

# UNIVERSITY OF NORTH BENGAL

## SUBJECT: PHYSIOLOGY

Course Curriculum for Physiology major, Minor and Discipline Specific Multidisciplinary Course under Framework for the four-year Undergraduate Programme-2024



### First Year

(Implemented from academic session 2024-2025)

#### Course structure design for Single Major and Single Minor

SEMESTER	COURSE TYPE	PAPER TYPE	PAPER NAME	PAPER CODE	CREDIT	PAPER LEVEL
1	MAJOR	THEORY AND PRACTICAL	CELLULAR BASIS OF PHYSIOLOGY	UPSIMAJ11001	4(Theory-03, Practical-01)	100 (Basic knowledge and foundational)
1	MAJOR	THEORY AND PRACTICAL	BIOLOGICAL PHYSICS AND ENZYMES	UPSIMAJ11002	4(Theory-03, Practical-01)	100
1	MINOR	THEORY AND PRACTICAL	CELL PHYSIOLOGY	UPSIMIN10001	4(Theory-03, Practical-01)	100
2	MAJOR	THEORY AND PRACTICAL	HAEMATOLOGY	UPSIMAJ11003	4(Theory-03, Practical-01)	100
2	MAJOR	THEORY AND PRACTICAL	BIOCHEMISTRY OF MOLECULES AND METABOLISM	UPSIMAJ11004	4(Theory-03, Practical-01)	100
2	MINOR	THEORY AND PRACTICAL	BLOOD AND BODY FLUIDS	UPSIMIN10002	4(Theory-03, Practical-01)	100

#### Course structure design for Three Discipline Specific Multidisciplinary Courses and Minor course

SEMESTER	COURSE TYPE	PAPER TYPE	PAPER NAME	PAPER CODE	CREDIT	PAPER LEVEL
1	DSC	THEORY AND PRACTICAL	CELL PHYSIOLOGY	UPSIDSC10001	4(Theory-03, Practical-01)	100
2	DSC	THEORY AND PRACTICAL	BLOOD AND BODY FLUIDS	UPSIDSC10002	4(Theory-03, Practical-01)	100

**SUBJECT: PHYSIOLOGY**  
**MAJOR COURSES**  
**COURSE-1: Cellular Basis of Physiology**  
**PAPER CODE: UPSIMAJ11001**  
**PAPER LEVEL- 100**  
**PAPER TYPE-T+P**  
**FULL MARKS =80 (Theory=60, Practical=20,)**  
**Hour of Exam- Theory=2.5 hrs, Practical=3 hrs**

**Learning Outcomes:** At the end of the semester the students will-

1. Understand the structural organization of cell, tissue and systems.
2. Acquire knowledge about intercellular communications.
3. Understand the coordination of functions between different systems

**COURSE-1: Cellular Basis of Physiology (Theory)**

**Lectures required-35**

Introduction, Homeostasis- Control System, Feed Back Mechanisms-Negative and positive, Long loop and short loop feedback. Intercellular Communication, Coordination of functions

Cell theory, Cells- Types, Distribution, Histology and Functions. Cell Organelles- Nucleus, Mitochondria, Ribosome, Lysosome, Golgi Body, Endoplasmic reticulum, Microtubules etc. GERL system, Transport Across cell Membranes- Diffusion, osmosis, facilitated diffusion, Active transport, Endocytosis, Exocytosis, Symport, Uniport, Antiport

Plasma membrane-models, Fluid mosaic model, Membrane fluidity, receptors, Channels-Ca<sup>++</sup> channel, Voltage gated channel, Ionic flux.

Cell Signalling-Signalling molecules, types and actions of Second Messengers,

Cell Junctions-types, histology and importances,

Organs- Histology and functions of Heart, lung, liver and kidney.

Systems-histology and functions of Cardiovascular system, Digestive system, respiratory system, Nervous system, muscular system, urogenital system,

Tissues-Epithelial tissue, Connective tissue, Muscular tissue, Nervous tissue, Adipose tissue. Bone and Cartilage.

Glands, Cell Cycle, Cell Division- Mitosis, Meiosis.

**COURSE-1: Cellular Basis of Physiology (Practical)**

1. Staining and identification of squamous epithelium. Cornified epithelium. skeletal muscle fiber  
Cardiac muscle fiber. Adipose tissue. Corneal cell space. **(one question to be set for 7 marks)**
2. **Identification of permanent slides-** Tongue, Oesophagus, Liver, Stomach, Duodenum, Ileum, Jejunum, Large Intestine, Trachea, Lung. **(one question to be set for 8 marks -4 slides 2 marks each) Viva voce=2, Lab Note Book=3.**

**COURSE-2: Biological Physics and Enzymes**  
**PAPER CODE: UPSIMAJ11002**  
**PAPER LEVEL- 100**  
**PAPER TYPE-T+P**  
**FULL MARKS =80 (Theory=60, Practical=20,)**  
**Hour of Exam- Theory=2.5 hrs, Practical=3 hrs**

**Learning Outcomes:** At the end of the semester the students will-

1. Understand the biophysical principles of the body.
2. Acquire knowledge about enzymes and their significances to maintain homeostasis.
3. Understand the principles and methods of different laboratory techniques.

**COURSE-2: Biological Physics and Enzymes (Theory)**

**Lectures required-35**

Units for Measuring, Concentration of solutes: Moles, Equivalent, Osmoles; Principles of dilution, pH, Buffers, Bonds and Forces in Biomolecules, Colloids: Properties, Importance. Surface tension, Specific Gravity, Viscosity and Resistance, Acids, Bases, Buffers, and pH, Dialysis and Ultracentrifugation, Chromatography, Electrophoresis, Autoradiography, Cell Fractionation and Tracer Techniques, Nanoparticles and its application in Physiology, Laminar and Streamline flow, Poiseuille-Hagen Formula, Laws of Laplace, Osmosis and Diffusion, Thermodynamics : Laws , Application in Physiology, Enzymes : Structure, coenzymes, Prosthetic Groups, Mechanism of enzyme action, Kinetics, Michaelis constant, Enzyme Inhibition Modulation of Enzymes Activities, Factors regulating enzyme activities, Isoenzymes, Allosteric enzymes, Proenzymes, Ribozymes, Abzymes, Concept of Rate limiting enzymes, Micelle, Liposome

**COURSE-2: Biological Physics and Enzymes (Practical)**

1. Determination of Systolic and Diastolic Blood Pressure by non-invasive methods (Auscultatory Method) in resting condition.
2. Determination of Pulse and Mean Blood Pressure by non-invasive methods (Auscultatory Method) in resting condition.
3. Determination of pulse rate and heart rate under resting condition.
4. Determine carotid pulse and radial pulse
5. Determination of pulse rate and heart rate in sitting and lying posture.
6. Determine the change in pulse rate and heart rate in sitting and lying posture.

**(One question to be set=10)**

1. **Measurement of systolic and Diastolic blood pressure of 10 subjects of a locality and preparation of report.**
2. **Or Measurement of heart rate, pulse rate and respiratory rate of 10 subjects of rural people and preparation of report.**

**(Field study report -5 marks, Viva Voce=2, Laboratory Note Book=3)**

**SUBJECT: PHYSIOLOGY**  
**MINOR COURSES**  
**COURSE-1: Cell Physiology**  
**PAPER CODE: UPSIMIN10001**  
**PAPER LEVEL- 100**  
**PAPER TYPE-T+P**  
**FULL MARKS =80 (Theory=60, Practical=20)**  
**Hour of Exam- Theory=2.5 hrs, Practical=3 hrs**

**Learning Outcomes:** At the end of the semester the students will-

1. Understand the structural organization of cell, tissue and systems.
2. Acquire knowledge about intercellular communications.
3. Understand the coordination of functions between different systems

**COURSE-1: Cell Physiology (Theory)**

**Lectures required-35**

Introduction, Cell theory, Cells- Types, Distribution, Histology and Functions. Cell Organelles- Nucleus, Mitochondria, Ribosome, Lysosome, Golgi Body, Endoplasmic reticulum, Microtubules etc. GERL system, Transport Across cell Membranes- Diffusion, osmosis, facilitated diffusion, Active transport, Endocytosis, Exocytosis, Symport, Uniport, Antiport  
Plasma membrane-models, Fluid mosaic model, Membrane fluidity, receptors, Channels-Ca<sup>++</sup> channel, Voltage gated channel, Ionic flux.  
Cell Signalling-Signalling molecules, types and actions of Second Messengers,  
Cell Junctions-types, histology and importances,  
Organs- Histology and functions of Heart, lung, liver and kidney.  
Systems-histology and functions of Cardiovascular system, Digestive system, respiratory system, Nervous system, muscular system, urogenital system,  
Tissues-Epithelial tissue, Connective tissue, Muscular tissue, Nervous tissue, Adipose tissue. Bone and Cartilage.  
Glands, Cell Cycle, Cell Division- Mitosis, Meiosis.

**COURSE-1: Cell Physiology (Practical)**

1. Staining and identification of squamous epithelium.
  2. Staining and identification of Cornified epithelium.
  3. Staining and identification of skeletal muscle fiber.
  4. Staining and identification of Cardiac muscle fiber.
  5. Staining and identification of Adipose tissue.
  6. Staining and identification of Corneal cell space.
- (2 questions of 7.5marks each to be set=15, Viva voce=2, Lab Note Book=3)**

**SECOND SEMESTER**  
**SUBJECT: PHYSIOLOGY**  
**MAJOR COURSES**  
**COURSE-3: Haematology**  
**PAPER CODE: UPSIMAJ11003**  
**PAPER LEVEL- 100**  
**PAPER TYPE-T+P**  
**FULL MARKS =80 (Theory=60, Practical=20)**  
**Hour of Exam- Theory=2.5 hrs, Practical=3 hrs**

**Learning Outcomes:** At the end of the semester the students will-

1. Understand histology, composition and functions of blood.
2. Acquire knowledge about actions of different blood cells and plasma.
3. Understand the coordination of functions and diseases related to blood.

**COURSE-3: Haematology (Theory)**

**Lectures required-36**

Introduction, Blood-properties & composition, Bone Marrow-Classification & Functions, White Blood Cells-Types, Characters, Shape & size, Functions, Immune activities of blood, Platelets, Red Blood Cells-Biosynthesis & Factors affecting, Hemoglobin- Synthesis, Estimation, Compounds & derivatives, Fate, abnormal Hemoglobins. Blood Types-ABO, Rh & MN, Cross matching, Agglutinogen & Agglutinins, Plasma proteins-Classification, Values & Functions, Plasmapheresis. Hemostasis- Coagulation factors, Mechanisms, Factors Hastening, Hemophilia, Role of Platelets in Coagulation, Blood Volume- Values, Physiological Variations, Measurements and Regulations, Lymph-Lymphatic system, Source, Composition, circulation and functions. TC, DC, ESR, MCH, MCHC, PCV, Leukemia, Leukocytosis, Leukopenia, Purpura, Arneht count, Erythroblastosis foetalis. Transfusion- Hazards, Precautions, Procedure of transfusion. Edema, Spleen-structure & function. Lymph-composition, circulation, peculiarities and functions. Arterial & Arteriolar Circulation, Capillary Circulation, Interstitial Fluid, Venous Circulation.

**COURSE-3: Haematology (Practical)**

Preparation of Haemin crystal, Bleeding time and Clotting time, Identification of blood group, Estimation of hemoglobin, Preparation and staining of blood film with *Leishman's* stain and Identification of the blood corpuscles, Differential count of WBC, Total Count of RBC, Total Count of WBC.

*(One experiment to be set =15)*  
*(Viva voce - 2 marks + Lab Note Book - 3 Marks)*

**SUBJECT: PHYSIOLOGY**  
**MAJOR COURSES**  
**COURSE-4: Biochemistry of Molecules and Metabolism**  
**PAPER CODE: UPSIMAJ11004**  
**PAPER LEVEL- 100**  
**PAPER TYPE-T+P**  
**FULL MARKS =80 (Theory=60, Practical=20)**  
**Hour of Exam- Theory=2.5 hrs, Practical=3 hrs**

**Learning Outcomes:** At the end of the semester the students will-

1. Understand the structure of different biomolecules
2. Acquire knowledge about different metabolic pathways
3. Understand the regulations and energetics of the pathways

**COURSE-4: Biochemistry of molecules and metabolism (Theory)      Lectures required-38**

Classification, structure, Properties and Functions of Carbohydrates, Proteins and lipids.

Structure, types and Functions of DNAs and RNAs.

Metabolic Pathways, energetics and Regulations- glycogenesis, Glycogenolysis, Glycolysis, TCA cycle, HMP pathway, Neoglucogenesis, Cori Cycle, Glucose Alanine cycle, TCA cycle- the final common Pathway,

Beta Oxidation, Alpha Oxidation, Omega Oxidation, Ketogenesis, Fatty acid Synthesis, Cholesterol Biosynthesis,

Glucogenic and Ketogenic amino acid, Pathway of serine metabolism, Deamination, Transamination, Urea cycle.

Inborn error of metabolism carbohydrate, protein and lipid metabolism.

**COURSE-4: Practical**

Qualitative tests for the identification of physiologically important substances: Hydrochloric acid, lactic Acid, Starch, Dextrin, Glucose, Fructose, Sucrose, Lactose, Albumin, Gelatin, Peptone, Urea, Glycerol, Bile salts, Acetone.      **(One sample to be identified-8 marks)**

At least 3 days Survey report (hand-written) on disease susceptibility of a community and identification of causative factors

Or Survey report (hand-written) on awareness level about health and hygiene status of a community .  
**{Family wise data to be collected for 2 to 3 consecutive days}**

Or Survey report (hand-written) on nutritional assessment of college students **(7 marks)**

**(Viva voce - 2 marks + Lab Note Book - 3 marks)**

## **SUBJECT: PHYSIOLOGY**

### **MINOR COURSES**

#### **COURSE-2: Blood and Body Fluids**

**PAPER CODE: UPSIMIN10004**

**PAPER LEVEL- 100 ; PAPER TYPE-T+P**

**FULL MARKS=80 (Theory=60, Practical=20)**

**Hour of Exam- Theory=2.5 hrs, Practical=3hrs**

**Learning Outcomes:** By the end of this course, the students should be able to understand the principles of hematology, both blood physiology, functions, and disorders and explain the pathophysiology of common haematological disorders, discuss the anatomy, functional organization and characteristics of the hematopoietic system. The students would also be able to interpret diagnostic test results and erroneous test results and able to fix them.

#### **COURSE-4: Blood and Body Fluids (Theory)**

**Lectures required-38**

Blood : Properties of blood, composition, character, properties and functions of blood. Plasma proteins : Origin, separation and functions. Plasmapheresis. Erythrocytes : Morphology, fate and functions. Erythropoiesis : Definition, steps of erythropoiesis, Role of different factors on erythropoiesis. Haemoglobin : Functions, derivatives. Abnormal haemoglobin. Anaemia : Different types, Clinical significances. Leucopoiesis. Leucocytes : Morphology and functions. Phagocytosis, Inflammation. Leukaemia. Platelets: Structure, functions. Significance of platelets counts. Coagulation of blood: Mechanism of blood coagulation, factors affecting blood coagulations, Anticoagulants. Bleeding disorders, Coagulation time, bleeding time, prothrombin time. Blood groups : The ABO systems, The Rh systems, Importance of blood groups, Immunological basis of identification of ABO and Rh blood groups. Crossmatching, Donor and Recipient. Blood transfusion: Precaution and hazards of blood transfusions. The Rh system and pregnancy, Erythroblastosis foetalis. Blood volume: Normal value. Determination of blood volume. Factors influencing blood volume, regulation of blood volume. Body fluids: Intracellular and extracellular compartment of body fluids. Lymph and tissue fluids - Composition, function and fate of lymph and tissue fluids.

#### **COURSE-4: Blood and Body Fluids (Practical)**

Preparation of blood film of your own blood. Staining of the blood film with Leishman's stain. Identification of different types of blood corpuscles. Determination of TC of RBC and WBC by haemocytometer. Differential count of WBC. Determination of ESR of human blood. Estimation of haemoglobin by haemoglobinometer. Preparation of haemin crystals. Determination of Blood groups. Determination of clotting time, bleeding time, prothrombin time.

**(1 Experiment to be set=15, Viva voce=2, Lab Note Book=3)**

## **Syllabus for Three Discipline Specific Courses (Multidisciplinary)**

**SUBJECT: PHYSIOLOGY**  
**COURSE-1: Cell Physiology**  
**PAPER CODE: UPSIDSC10001**  
**PAPER LEVEL- 100, PAPER TYPE-T+P**

**FULL MARKS =80 (Theory=60, Practical=20)**  
**Hour of Exam- Theory=2.5 hrs, Practical=3hrs**

**Learning Outcomes:** At the end of the semester the students will-

4. Understand the structural organization of cell, tissue and systems.
5. Acquire knowledge about intercellular communications.
6. Understand the coordination of functions between different systems

### **COURSE-1: Cell Physiology (Theory)**

**Lectures required-35**

Introduction, Cell theory, Cells- Types, Distribution, Histology and Functions. Cell Organelles- Nucleus, Mitochondria, Ribosome, Lysosome, Golgi Body, Endoplasmic reticulum, Microtubules etc. GERL system, Transport Across cell Membranes- Diffusion, osmosis, facilitated diffusion, Active transport, Endocytosis, Exocytosis, Symport, Uniport, Antiport  
Plasma membrane-models, Fluid mosaic model, Membrane fluidity, receptors, Channels-Ca<sup>++</sup> channel, Voltage gated channel, Ionic flux.  
Cell Signalling-Signalling molecules, types and actions of Second Messengers,  
Cell Junctions-types, histology and importances,  
Organs- Histology and functions of Heart, lung, liver and kidney.  
Systems-histology and functions of Cardiovascular system, Digestive system, respiratory system, Nervous system, muscular system, urogenital system,  
Tissues-Epithelial tissue, Connective tissue, Muscular tissue, Nervous tissue, Adipose tissue. Bone and Cartilage. Glands, Cell Cycle, Cell Division- Mitosis, Meiosis.

### **COURSE-1: Cell Physiology (Practical)**

**(2 questions of 7.5marks each to be set=15, Viva voce=2, Lab Note Book=3)**

1. Staining and identification of squamous epithelium.
2. Staining and identification of Cornified epithelium.
3. Staining and identification of skeletal muscle fiber.
4. Staining and identification of Cardiac muscle fiber.
5. Staining and identification of Adipose tissue.
6. Staining and identification of Corneal cell space.



**SUBJECT: PHYSIOLOGY**

**COURSE-2: Blood and Body Fluids**

**PAPER CODE: UPSIDSC10004**

**PAPER LEVEL- 100 ; PAPER TYPE-T+P**

**FULL MARKS =80 (Theory=60, Practical=20)**

**Hour of Exam- Theory=2.5 hrs, Practical=3hrs**

**Learning Outcomes:** By the end of this course, the students should be able to understand the principles of hematology, both blood physiology, functions, and disorders and explain the pathophysiology of common haematological disorders, discuss the anatomy, functional organization and characteristics of the hematopoietic system. The students would also be able to interpret diagnostic test results and erroneous test results and able to fix them.

**COURSE-4: Blood and Body Fluids (Theory)**

**Lectures required-36**

Blood : Properties of blood, composition, character, properties and functions of blood. Plasma proteins : Origin, separation and functions. Plasmapheresis. Erythrocytes : Morphology, fate and functions. Erythropoiesis : Definition, steps of erythropoiesis, Role of different factors on erythropoiesis. Haemoglobin : Functions, derivatives. Abnormal haemoglobin. Anaemia : Different types, Clinical significances. Leucopoiesis. Leucocytes : Morphology and functions. Phagocytosis, Inflammation. Leukaemia. Platelets: Structure, functions. Significance of platelets counts. Coagulation of blood: Mechanism of blood coagulation, factors affecting blood coagulations, Anticoagulants. Bleeding disorders, Coagulation time, bleeding time, prothrombin time. Blood groups : The ABO systems, The Rh systems, Importance of blood groups, Immunological basis of identification of ABO and Rh blood groups. Crossmatching, Donor and Recipient. Blood transfusion: Precaution and hazards of blood transfusions. The Rh system and pregnancy, Erythroblastosis foetalis. Blood volume: Normal value. Determination of blood volume. Factors influencing blood volume, regulation of blood volume. Body fluids: Intracellular and extracellular compartment of body fluids. Lymph and tissue fluids - Composition, function and fate of lymph and tissue fluids.

**COURSE-4: Blood and Body Fluids (Practical)**

Preparation of blood film of your own blood. Staining of the blood film with Leishman's stain. Identification of different types of blood corpuscles. Determination of TC of RBC and WBC by haemocytometer. Differential count of WBC. Determination of ESR of human blood. Estimation of haemoglobin by haemoglobinometer. Preparation of haemin crystals. Determination of Blood groups. Determination of clotting time, bleeding time, prothrombin time.

**(1 question to be set=15, Viva voce=2, Lab Note Book=3**

**QUESTION PATTERN (Theory) FOR MAJOR, MINOR AND DISCIPLINE SPECIFIC  
MULTIDISCIPLINARY COURSE**

<b>SL NO</b>	<b>Questions to be answered</b>	<b>Out of</b>	<b>Marks of each question</b>	<b>Total marks</b>
<b>1</b>	<b>4</b>	<b>6</b>	<b>3</b>	<b>12</b>
<b>2</b>	<b>4</b>	<b>6</b>	<b>6</b>	<b>24</b>
<b>3</b>	<b>2</b>	<b>6</b>	<b>12</b>	<b>24</b>

**\*\*\* At least 75% regular attendance and regular signature of teacher is mandatory to get marks in laboratory note book of practical papers.**

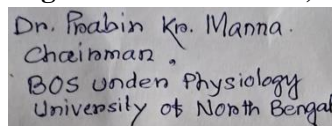
**\*\*\*At least 2 questions to be asked for viva voce of each practical paper.**

**\*\*\* Hand written field study report or survey report is preferred.**

### **Recommended Text and Reference Books:**

1. Best and Taylor's Physiological basis of Medical Practices, by B.K. Brobecks. The William and Wilkins Co.
2. Review of Medical Physiology, by W.F. Ganong, Lange Medical Book. Pretices- Hall International. Mc Graw Hill.
3. Text book of Medical Physiology, by A.C. Guyton. W.B. Saunders Co.
4. Physiology, by R.M. Berne and M.N. Levy, C.V Mosby Co.
5. Text book of Medical physiology by Prof. G K Pal. Ahuja Publishing house
6. Essentials of Medical Physiology By Indu Khurana, ELSEVIER.
7. Concise medical Physiology by Sujit k chaudhuri, NCBA.
8. Essentials of Medical Physiology By K Sembulingam, JAYPEE BROTHERS.
9. Essentials of Medical Physiology By Anil Baran Sinha Mahapatra, Current Books International.
10. Human Physiology by C.C. Chatterjee, Medical Allied Agency.
  
11. Lehninger's Principles of Biochemistry, by D.L. Nelson and M.M. Cox, Worth Publishers Inc.
12. Biochemistry, by D Das. Academic Publishers.
13. Harper's illustrated Biochemistry, by R.K. Murray and others. Lange Medical Book, International edition, Mc Graw Hill.
14. Text book of Biochemistry, by E.S. West; W.R.Todd; H.S. Mason; J.T Van Bruggen. The Macmillan Company.
15. Fundamentals of Biochemistry by A.C Deb, New Cental Book Agency.
16. Biochemistry by U. satyanarayan, Books and allied(P) Ltd.
  
17. Biophysics and Biophysical Chemistry, by D.Das. Academic Publishers.
18. A text book of biophysics by R.N.Roy, New Cental Book Agency.
19. The Physiological Basis of Physical Education and Athletics, by W.D. McArdle, F. Katch and V.L Katch. Williams and Wilkins.
20. The Text Book of Work Physiology by P.O. Astrand and K. Rodhal. McGraw-Hill Books Co.
21. Human factors in Engineering and Design, by E.O. McCormick and M. Sanders. Tata McGraw Hill.
22. Sports Physiology, by E.L. Fox, Saunders College Publishing Holt-Saunders.
23. Ross and Wilson Anatomy and Physiology in Health and Illness, by A. Waugh and A. Grant. International Edition, Churchill Livigstone Elesvier.

#### **Signature of Chairman,**



Dr. Prabin K. Manna.  
Chairman,  
BOS Under Physiology  
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