THE UNIVERSITY OF BURDWAN

SYLLABUS FOR THREE-YEAR DEGREE COURSE IN PHYSIOLOGY GENERAL UNDER CHOICE BASED CREDIT SYSTEM (CBCS)

(With effect from 2017- 18)

OUTLINE OF THE SEMESTER WISE COURSE STRUCTURE OF B.SC. GENERAL UNDER THE CHOICE BASED CREDIT SYSTEM (CBCS)

SCHEME FOR CBCS CURRICULUM

SEMESTER	CORE COURSES (12)	Ability Enhancement Compulsory Courses AECC (2)	Skill Enhancement Courses SEC (4)	Discipline Specific Elective DSE (4)	Total Credit
I	CC- 1A (Physiology) CC- 1B Other discipline/ subject CC- 1C Other discipline/ subject	Environmental Studies AECC I			22
II	CC- 1B (Physiology) CC- 2B Other discipline/ subject CC- 3B Other discipline/ subject	English Communication /MIL AECC II			20
III	CC- 1C (Physiology) CC- 2C Other discipline/ subject CC- 3C Other discipline/ subject		SEC-I (SEC IA or IB)		20
IV	CC- 1D (Physiology) CC- 2D Other discipline/		SEC-II (SEC IIA or IIB)		20

	subject CC- 3D Other discipline/ subject				
V			SEC-III (SEC IIIA or IIIB)	DSE-1A (Physiology) DSE-2A DSE-3A	20
VI			SEC-IV (SEC IVA or IVB)	DSE-1B (Physiology) DSE-2B DSE-3B	20
Total course number (I-VI)	**12 CC** **12X6=72 CREDITS**	**2 AECC** **2x1=2 CREDITS** **4x1=4 CREDITS**	**4 SEC** **4X2= 8 CREDITS**	**6 DSE** **6X6=36 CREDITS**	**122**

CREDIT DISTRIBUTION ACROSS COURSES

Course Type	Number of Courses	Credits		
		Theory	Practical	Theory + Practical
1. Core course (CC)	12 Papers (4 Papers each in 3 Disciplines of Choice)	12×4=48	12×2=24	72
2. Discipline specific elective courses (DSE)	6 Papers (2 Papers each in 3 Disciplines of Choice)	6×4=24	6×2=12	36
3. Ability Enhancement compulsory course	2 Papers	2×1=2		6

(AECC)	(Compulsory Language Paper & Environmental Science)	4x1=4		
4. Skill Enhancement Course (SEC)	4 Papers	4×2=8		8
Total		84	36	122

 # Optional Dissertation/ Project Work in place of One DSE paper (4 Credits) in 6th Semester

CORE COURSE (CC)

Semester	Theory (Credit 4)	Practical (Credit 2)
CC- 1A : Cellular Physiology, Biophysics, Biochemistry of Biomolecules	**a) Units of Human System** **b) Biophysical and Biochemical Principles** **c) Biochemistry of Bio Molecules.**	**a) Identification of permanent slides** **b) Fresh tissue experiments**
CC - 1B : Digestion and Metabolism	**a) Digestive System** **b) Nutrition** **c) Metabolism**	**Qualitative and Quantitative Biochemical Experiments**
CC - 1C : Respiratory and Cardiovascular Physiology	**a) Respiratory Physiology** **b) Cardiovascular Physiology** **c)Blood and Body Fluids**	**a) Haematological experiments I** **b) Haematological experiments II**
CC- 1D : Endocrinology, Renal Physiology, skin and Body Temperature Regulation	**a) Endocrine System** **b) Renal Physiology** **c) Skin and Regulation of Body Temperature**	**Biochemistry**

DISCIPLINE SPECIFIC ELECTIVE COURSE (DSE)

Semester	Theory (Credit 4)	Practical (Credit 2)
V	1. Muscle and Nerve Physiology 2. Nervous System	a) Human Experiment I b) Field Study
VI	1. Reproductive System 2. Sensory Physiology	Human Experiment II

SKILL ENHANCEMENT COURSES: PHYSIOLOGY

Semester	Papers	Topics (Credit 2)
III	SEC I a. or b.	a) Pharmacology b) Biostatistics
IV	SEC II a. or b.	a) Molecular Biology b) Social Physiology
V	SEC III a. or b.	a) Microbiology b) Immunology
VI	SEC IV a. or b.	a) Environmental Physiology b) Work Physiology

CORE COURSE - 1A:

Cellular Physiology, Biophysics, Biochemistry of Biomolecules

Theory (Credit 4) **Class 60**

1. Units of Human System

a. Structure and functions of plasma membrane, nucleus and different cell organelles
b. Endoplasmic reticulum, Golgi bodies, Mitochondria, Lysosome and Peroxisome.
c. Structure, function and classification of Epithelial, Connective, Muscular and Nervous tissues.

2. **Biophysical and Biochemical Principles**
    a. Physiological importance of the following physical processes:
        i. Diffusion
        ii. Osmosis
        iii. Dialysis
        iv. Ultra filtration
        v. Surface tension
        vi. Adsorption
        vii. Absorption.
    b. A brief idea about acids, bases, buffers and indicators. pH – definition, significance and maintenance of pH in the blood.
    c. Colloids - definition, classification and physiological importance
    d. Enzymes: definition, classification, factors affecting enzyme action. Concept of coenzymes and isozymes.

3. **Biochemistry of Bio Molecules.**
    a. Carbohydrates: Definition and classification.
    b. Monosaccharide – Classification, structure. Chemical reactions of monosaccharide (Glucose & Fructose) - Reactions with concentrated mineral acids, alkali, phenylhydrazine and their biochemical importance.
    c. Disaccharides – Maltose, Lactose and Sucrose: Structure, occurrence and physiological importance.
    d. Polysaccharides – Starch, Glycogen, Dextrin, Cellulose.
    e. Lipids: Definition and classification. Fatty acids ----- Classification. Properties of Fat and Fatty acids—Hydrolysis, Saponification, Saponification number, Iodine number, Hydrogenation, Rancidity-Acid number. Phospholipids, Cholesterol & its ester - physiological importance.
    f. Amino acids, Peptides and Proteins : Classification and structure. Structure of peptide bonds.

Practicals (Credit 2)

i. **Identification of permanent slides** : Bone, Lung, Trachea, Spleen, Lymph gland, Liver, Salivary gland, Pancreas, Adrenal gland, , Thyroid

gland, Spinal cord, Cerebellum, Cerebral cortex, Kidney, Skin, Testis, Ovary, Tongue, Oesophagus, Stomach, Small intestine, Large intestine.

ii. Fresh tissue experiments:

a) Examination and staining of fresh tissues (other than blood) squamous, certified, ciliated and columnar epithelium, skeletal muscle, cardiac muscle by methylene blue stain.

b) Staining of adipose tissue by Sudan III or IV.

Suggested Readings

1. TextbookofMedicalPhysiology,by A.C.Guyton.W.B.SaundersCo.
2.Best &Taylor's Physiological Basis of Medical Practices, editedbyB.K. Brobeck.TheWilliamandWilkinsCo.
3.Review of Medical Physiology. By W.F. Ganong, Lange Medical Book. Prentice-HallInternational.
4.Harper's Biochemistry, by R.K. Murryand others. Lange Medical Book. Prentice-HallInternational.
5. Lehninger's PrinciplesofBiochemistry. By D.L. Nelsonand M. M. Cox, WorthPublishersInc.
6. TextBookofBiochemistry,byE.S.West.W.R.Todd.H.S.Mason.J.T.VanBruggen.TheMacmillanCompany.
7. Biochemistry.ByD.Das,AcademicPublishers.
8. BiophysicsandBiophysical Chemistry,byD.Das.AcademicPublishers.
9. SamsonWright'sAppliedPhysiology.EditedbyC.A.Keele.ENeil&N. Toels.OxfordUniversity Press.
10.Physiology,by R.M.Berne&M.N.Levy,C.V.MosbyCo.
11.BasicHistology,by L.C.Junqueira&JCarneiro,McGraw-Hill.
12.Histology-ATextandAtlas,byM.H.Ross&E.J.Reith.TheWilliamsandWilkinsCompany.
13.Bailey'sTextBookofHistology,revisedby W.M.Copenhaver;TheWilliams andWilkinsCompany.
14.TheCell–AMolecularApproach,G.M.Cooper&R.E.Hausman,ASMPressSINAUER.
15.CoreTextBookofNeuro-Anatomy,byM.B. Carpenter;theWilliamsandWilkinsCompany.
16. TheHumanNervousSystem,byCharlesNobach,McGrawHillBookCo.
17.BiomedicalInstrumentation&Measurements,byL.Cromwell,F.J.Weibell& E.A.Pfeiffer; Prentice-HallofIndiaPvtLtd.
18. TheHumanNervousSystem.By M.L.Barr&J.A.Kierman,Harper&Row.
19.EssentialFoodandNutrition,byM.Swaminathan.TheBangalorePrinting&PublishingCo.Ltd.
20. EssentialImmunology,byI.M.Roitt,BlackwellScientificPublications.

CORE COURSE – 1B : Digestion and Metabolism

Theory (Credit 4) **Class 60**

1. Digestive System

a. Structure in relation to functions of alimentary cana1 and digestive glands.

b. Composition, functions and regulation of secretion of digestive juices including bile.

c. Digestion and absorption of carbohydrate, protein and lipid.

d. Movements of the stomach and small intestine

2. Nutrition

a. Basic constituents of food and their nutritional significance.
b. Vitamins: definition, classification, functions, deficiency symptoms and daily requirements. Hypervitaminosis.
c. Mineral metabolism - Ca. P, Fe.
d. BMR: definition, factors affecting, determination by Benedict-Roth apparatus. Respiratory quotient: definition, factors affecting and significance.
e. Biological value of proteins. Essential and non-essential amino acids, Nitrogen equilibrium.
f. Minimum protein requirement-Positive and negative nitrogen balance.
g. SDA: definition and: importance.

3. Metabolism

a. Glycolysis, TCA cycle, Glycogenesis, Glycogenolysis. Gluconeogenesis.
b. Depot fat. Beta oxidation of saturated fatty acid
c. Ketone bodies formation and significance.
d. Deamination, Transamination. Amino acid pool - fate and functions of amino acids in the body.
e. Formation of urea and its importance.
f. Brief idea of HMP shunt and its significance (detailed enzymatic reactions are not required).
g. Lipoproteins - types and functions.
h. Purine and pyrimidine bases, nucleosides, nucleotides and polynucleotides.
i. Pathophysiological significance of the following blood constituents: glucose, urea, creatinine, uric acid, cholesterol, bilirubin, SGPT and SGOT, alkaline and acid phosphatases and ketone bodies.

Practicals (Credit 2)
Qualitative and Quantitative Biochemical Experiments

1. **Qualitative Experiments**:

Qualitative tests for identification of starch, dextrin, lactose, sucrose,

glucose, fructose, albumin, gelatin, peptone, lactic acid, hydrochloric acid, uric acid, acetone, glycerol, bile salts, urea.

2. **Quantitative Experiments**:

a) Quantitative estimation of glucose by Benedict's method.

b) Quantitative estimation of amino-nitrogen by Sorensen's formol titration method. Percentage and total quantity to be done.

Demonstration:

a) Quantitative estimation of Sucrose by Benedict's method.

b) Analysis of wheat, rice, milk and oil to test the presence of carbohydrate, protein and fat.

c) Salivary amylase activity on starch at body temperature (37.5 C), above 40°C and in presence of HCl.

Suggested Readings

1. TextbookofMedicalPhysiology,by A.C.Guyton.W.B.SaundersCo.
2.Best &Taylor's Physiological Basis of Medical Practices, editedbyB.K. Brobeck.TheWilliamandWilkinsCo.
3.Review of Medical Physiology. By W.F. Ganong, Lange Medical Book. Prentice-HallInternational.
4.Harper's Biochemistry, by R.K. Murryand others. Lange Medical Book. Prentice-HallInternational.
5. Lehninger's PrinciplesofBiochemistry. By D.L. Nelsonand M. M. Cox, WorthPublishersInc.
6. TextBookofBiochemistry,byE.S.West.W.R.Todd.H.S.Mason.J.T.VanBruggen.TheMacmillanCompany.
7. Biochemistry.ByD.Das,AcademicPublishers.
8. BiophysicsandBiophysical Chemistry,byD.Das.AcademicPublishers.
9. SamsonWright'sAppliedPhysiology.EditedbyC.A.Keele.ENeil&N. Toels.OxfordUniversity Press.
10.Physiology,by R.M.Berne&M.N.Levy,C.V.MosbyCo.
11.BasicHistology,by L.C.Junqueira&JCarneiro,McGraw-Hill.
12.Histology-ATextandAtlas,byM.H.Ross&E.J.Reith.TheWilliamsandWilkinsCompany.
13.Bailey'sTextBookofHistology,revisedby W.M.Copenhaver;TheWilliams andWilkinsCompany.
14.TheCell–AMolecularApproach,G.M.Cooper&R.E.Hausman,ASMPressSINAUER.
15.CoreTextBookofNeuro-Anatomy,byM.B. Carpenter;theWilliamsandWilkinsCompany.
16. TheHumanNervousSystem,byCharlesNobach,McGrawHillBookCo.
17.BiomedicalInstrumentation&Measurements,byL.Cromwell,F.J.Weibell& E.A.Pfeiffer; Prentice-HallofIndiaPvtLtd.
18. TheHumanNervousSystem.By M.L.Barr&J.A.Kierman,Harper&Row.
19.EssentialFoodandNutrition,byM.Swaminathan.TheBangalorePrinting&PublishingCo.Ltd.
20. EssentialImmunology,byI.M.Roitt,BlackwellScientificPublications.

CORE COURSE – 1C : Respiratory and Cardiovascular Physiology

Theory (Credit 4) **Class 60**

1. Respiratory Physiology

a. Anatomy and histology of the respiratory passage and organs.
b. Role of respiratory muscles in breathing. Artificial respiration.
c. Significance of physiological and anatomical dead space.
d. Lung volumes and capacities.
e. Exchange of respiratory gases between lung and blood and between blood and tissues.
f. Transport of oxygen and carbon dioxide in blood.
g. Regulation of respiration - neural and chemical. Hypoxia.

2. Cardiovascular Physiology

a. Anatomy and histology of the heart.
b. Properties of cardiac muscle.
c. Origin and propagation of cardiac impulse.
d. Cardiac cycle: events. Heart sounds. Heart rate. Cardiac output: methods of determination (dye dilution and Fick principle), factors affecting, regulation.
e. Structure of arteries, arterioles, capillaries. venules and veins.
f. Pulse - arterial and venous.
g. Blood pressure and its regulation and factors controlling. Baro- and chemoreceptors. Vasomotor reflexes. Methods of measurement of blood pressure.
h. Peculiarities of regional circulations coronary, pulmonary, renal, hepatic and cerebral.

3. Blood and Body Fluids

a. Blood: composition and functions.
b. Plasma proteins: origin and functions. Plasmapheresis.
c. Bone marrow. Formed elements of blood - their morphology and functions.
d. Erythropoiesis and leucopoiesis.

e. Haemoglobin : different types of compounds and derivatives. Functions and estimation of haemoglobin. Abnormal haemoglobins - thalassaemia and sickle-cell anaemia.

f. Blood volume and its determination (dye method and radioisotope method) and regulation.

g. Coagulation of blood : mechanism, factors affecting, procoagulants, anticoagulants, and disorders of coagulation.

h. Lymph and tissue fluids: composition, formation, and functions.

i. Blood groups - ABO and Rh. Blood transfusion - precaution and hazards. Immunological basis of identification of ABO and Rh blood groups.

j. Anaemia - types (definition and causes).

k. Leucocytosis, leucopenia and leukaemia. Purpura.

Practicals (Credit 2)

1. Haematological experiments I

a. Leishman's staining of human blood film and identification of different types of blood corpuscles.

b. Preparation of Haemin crystals.

2. Haematological experiments II

DC of WBC, estimation of haemoglobin, blood group determination,

Bleeding time and coagulation time.

Demonstration: Haematocrit, MCV, TC of RBC and WBC, ESR.

Suggested Readings

. TextbookofMedicalPhysiology,by A.C.Guyton.W.B.SaundersCo.
2.Best &Taylor's Physiological Basis of Medical Practices, editedbyB.K. Brobeck.TheWilliamandWilkinsCo.
3.Review of Medical Physiology. By W.F. Ganong, Lange Medical Book. Prentice-HallInternational.
4.Harper's Biochemistry, by R.K. Murryand others. Lange Medical Book. Prentice-HallInternational.
5. Lehninger's PrinciplesofBiochemistry. By D.L. Nelsonand M. M. Cox, WorthPublishersInc.
6. TextBookofBiochemistry,byE.S.West.W.R.Todd.H.S.Mason.J.T.VanBruggen.TheMacmillanCompany.
7. Biochemistry.ByD.Das,AcademicPublishers.

8. BiophysicsandBiophysical Chemistry,byD.Das.AcademicPublishers.
9. SamsonWright'sAppliedPhysiology.EditedbyC.A.Keele.ENeil&N. Toels.OxfordUniversity Press.
10.Physiology,by R.M.Berne&M.N.Levy,C.V.MosbyCo.
11.BasicHistology,by L.C.Junqueira&JCarneiro,McGraw-Hill.
12.Histology-ATextandAtlas,byM.H.Ross&E.J.Reith.TheWilliamsandWilkinsCompany.
13.Bailey'sTextBookofHistology,revisedby W.M.Copenhaver;TheWilliams andWilkinsCompany.
14.TheCell–AMolecularApproach,G.M.Cooper&R.E.Hausman,ASMPressSINAUER.
15.CoreTextBookofNeuro-Anatomy,byM.B. Carpenter;theWilliamsandWilkinsCompany.
16. TheHumanNervousSystem,byCharlesNobach,McGrawHillBookCo.
17.BiomedicalInstrumentation&Measurements,byL.Cromwell,F.J.Weibell& E.A.Pfeiffer; Prentice-HallofIndiaPvtLtd.
18. TheHumanNervousSystem.By M.L.Barr&J.A.Kierman,Harper&Row.
19.EssentialFoodandNutrition,byM.Swaminathan.TheBangalorePrinting&PublishingCo.Ltd.
20. EssentialImmunology,byI.M.Roitt,BlackwellScientificPublications.
21.KubyImmunology,byR.A. Goldsby.T.J.Kindtand B.A.Osborne,W.H. FreemanandCo.
22.Microbiology,byM.J.Pelczer&Others;TataMcGrawHillPublishingCo. Ltd.
23Cellular&MolecularBiology,byEDPDeRobertis&EMFDeRobertis;Lea&Febiger.
24. Molecular Biologyof the Gene, byJ.D. Watson, H.H. Nancy &others; Benjamin-Cummings.
25. MolecularBiologyoftheCell,by B.Albertsandothers,Garland.
26. TextbookofMedicalPhysiology,InduKhurana,Elsevier.
27. Carleton's Histological Techniques, byR.A.B. Drury&E.A. Wellignton, OxfordUniversityPress.
28.HandbookofExperimentalPhysiologyand Biochemistry, byP.V.Chadha; Jaypee BrothersMedicalpublishers.
29.Neurobiology,byG.M.Shepherd,OxfordUniversity Press
30.Biochemistry,byL.Stryer,W.H.FreemanandCo.

CORE COURSE- 1D :

Endocrinology, Renal Physiology, skin and Body Temperature Regulation

Theory (Credit 4) **Class 60**

1. **Endocrine System**

a. Anatomy of endocrine system. Hormones - classification. Basic concept of regulation of hormone actions. Positive and negative feedback mechanism. Elementary idea of hormone action.

b. *Hypothalamus:* Basic concept of neurohormone. Hypothalamo-hypophyseal tract and portal system.

c. *Pituitary:* Histological structure, hormones, functions. Hypo and hyperactive states of pituitary gland.

d. *Thyroid:* Histological structure. Functions of thyroid hormones & thyrocalcitonin. Hypo and hyper-active states of thyroid.

e. P*arathyroid:* Histological structure, functions of parathyroid hormone. Tetany.

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

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

h. *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.

1. Renal Physiology

a. Elementary Structure of Kidney & Location.

b. Relationship between structure and functions of kidney.

c. Mechanism of formation of urine.

d. Normal and abnormal constituents of urine.

e. Physiology of urine storage and micturition.

f. Renal regulation of acid-base balance.

g. Non-excretory functions of kidney

2. Skin and Regulation of Body Temperature

a. Structure and functions of skin.

b. Insensible and sensible perspiration

c. Regulation of body temperature -- physical and physiological processes involved in it.

d. Physiology of sweat secretion and its regulation

Practicals (Credit 2)

Biochemistry II

1. Identification of normal constituents of urine - chlorIde. sulphate, phosphate, creatinine and urea.
2. Identification of abnormal constituents of urine - glucose, protein, acetone blood and bile salts.

Demonstration: Blood sugar estimation (Folin -Wu method)

Suggested Readings

. TextbookofMedicalPhysiology,by A.C.Guyton.W.B.SaundersCo.
2.Best &Taylor's Physiological Basis of Medical Practices, editedbyB.K. Brobeck.TheWilliamandWilkinsCo.
3.Review of Medical Physiology. By W.F. Ganong, Lange Medical Book. Prentice-HallInternational.
4.Harper's Biochemistry, by R.K. Murryand others. Lange Medical Book. Prentice-HallInternational.
5. Lehninger's PrinciplesofBiochemistry. By D.L. Nelsonand M. M. Cox, WorthPublishersInc.
6. TextBookofBiochemistry,byE.S.West.W.R.Todd.H.S.Mason.J.T.VanBruggen.TheMacmillanCompany.
7. Biochemistry.ByD.Das,AcademicPublishers.
8. BiophysicsandBiophysical Chemistry,byD.Das.AcademicPublishers.
9. SamsonWright'sAppliedPhysiology.EditedbyC.A.Keele.ENeil&N. Toels.OxfordUniversity Press.
10.Physiology,by R.M.Berne&M.N.Levy,C.V.MosbyCo.
11.BasicHistology,by L.C.Junqueira&JCarneiro,McGraw-Hill.
12.Histology-ATextandAtlas,byM.H.Ross&E.J.Reith.TheWilliamsandWilkinsCompany.
13.Bailey'sTextBookofHistology,revisedby W.M.Copenhaver;TheWilliams andWilkinsCompany.
14.TheCell–AMolecularApproach,G.M.Cooper&R.E.Hausman,ASMPressSINAUER.
15.CoreTextBookofNeuro-Anatomy,byM.B. Carpenter;theWilliamsandWilkinsCompany.
16. TheHumanNervousSystem,byCharlesNobach,McGrawHillBookCo.
17.BiomedicalInstrumentation&Measurements,byL.Cromwell,F.J.Weibell& E.A.Pfeiffer; Prentice-HallofIndiaPvtLtd.
18. TheHumanNervousSystem.By M.L.Barr&J.A.Kierman,Harper&Row.
19.EssentialFoodandNutrition,byM.Swaminathan.TheBangalorePrinting&PublishingCo.Ltd.
20. EssentialImmunology,byI.M.Roitt,BlackwellScientificPublications.
21.KubyImmunology,byR.A. Goldsby.T.J.Kindtand B.A.Osborne,W.H. FreemanandCo.
22.Microbiology,byM.J.Pelczer&Others;TataMcGrawHillPublishingCo. Ltd.
23Cellular&MolecularBiology,byEDPDeRobertis&EMFDeRobertis;Lea&Febiger.
24. Molecular Biologyof the Gene, byJ.D. Watson, H.H. Nancy &others; Benjamin-Cummings.
25. MolecularBiologyoftheCell,by B.Albertsandothers,Garland.
26. TextbookofMedicalPhysiology,InduKhurana,Elsevier.
27. Carleton's Histological Techniques, byR.A.B. Drury&E.A. Wellignton, OxfordUniversityPress.
28.HandbookofExperimentalPhysiologyand Biochemistry, byP.V.Chadha; Jaypee BrothersMedicalpublishers.
29.Neurobiology,byG.M.Shepherd,OxfordUniversity Press
30.Biochemistry,byL.Stryer,W.H.FreemanandCo.

DISCIPLINE SPECIFIC ELECTIVE COURSES

DSE- 1A

Theory (Credit 4) **Class**

1. Muscle and Nerve Physiology

a. Different types of muscle and their structure. Red and white muscle.

b. Muscular contraction: structural, mechanical and chemical changes in skeletal muscle during contraction and relaxation.

c. Isotonic and isometric contractions.

d. Properties of muscle: all or none law, beneficial effect, summation. refractory period, tetanus, fatigue.

e. A brief idea about the muscle spindle.

f. Structure and classification of nerves.

g. Origin and propagation of nerve impulse.

h. Velocity of impulse in different types of nerve fiber.

i. Properties of nerve fibers: all or none law, rheobase and chronaxie, refractory period. indefatiguability.

j. Synapses: structure, different types, mechanism of synaptic transmission.

k. Motor unit. Myoneural junction: structure,

l. Mechanism of impulse transmission.

m. Degeneration and regeneration in nerve fibres

.

2. Nervous System

a. A brief outline of organization and basic functions (sensory, motor and association) of the nervous system, central and peripheral nervous system. (emphasis on the structure of spinal cord and brain stem).

b. Ascending tracts carrying touch, kinaesthetic, temperature and pain sensations. Descending tracts: pyramidal tract and brief outline of the extra-pyramidal tracts. Pain.

c. Reflex action - definition, reflex arc, classification, properties.

d. Functions of the spinal cord. Outline of functions of brain stem.

e. A brief idea of the structure, connections and functions of cerebellum.

f. Different nuclei and functions of thalamus and hypothalamus.

g. Cerebral cortex: histological structure and localization of functions.

h. CSF : composition, formation, circulation and functions.

i. A brief description of the organization of the autonomic (sympathetic and parasympathetic) nervous system. Functions of sympathetic and parasympathetic nervous system.

j. A brief idea of speech, aphasia, conditioning, learning and memory.

Practicals (Credit 2)

1. **Human Experiment I**

   a. Use of kymograph, Recording of Pneumography.
   b. Measurement of systolic and diastolic arterial pressure by sphygmomanometer and determination of pulse pressure and mean pressure during rest and exercise.

2. **Field Study**

   Any **one** of the followings:

   a) Diet survey of a family as per ICMR specification.
   b) Population study of physiological parameters such as height, weight, heart-rate, blood pressure, respiratory rate, PFI, TC of RBC, estimation of haemoglobin, DC of WBC as far as practicable

Suggested Readings

. TextbookofMedicalPhysiology,by A.C.Guyton.W.B.SaundersCo.
2.Best &Taylor's Physiological Basis of Medical Practices, editedbyB.K. Brobeck.TheWilliamandWilkinsCo.
3.Review of Medical Physiology. By W.F. Ganong, Lange Medical Book. Prentice-HallInternational.
4.Harper's Biochemistry, by R.K. Murryand others. Lange Medical Book. Prentice-HallInternational.
5. Lehninger's PrinciplesofBiochemistry. By D.L. Nelsonand M. M. Cox, WorthPublishersInc.
6. TextBookofBiochemistry,byE.S.West.W.R.Todd.H.S.Mason.J.T.VanBruggen.TheMacmillanCompany.
7. Biochemistry.ByD.Das,AcademicPublishers.
8. BiophysicsandBiophysical Chemistry,byD.Das.AcademicPublishers.
9. SamsonWright'sAppliedPhysiology.EditedbyC.A.Keele.ENeil&N. Toels.OxfordUniversity Press.
10.Physiology,by R.M.Berne&M.N.Levy,C.V.MosbyCo.
11.BasicHistology,by L.C.Junqueira&JCarneiro,McGraw-Hill.
12.Histology-ATextandAtlas,byM.H.Ross&E.J.Reith.TheWilliamsandWilkinsCompany.
13.Bailey'sTextBookofHistology,revisedby W.M.Copenhaver;TheWilliams andWilkinsCompany.
14.TheCell–AMolecularApproach,G.M.Cooper&R.E.Hausman,ASMPressSINAUER.

15.CoreTextBookofNeuro-Anatomy,byM.B. Carpenter;theWilliamsandWilkinsCompany.
16. TheHumanNervousSystem,byCharlesNobach,McGrawHillBookCo.
17.BiomedicalInstrumentation&Measurements,byL.Cromwell,F.J.Weibell& E.A.Pfeiffer; Prentice-HallofIndiaPvtLtd.
18. TheHumanNervousSystem.By M.L.Barr&J.A.Kierman,Harper&Row.
19.EssentialFoodandNutrition,byM.Swaminathan.TheBangalorePrinting&PublishingCo.Ltd.
20. EssentialImmunology,byI.M.Roitt,BlackwellScientificPublications.
21.KubyImmunology,byR.A. Goldsby.T.J.Kindtand B.A.Osborne,W.H. FreemanandCo.
22.Microbiology,byM.J.Pelczer&Others;TataMcGrawHillPublishingCo. Ltd.
23Cellular&MolecularBiology,byEDPDeRobertis&EMFDeRobertis;Lea&Febiger.
24. Molecular Biologyof the Gene, byJ.D. Watson, H.H. Nancy &others; Benjamin-Cummings.
25. MolecularBiologyoftheCell,by B.Albertsandothers,Garland.
26. TextbookofMedicalPhysiology,InduKhurana,Elsevier.
27. Carleton's Histological Techniques, byR.A.B. Drury&E.A. Wellignton, OxfordUniversityPress.
28.HandbookofExperimentalPhysiologyand Biochemistry, byP.V.Chadha; Jaypee BrothersMedicalpublishers.
29.Neurobiology,byG.M.Shepherd,OxfordUniversity Press
30.Biochemistry,byL.Stryer,W.H.FreemanandCo.

DSE-1B

Theory (Credit 4) **Class**

1. Reproductive Physiology

a. Primary and accessory sex organs and secondary sex characters.
b. Testis: histology, spermatogenesis, testicular hormones and their functions.
c. Ovary: histology, oogenesis, ovarian hormones and their functions. Spermatogenesis & Oogenesis – processes and factors controlling.
d. Oestrus and menstrual cycles and their hormonal control.
e. Fertilization, implantation and structure and functions of placenta. Maintenance of pregnancy – role of hormones. Development of mammary gland and lactation - role of hormones

2. Sensory Physiology

a. Classification of general and special senses and their receptors. Receptors as biological transducer.
b. Olfaction and Gustation: Structure of sensory organ, neural pathway of olfactory and gustatory sensation. Physiology of olfactory and gustatory sensation. Olfactory and gustatory adaptation. After-taste.
c. Audition: Structure of ear, auditory pathway, mechanism of

hearing.

d. Vision: Structure of the eye. Histology of retina. Visual pathway. Light reflex. Chemical changes in retina on exposure to light. Accommodation - mechanism and pathway. Errors of refraction. Positive and negative after-image. Light and dark adaptation. Elementary idea of colour vision and colour blindness.

Practicals (Credit 2)

Human Experiments II

a) Determination of Physical Fitness Index (PFI) of an individual by modified

Harvard step test and recording of recovery heart-rate after standard exercise.

b) Pneumographic recording of respiratory movements along with the effect of drinking of water, talking, forced hyperventilation and breath holding.

c) Measurement of some common anthropometric parameters: stature, weight, eye height, shoulder height, elbow height. sitting height, elbow rest height (sitting), knee height (sitting), arm reach from wall, mid-arm circumference, waist circumference, hip circumference, neck circumference, head circumference, chest circumference.

d) Calculation of Body Surface Area (using a nomogram) and Body Mass Index from anthropometric measurements.

Demonstration:

Ergographic recording of muscular fatigue by' Moss's ergograph. Clinical

Classification of reflexes: superficial reflex - planter reflex, Deep reflex – knee jerk, visceral reflex - pupillary light reflex.

Suggested Readings

. TextbookofMedicalPhysiology,by A.C.Guyton.W.B.SaundersCo.
2.Best &Taylor's Physiological Basis of Medical Practices, editedbyB.K. Brobeck.TheWilliamandWilkinsCo.
3.Review of Medical Physiology. By W.F. Ganong, Lange Medical Book. Prentice-HallInternational.
4.Harper's Biochemistry, by R.K. Murryand others. Lange Medical Book. Prentice-HallInternational.
5. Lehninger's PrinciplesofBiochemistry. By D.L. Nelsonand M. M. Cox, WorthPublishersInc.
6.TextBookofBiochemistry,byE.S.West.W.R.Todd.H.S.Mason.J.T.VanBruggen.TheMacmillanCompany.
7. Biochemistry.ByD.Das,AcademicPublishers.
8. BiophysicsandBiophysical Chemistry,byD.Das.AcademicPublishers.

9. SamsonWright'sAppliedPhysiology.EditedbyC.A.Keele.ENeil&N. Toels.OxfordUniversity Press.
10.Physiology,by R.M.Berne&M.N.Levy,C.V.MosbyCo.
11.BasicHistology,by L.C.Junqueira&JCarneiro,McGraw-Hill.
12.Histology-ATextandAtlas,byM.H.Ross&E.J.Reith.TheWilliamsandWilkinsCompany.
13.Bailey'sTextBookofHistology,revisedby W.M.Copenhaver;TheWilliams andWilkinsCompany.
14.TheCell–AMolecularApproach,G.M.Cooper&R.E.Hausman,ASMPressSINAUER.
15.CoreTextBookofNeuro-Anatomy,byM.B. Carpenter;theWilliamsandWilkinsCompany.
16. TheHumanNervousSystem,byCharlesNobach,McGrawHillBookCo.
17.BiomedicalInstrumentation&Measurements,byL.Cromwell,F.J.Weibell& E.A.Pfeiffer; Prentice-HallofIndiaPvtLtd.
18. TheHumanNervousSystem.By M.L.Barr&J.A.Kierman,Harper&Row.
19.EssentialFoodandNutrition,byM.Swaminathan.TheBangalorePrinting&PublishingCo.Ltd.
20. EssentialImmunology,byI.M.Roitt,BlackwellScientificPublications.
21.KubyImmunology,byR.A. Goldsby.T.J.Kindtand B.A.Osborne,W.H. FreemanandCo.
22.Microbiology,byM.J.Pelczer&Others;TataMcGrawHillPublishingCo. Ltd.
23Cellular&MolecularBiology,byEDPDeRobertis&EMFDeRobertis;Lea&Febiger.
24. Molecular Biologyof the Gene, byJ.D. Watson, H.H. Nancy &others; Benjamin-Cummings.
25. MolecularBiologyoftheCell,by B.Albertsandothers,Garland.
26. TextbookofMedicalPhysiology,InduKhurana,Elsevier.
27. Carleton's Histological Techniques, byR.A.B. Drury&E.A. Wellignton, OxfordUniversityPress.
28.HandbookofExperimentalPhysiologyand Biochemistry, byP.V.Chadha; Jaypee BrothersMedicalpublishers.
29.Neurobiology,byG.M.Shepherd,OxfordUniversity Press
30.Biochemistry,byL.Stryer,W.H.FreemanandCo.

SKILL ENHANCEMENT COURSES

SEC- I

Theory (Credit 2) Class

IA : Pharmacology–BasicconceptandDrug designing:

Basic concept of pharmacology. Pharmacokinetics : Drug-receptor interaction, Desensitization of receptors,Absorption,Distribution,Elimination,Half-life.Definition ofdrug,agonistandantagonist partialagonistandantagonist,Receptors- drug interaction,Spare receptors.Pharmacodynamics: dose- response curves.Beneficialversus toxiceffects of drugs**.**Drug biotransformation. Bioavailability. Drug accumulation.therapeuticindex.

OR

IB : Bio statistics

Scope of statistics– utilityand misuse.Principlesofstatisticalanalysisofbiological data. Basicconcepts – variable, parameter, statistics, Sampling. Presentation of data-frequency distribution, frequency polygon, histogram, bar diagram and pie diagram. Parameters. Different classes of statistics-mean, median,mode,meandeviation,variance,standarddeviation,standard errorofthe mean, Standard score. Degrees of freedom, Probability. Normal distribution. Student's t- distribution.Testingofhypothesis-Null hypothesis, errorsofinference, levelsofsignificance,t-

test and z score for significance of difference.

Suggested readings

1. MedicalStatisticsbyB.K.Mahajan.JaypeeBrothers,MedicalPublishersPvt. Ltd.
2. .StatisticalMethodsbyG.W. Snecedor and W.G. Cochran, Oxford &IBH PublishingCoPvt.Ltd.
3. StatisticsinBiologyandPsychologybyD.DasAcademicPublishers
4. QuintessenceofMedicalPharmacology,S.K.Chaudhuri,NewCentralBookAgency.
5. EssentialsofMedicalPharmacology,KDTripathi,Jaypee.

SEC- II

Theory (Credit 2) **Class**

II A Molecular Biology

a. Structure of DNA and RNA.
b. Elementary idea of gene, genome, transcription, genetic code, translation and genetic engineering.

OR

II B Social Physiology

c. Composition and nutritional value of common Indian foodstuffs – rice, wheat, pulses, egg, meat, fish and milk.

d. Dietary fibers. Calorie requirement. Concept of ACU.

e. Principle of balanced diet formulation of individuals - infants, growing children, students, pregnant women, lactating women and aged persons.

f. Dietary management or obese, diabetic person, hypertensive person and athlete.

g. Diet survey.

h. Malnutrition and its causes - PCM, marasmus, kwashiorkor their prevention. Iron and iodine deficiency.

i. Population problem and its control. Problem of infertility and brief idea about *in vitro* fertilization and intrauterine gamete transfer.

j. Brief idea of AIDS and hepatitis B and their preventions.

Suggested Reading

1. Park's Text Book of Preventive and Social Medicine by K. Park, M/s. BanarsidasBhanotPublishers.
2. TheCell–AMolecularApproach,G.M.Cooper&R.E.Hausman,ASMPressSINAUER.
3. Molecular Biologyof the Gene, byJ.D. Watson, H.H. Nancy &others; Benjamin-Cummings.
4. MolecularBiologyoftheCell,by B.Albertsandothers,Garland.
5. Molecular Cell Biology, by H. Lodish, D. Baltimore &others. ScientificAmericanBook.
6. Genetics:AnalysisofGenesandGenomes,byDLHartlandEW Jones&BurtletPublishers

SEC- III

Theory (Credit 2) **Class**

III A Microbiology

a. Virus - DNA virus and RNA virus.
b. Bacteriophage.
c. Bacteria-structure and morphological classification.
d. Gram positive and Gram negative and acid-fast bacteria.
e. Pathogenic and non-pathogenic bacteria - definition with a few examples.
f. Sterilization and Pasteurization

OR

III B Immunology

g. A brief idea of antibiotics.

h. Elementary knowledge of innate and acquired immunity.

i. Humoral and cell mediated immunity

j. Vaccination - principles and importance of immunization.

k. Basic principle of immunological detection of pregnancy.

Suggested readings

1. EssentialImmunology,byI.M.Roitt,BlackwellScientificPublications.
2. KubyImmunology,byR.A. Goldsby.T.J.Kindtand B.A.Osborne,W.H. FreemanandCo.
3. .Microbiology,byM.J.Pelczer&Others;TataMcGrawHillPublishingCo. Ltd.
4. Cellular&MolecularBiology,byEDPDeRobertis&EMFDeRobertis;Lea&Febiger.
5. Molecular Biologyof the Gene, byJ.D. Watson, H.H. Nancy &others; Benjamin-Cummings.
6. MolecularBiologyoftheCell,by B.Albertsandothers,Garland.

SEC IV

Theory (Credit 2) **Class**

IV A Work Physiology

a. Physical work - definition and units of measurement.

b. Concept and classification of physical work -- static and dynamic work, positive & negative work.

c. Cardiovascular and respiratory changes during physical exercise.

d. Brief idea of maximal aerobic power and excess post-exercise oxygen consumption.

e. Basic idea of doping.

f. EMG.

g. Physical fitness index - Harvard step test.

h. ECG -- normal waves and leads.

i. Anthropometry and its uses

OR

IV B Environmental Physiology

j. Environment - its physiological aspects.

k. Effect of extreme temperature on humans.

l. Hypobaric environment - effects on physiological system, acclimatization.

m. Hyperbaric conditions and Caisson disease.

n. Brief idea of cyanosis, dyspnoea, hyperpnoea, apnoea and asphyxia.

o. Some common pollutants and their effects - carbon monoxide, lead and arsenic.

p. Effects of noise on human body and preventive measures

Suggested readings

1. ExercisePhysiology–Energy,NutritionandHumanPerformancebyW.D. McArdle,
2. F.KatchandV.L.Katch.Lippincott,WilliamsandWilkins.
3. EssentialsofExercisePhysiology byL.G.Shaver,SurjeetPublications.
4. TextbookofWorkPhysiologybyP.O.AstrandandK.Rodahl.McGraw- HillBookCo.
5. SportsPhysiologybyE.L.Fox, Saunders CollegePublishing.Holt-Saunders.
6. PesticidesbyP.K.Gupta,Interprint.
7. EnvironmentalChemistry byP.V.De.WileyEasternLtd.
8. Text Book of Environmental Physiologyby C. Edger Folk Jr. LeaandFebiger.