foil, Chicory, Bisphenol A and Bisphenol S, Chocolate Brown HT, Margarine, Pb, Hg, As, PCB, Dioxin etc. in turmeric powder, besan, laddoo, noodles, chocolate and amriti.

( Two compounds to be identified 8+7=15, Viva voce-2 marks & lab note book-3 marks)

**SEC 5: Histopathological Techniques**

Preparation of tissue sections, H&E staining of tissue sections, Preparation and staining of bone marrow smear, measurement of diameter of megakaryocyte, reticulocyte staining, staining of collagen in tissue sections.

(One experiment to be set 15) (viva Voce-2 marks+ Lab Note Book-3 Marks)

**SEC 6: Pathological Microbiology / Bio-Medical Technology**

Electrocardiographic recordings of different waves of Heart and correlation with disease. Estimation of blood glucose by kit method of ten subjects and graphical presentation.
Handling of Doctor’s centrifuge. Handling of colorimeter / spectrophotometer, Microtome, Binocular microscope, ECG, Perimeter, Analysis of physiological/Pathological data through computer software.

(One experiment to be set 15) ( viva Voce-2 marks+ Lab Note Book-3 Marks)

Generic Elective:
Components of Core Courses

<table>
<thead>
<tr>
<th>GEIT: Paper-I(T)</th>
<th>4 Credits</th>
</tr>
</thead>
</table>


<table>
<thead>
<tr>
<th>GE1P: Paper 1 (p)</th>
<th>2 Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Histology:</strong> Study and Identification of Stained Sections of Different Mammalian Tissues and Organs: Trachea, Lungs, Lymph gland, Tongue, Esophagus, Stomach, Duodenum, , Liver, Kidney , Spinal Cord, Cerebral cortex, Cerebellum, Staining &amp;Identification of squamous &amp; cornified epithelium. (8marks)</td>
<td></td>
</tr>
</tbody>
</table>

**Biological Chemistry:** Qualitative tests for the identification of physiologically important substances: Hcl, lactic Acid, Glucose, Fructose, Lactose, Albumin, Peptone,Starch, Dextrin, Urea. (7marks)

( Viva Voce-2 marks& Lab note Book -3 marks)

<table>
<thead>
<tr>
<th>GE 2: Paper-2 (T)</th>
<th>4 Credits</th>
</tr>
</thead>
</table>
Renal system: Nephrnon, Juxtaglomerular apparatus, Countercurrent mechanism, Micturation, Normal &Abnormal constituents of urine. |

<table>
<thead>
<tr>
<th>GE 3: Paper-2(p)</th>
<th>2 Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preparation and staining of blood film with Leishman’s stain., Identification of the blood corpuscles.. Bleeding time and clotting time. Preparation of haemin crystal. (7 marks)</td>
<td></td>
</tr>
</tbody>
</table>

(8 marks) (Viva Voce-2 marks & Lab note Book -3 marks)

**Ability Enhancement Course (AECC) (Compulsory)**

1. Environmental Science
2. English/MIL Communication

**AEC 1T: Environmental Science**

**AEC 2T: English / MIL Communication**
Recommended Text and Reference Books for Physiology (Honours)


11. Cellular and Molecular Biology, by E.D.P. De Robertis and E.M.F. De Robertis; Lea and Febiger.

12. Molecular Biology of gene, by J.D. Watson; H.N. Nancy and other; Benjamin-Cummings.


17. The Text Book of Environmental Physiology, by C. Edger Folk Jr. Lea and Febiger.


SYLLABUS
FOR
BACHELOR OF SCIENCE
IN
PHYSIOLOGY GENERAL
UNDER
CHOICE BASED CREDIT SYSTEM

UNIVERSITY OF NORTH BENGAL

:EFFECTIVE FROM ACADEMIC SESSION - 2018 - 19:
**Scheme for CBCS Curriculum for Physiology General Course**

<table>
<thead>
<tr>
<th>Course type</th>
<th>Total papers</th>
<th>Theory +Practical</th>
<th>Theory +Practical</th>
</tr>
</thead>
<tbody>
<tr>
<td>Core courses(12)</td>
<td>4</td>
<td>4X4=16</td>
<td>16x3=48</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4X2=8</td>
<td>8x3=24</td>
</tr>
<tr>
<td>Elective Courses(6)</td>
<td>2</td>
<td>2X4=8</td>
<td>8x3=24</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2X2=4</td>
<td>4x3=12</td>
</tr>
<tr>
<td>Ability Enhancement Courses</td>
<td>2</td>
<td>2X2=4 (common)</td>
<td></td>
</tr>
<tr>
<td>Skill Enhancement Courses(4)</td>
<td>2</td>
<td>2X2=4 (for Physiology)</td>
<td>4 x2=8</td>
</tr>
<tr>
<td>Total</td>
<td>12</td>
<td>4+4+0/4=40/36 credits for physiology</td>
<td>120</td>
</tr>
</tbody>
</table>

- All general courses will have 3 subjects/disciplines of interest. Students will select 4 core courses each from discipline of choice including Physiology as one of the disciplines.
- Students will select 2 elective courses each from discipline of choice including Physiology as one of the disciplines.
- Student may also choose 2 skill enhancement courses in Physiology.

**Framework of CBCS in Physiology General (B.Sc. General in Physiology)**

<table>
<thead>
<tr>
<th>Semester</th>
<th>Core Course (04)</th>
<th>Ability Enhancement Compulsory Course (AECC) (2)</th>
<th>Skill Enhancement SpecificElective (2)</th>
<th>Discipline SpecificElective (2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>C1</td>
<td>Environmental Science/ (English Communication/MIL/Bengali)</td>
<td>SEC-1</td>
<td></td>
</tr>
<tr>
<td>II</td>
<td>C2</td>
<td>Environmental Science/ (English/ MIL Communication/Bengali)</td>
<td>SEC-1</td>
<td></td>
</tr>
<tr>
<td>III</td>
<td>C3</td>
<td></td>
<td>SEC-1</td>
<td>DSE—1</td>
</tr>
<tr>
<td>IV</td>
<td>C4</td>
<td></td>
<td>SEC-2</td>
<td></td>
</tr>
<tr>
<td>V</td>
<td></td>
<td>Or SEC-1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>VI</td>
<td></td>
<td>SEC-2</td>
<td></td>
<td>DSE-2</td>
</tr>
</tbody>
</table>
# Courses of B.Sc. General Physiology under CBCS

## Core Courses

1. Cellular Basis of Physiology, Bio-Physics, Biochemistry, Gastrointestinal Physiology.
2. Circulating Body Fluids, Circulation, Respiration, Formation and Excretion of Urine
3. Nerve and Muscle, Nervous system, Nutrition
4. Special Senses, Endocrinology, Reproductive Function

## Ability Enhancement Course (AEC) (Compulsory)

1. Environmental Science
2. English/MIL Communication/Bengali

## Elective Course (DSE) (any two)

<table>
<thead>
<tr>
<th>A. Discipline Specific Electives (DSE)(Any two)</th>
<th>1. Biological Statistics</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2. Microbiology and immunology</td>
</tr>
<tr>
<td></td>
<td>3. Sports and Exercise Physiology</td>
</tr>
<tr>
<td></td>
<td>4. Environmental Physiology</td>
</tr>
</tbody>
</table>

## Skill Enhancement Course (SEC) (Any two)

1. Diet Survey and formulation of Diet Chart
2. Hematological Techniques
3. Histopathological Technique
4. Bio-Medical technology

---

## Summary of the Syllabus

**Semester 1**

1. Each semester will consist of 15-18 weeks of academic work equivalent to 90 actual teaching days.
2. One Credit is equivalent to one (1) hour of teaching (lecture) or two hours of Practical work per week.
3. Numbers in parentheses indicate value of credit.

<table>
<thead>
<tr>
<th>(A) Core Courses (CC)</th>
<th>Theoretical (T)</th>
<th>Practical (P)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CCT1. (4)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CCP1. (2)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>(B) Ability Enhancement Courses (AEC)</th>
</tr>
</thead>
<tbody>
<tr>
<td>AECA1. Environmental Science (1), AEC A2.English/MIL Communication/Bengali (1)</td>
</tr>
</tbody>
</table>

Total credits in Semester I: 6 (for Physiology)+ 2 (Compulsory)=(6+2)=8.

---

**Semester II**

<table>
<thead>
<tr>
<th>(A) Core Courses (CC)</th>
<th>Theoretical (T)</th>
<th>Practical (P)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CCT2. (4)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CCP2. (2)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>(B) Ability Enhancement Courses (AEC)</th>
</tr>
</thead>
<tbody>
<tr>
<td>AECB1. Environmental Science (1), AEC B2.English/MIL Communication/Bengali (1)</td>
</tr>
</tbody>
</table>

Total credits in Semester II: 6 (for Physiology)+ 2 (Compulsory)=(6+2)=8.
Semester III  
(A) Core Courses (CC)  
Theoretical (T) Practical (P)  
CCT3. (4) CCP3. (2)  
(B) Skill Enhancement Courses (SEC)  
SEC 1. ................................. (2)  
Total credits in Semester III: 6+2or (6+0)=8 or 6 (for Physiology)  

Semester IV  
(A) Core Courses (CC)  
Theoretical (T) Practical (P)  
CCT4. (4) CCP4. (2)  
(B) Skill Enhancement Courses (SEC)  
SEC 2. ................................. (2)  
Total credits in Semester IV: 6+2or (6+0)=8 or 6 (for Physiology)  

Semester V  
(C) Skill Enhancement Courses (SEC)  
Or SEC 1. ................................. (2)  
(A) Elective Courses (EC)  
Theoretical (T) Practical (P)  
DSE 1T. (4) DSE 1P (2)  
Total credits in Semester IV: 6+2or (6+0)=8 or 6 (for Physiology)  

Semester VI  
(D) Skill Enhancement Courses (SEC)  
Or SEC 2. ................................. (2)  
(B) Elective Courses (EC)  
Theoretical (T) Practical (P)  
DSE 2T. (4) DSE 2P (2)  
Total credits in Semester IV: 6+2or (6+0)=8 or 6 (for Physiology)  

Credit Distribution Across Courses in Physiology  

<table>
<thead>
<tr>
<th>COURSE TYPE</th>
<th>TOTAL PAPERS</th>
<th>CREDITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Core Courses</td>
<td>4</td>
<td>16 &amp; 8</td>
</tr>
<tr>
<td>Ability Enhancement Language Courses</td>
<td>2</td>
<td>4 &amp; 0</td>
</tr>
<tr>
<td>Elective Courses</td>
<td>2</td>
<td>8 &amp; 4</td>
</tr>
<tr>
<td>Skill Enhancement Courses</td>
<td>2</td>
<td>4 &amp; 0</td>
</tr>
<tr>
<td>TOTAL</td>
<td>12</td>
<td>44 – (4+0/4)=40/36</td>
</tr>
</tbody>
</table>
Components of Core Courses

1. **CCT1: Cellular Basis of Physiology, Bio-Physics, Biochemistry, Digestive Physiology.**


   **Biophysics:** Osmosis and Diffusion, pH, Buffers, Colloids: Properties, Importance, Surface tension, Specific Gravity, Viscosity and Resistance, Acids, Bases, Enzymes: Structure, coenzymes, Prosthetic Groups, Mechanism of enzyme action, Enzyme Inhibition, Factors regulating enzyme activities, Isoenzymes, Allosteric enzymes, Pro-enzymes, Ribozymes, Abzymes, Concept of Rate limiting enzymes.

   **Biochemistry:** Classification, structure, Properties and Functions of Carbohydrates, Proteins and lipids. Structure, types and Function of DNAs and RNAs. Metabolic pathways-Glycogenesis, Glycogenolysis, Glycolysis, TCA cycle, Beta oxidation, Ketogenesis & Urea cycle, Deamination, Transamination.


3. **CCP1: Histology & Biochemistry**

   Study on different parts & functions of simple & compound microscope

   **Histology:** Study and Identification of Stained Sections of Different Mammalian Tissues and Organs: Trachea, Lungs, Lymph gland, Tongue, Esophagus, Stomach, Duodenum, Liver, Kidney, Spinal Cord, Cerebral cortex, Cerebellum, Staining & Identification of squamous & cornified epithelium. (8 marks)

   **Biological Chemistry:** Qualitative tests for the identification of physiologically important substances: Hydrochloric acid, lactic Acid, Glucose, Fructose, Lactose, Albumin, Peptone, Starch, Dextrin, Urea. (7 marks) (Viva voce-2marks, Lab note book-3 marks)

4. **CCT2: Blood, Cardio-vascular, Respiration & Renal**


   **Cardiovascular system:** Properties, Special junctional tissues, Cardiac cycle, Cardiac output, Blood Pressure: Measurement, Regulation, Heart rate, heart sound

   **Respiratory system:** Process of Respiration, Neural control, Chemical control, Anoxia, Oxygen transport, Carbon-di-oxide transport, Oxygen dissociation curve.

   **Renal system:** Nephron, Juxtaglomerular apparatus, Countercurrent mechanism, Micturation, Normal & Abnormal constituents of urine.
## CCP2: Haematology & Experimental Physiology  
**2 Credits**

**Haematology:** Preparation and staining of blood film with Leishman’s stain. Identification of the blood corpuscles. Bleeding time and clotting time. Preparation of haemin crystal.

(7 marks)

**Experimental:** Measurement of Systolic and diastolic blood pressure in resting & exercise condition. Measurement of pulse rate, respiratory rate and pulse-respiratory ratio during rest & exercise. Pneumographic recording of respiratory movement along with the effect of hyperventilation, breath holding, talking & drinking. Measure the following anthropometric parameters—Stature, Eye height, Shoulder height, Elbow height, Knee height, suprasternal height, Iliac crest height, Sitting height(all), arm reach from wall, Measurement of girth-Neck, Upper arm, chest, waist hip & thigh. (8 marks) (Viva-2+ LNB-3)

## CCT3: Nerve Muscle Physiology, Nervous system & Nutrition  
**4 Credits**


Synaptic & Junctional Transmission- Introduction, Transmission: Functional Anatomy,

**Nervous system:** Reflex-Introduction, Monosynaptic Reflexes: The Stretch Reflex, Polysynaptic Reflexes: Properties. Pathways- Touch, Temperature, Pain, Corticospinal & Corticobulbar System,

Medulla Oblongata, The Reticular Formation & the Reticular Activating System, The Thalamus & the Cerebral Cortex, Hypothalamus, Hypothalamic Function, Cerebellum, The Electroencephalogram, Learning & Memory,

**Nutrition:** Importances of Carbohydrate, Protein, Fat, BMR, RQ, RDA, SDA, Nitrogen balance, essential amino acids, biological value of proteins. Supplementary value of protein. Protein efficiency ratio and net protein utilization of dietary proteins. Dietary fibres. Composition and nutritional value of common food stuffs.

Vitamins- Sources, functions, deficiency signs of A, D, E, K, B complex & C. mineral- Sources & functions of Na, K, Ca, Mg, S, P, Fe, Mn, Zn.

## CCP3: Histology & Experiments of Nerve and Muscle  
**2 Credits**

**Histology:** Isolation and Staining- Node(s) of Ranvier (AgNO₃), Adipose tissue, Cornea.

(5 marks)

**Experiment of Nerve and Muscle:** Study of Kymograph, Induction coil, Key and other instruments used to study mechanical responses of skeletal muscle. Kymographic recording of mechanical responses of gastrocnemius muscle to a single stimulus and two successive stimuli. Preparation of Amphibian Ringer solution. Kymographic recording of the movements of unperfused heart of toad. Study of the effects of changes in temperature and adrenaline on the movement of heart. (10 marks) (Viva-2+ LNB-3)

## CCT4: Special Sense, Endocrinology & Reproductive system  
**4 Credits**

**Special Sense:** Vision: The Photoreceptor Mechanism: Visual Pathways

**Color Vision,**
Hearing- Anatomic considerations, Hair cells, Mechanism of hearing, Smell & Taste- Smell- Receptors & Pathways, Physiology of Olfaction, Taste- Receptor Organs & Pathways, Physiology of Taste.


**Reproductive system:** Introduction, Puberty, Precocious & Delayed Puberty, Menopause, Pituitary Gonadotropins & Prolactin, The male reproductive System- Structure, Spermatogenesis, Endocrine Function of the Testes. The Female Reproductive system- The Menstrual Cycle, Ovarian Hormones, Control of Ovarian Function, Pregnancy, Placenta, Breast development and Lactation, Physiological concepts for a planned family

<table>
<thead>
<tr>
<th>CCP4: Biochemical Estimation &amp; Experiments on Special Sense &amp; Reproductive system</th>
<th>2 Credits</th>
</tr>
</thead>
</table>

**Biochemical Estimation:**
Quantitative estimation of gram percentage & total quantity of glucose and sucrose by Benedict’s method. Quantitative estimation of gram percentage & total quantity of amino nitrogen [Sorensen’s formol titration method.

**Experiments on Special Sense & Reproductive system**

One experiment to be set-15 marks) ( Viva-2marks+LNB -3 marks)

---

**Ability Enhancement Compulsory Course (ASCC)**

1. Environmental science
2. English/MIL communication

| ASCCT1: Environmental Science |
| ASCCT2: English/MIL Communication |
Elective Courses (any two)

A. Discipline Specific Electives (DSE) (Courses of Serial no-1 & 2 will be selected)
1. Biological Statistics
2. Microbiology and Immunology
3. Sports and Exercise Physiology
4. Environmental Physiology

**DSET1 : Biological Statistics**

<table>
<thead>
<tr>
<th>Credits</th>
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<tbody>
<tr>
<td>4</td>
</tr>
</tbody>
</table>


Testing of hypothesis - Null hypothesis, errors of inference, levels of significance, Students’ ‘t’ test and z score for significance of difference. Distribution-free test - Chi-square test.

**DSE P1 : Biological Statistics Lab**

<table>
<thead>
<tr>
<th>Credits</th>
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<tbody>
<tr>
<td>2</td>
</tr>
</tbody>
</table>

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. Student’s ‘t’ test for significance of difference between means.

Demonstration: Statistical analysis and graphical representation of biological data with computer using One way ANOVA etc.

(One experiment to be set-15 marks) (Viva-2marks+LNB -3 marks)

**DSE T2 : Microbiology and Immunology**

<table>
<thead>
<tr>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
</tr>
</tbody>
</table>


Viruses - Structure and types, Lytic and lysogenic cycle.


**DSE P2 : Microbiology and Immunology Lab**

<table>
<thead>
<tr>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
</tr>
</tbody>
</table>

**Instruments components & functions**- Study on Laminar flow, Autoclave, Study on different classes of bacteria, Study on disinfection of glasswares, Study on types of culture media, Preparation of Culture media, Gram staining of bacteria and identification of Gram positive and Gram negative bacteria, Spore Staining, Radial immuno-diffusion.
Identification of tubercular bacteria in sputum (demonstration: with utmost precautionary). One experiment to be set-15 marks) (Viva-2marks+LNB -3 marks)

<table>
<thead>
<tr>
<th>DSE T3 : Sports and Exercise Physiology</th>
<th>4 Credits</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>DSE P3 : Sports and Exercise Physiology Lab</th>
<th>2 Credits</th>
</tr>
</thead>
</table>

a)  

<table>
<thead>
<tr>
<th>DSE T4 : Environmental Physiology</th>
<th>4 Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Toxicology: Toxins and Toxicology. Factors Affecting toxicity. LD$<em>{50}$, LOD$</em>{50}$, ED$_{50}$, Concept of Acute and Chronic Effects. Teratogens. Concepts of Biomagnification and Bioconcentration. Other Food Toxicants: Pesticides, PAH, Dioxin, PCB, Heavy Metals: Pb, Hg, Cd, As etc. Environmental Pollutions and Health Hazards</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>DSE 4P : Environmental Physiology Lab</th>
<th>2 Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Determination of sound levels by sound level meter and noise index.</td>
<td></td>
</tr>
</tbody>
</table>
Determination of dissolve oxygen in the supplied water samples-supplied water, ground water extracted by shallow and deep tube wells, stream waters, pond water etc. Detection of food additives in different food samples. Kymographic recording of the effects of food additives on the movement of perfused heart of toad and intestinal movements of rat in Dale's bath. Biochemical estimation of serum glucose, total proteins, SGPT and SGOT in chronically exposed rats. (Two experiments to be set 7+8=15) (Viva-2 marks, LNB -3 marks)

**Skill Enhancement Course (SEC) (Any two)**  
(Courses of Serial no-1 &2 will be selected)

1. Diet & field Survey  
2. Hematological Techniques  
3. Histopathological Techniques  
4. Bio-Medical Technology

<table>
<thead>
<tr>
<th>SEC T1: Diet survey and Formulation of diet chart</th>
<th>2 credits</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Nutrition and Dietetics - Diet Survey (Field Study Record):</strong></td>
<td></td>
</tr>
<tr>
<td>a) Diet survey report (hand-written) of 10 families (as per ICMR specification)(8 marks)</td>
<td></td>
</tr>
<tr>
<td>b) A report (hand-written) on the basis of field survey from ONE of the followings: (1) Physiological parameters of human (at least three parameters). (2) Anthropometric measurements on human (at least four parameters). (3) Epidemiological studies on human.</td>
<td>(7 marks) (Viva Voce 2+LNB 3=20)</td>
</tr>
</tbody>
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<table>
<thead>
<tr>
<th>SEC T2: Hematological Techniques</th>
<th>2 Credits</th>
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<tr>
<th>SEC T3: Histopathological Techniques</th>
<th>2 Credits</th>
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<tr>
<td>Preparation of tissue sections, H&amp;E staining of tissue sections, Preparation and staining of bone marrow smear, measurement of diameter of megakaryocyte, reticulocyte staining, staining of collagen in tissue sections.</td>
<td>(15+2+3=20)</td>
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<tr>
<th>SEC T4: Bio-Medical Technology</th>
<th>2 Credits</th>
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<tr>
<td>Electrocardiographic recordings of different waves of Heart and correlation with disease. Estimation of blood glucose by kit method of ten subjects and graphical presentation. Handling of Doctor’s centrifuge. Handling of colorimeter / spectrophotometer, Microtome, Binocular microscope, ECG, Perimeter,</td>
<td></td>
</tr>
</tbody>
</table>
Recommended Text and Reference Books for Physiology (General)

- Essential Immunology, by I.M. Roitt, Blackwell Scientific Publications.
- Cellular and Molecular Biology, by E.D.P. De Robertis and E.M.F. De Robertis; Lea and Febiger.
- Molecular Biology of gene, by J.D. Watson; H.N. Nancy and other; Benjamin-Cummings.
- Human Physiology, by Rhoades and Pflanger, Saunder College Publishing.
- The Text Book of Environmental Physiology, by C. Edger Folk Jr. Lea and Febiger.
- Sharirvigyan, by J. Debnath.