SEMESTER I PHYSIOLOGY MINOR

M1T- BODY FLUIDS AND CARDIO-RESPIRATORY PHYSIOLOGY 3 Credits (1+1+1)

Body Fluids

Blood- formation, composition, circulation, and functions. Blood vessels: artery, vein, capillaries. Hemoglobin- structure, types, functions. Blood disorders- anemia, thalassemia, leukemia, hemophilia. Blood groups (ABO & Rh systems), Blood transfusion, and Blood storage. Lymph - formation, composition, circulation, and functions.

Cardiac Physiology

Anatomy of Heart. Electrical Activity of the heart: Electrocardiogram, Cardiac Arrhythmias, Hypertrophy and Cardiomyopathy. Cardiac Cycle, Heart sounds, Cardiac Output. Cardiovascular regulatory Mechanisms: Local, Hormonal, Neural. Arterial blood pressure, Korotkoff sounds. Coronary Circulation.

Respiratory Physiology

Anatomy of Respiratory tract and Lungs. Pulmonary Function: Mechanics of breathing, Gas Exchange in the lungs & tissues, Pulmonary Circulation, Other Functions of the Respiratory System. Oxygen & Carbon Dioxide Transport, Hypercapnia (respiratory acidosis) and hypocapnia (respiratory alkalosis). Neural & Chemical Regulation of Respiration. Forms of Hypoxia. Chronic obstructive pulmonary disease (COPD). Artificial Respiration.

M 1 P- BODY FLUIDS AND CARDIO-RESPIRATORY PHYSIOLOGY 2 Credits

Study and Identification of Stained Sections of Different Mammalian Tissues and Organs- Artery, Vein, Cardiac Muscle, Trachea, Lungs.

Preparation of blood smear and identification of blood cells. Determination of blood group.

Sphygmomanometric measurement of arterial blood pressure at rest. Measurement of oxygen saturation by pulse oximeter before and after exercise. Measurement of peak expiratory flow rate.

Demonstration: Differential count of WBC. Total count of RBC and WBC. Bleeding time and clotting time. Pneumographic recording of effects of talking, drinking, laughing, coughing, exercise, hyperventilation and breath holding. Study of Kymograph and its accessories. Electrocardiogram. Cardiopulmonary Resuscitation (CPR).

SEMESTER II PHYSIOLOGY MINOR

M 2T- PHYSIOLOGICAL CHEMISTRY, GASTROINTESTINAL AND NUTRITIONAL PHYSIOLOGY, AND EXCRETION 3
Credits (1+1+1)

Physiological Chemistry

Classification, structure, Properties and Functions of Carbohydrates, Proteins and lipids, DNAs and RNAs, Enzymes. Coenzymes, Cofactor, Prosthetic Groups. Mechanism of enzyme action. Michaelis-Menten equation, Hyperbolic kinetics, Enzyme Inhibition. Factors regulating enzyme activities. Isoenzymes, Allosteric enzymes, Ribozymes, Abzymes, Rate limiting enzymes.

Gastrointestinal and Nutritional Physiology

Anatomy of Gastrointestinal tract. Digestion & absorption, Mechanism and Regulation of Gastric HCl secretion. Gastrointestinal hormones, Exocrine Functions. Gastrointestinal Diseases- Constipation, irritable bowel syndrome (IBS), inflammatory bowel disease (IBD), gastroesophageal reflux disease (GERD), functional dyspepsia, hemorrhoids, colitis, ulcers, colorectal cancer, gall stone, fatty liver disease.

BMR, RQ, RDA, SDA, NPU, Biological value of Proteins. Vitamins. Minerals. Calorie requirement. Balanced diet. ACU. Metabolism of carbohydrates, proteins and lipids.

Excretion

Anatomy and function of Renal System. Micturition. Renal Circulation, Non-excretory function of kidney. Chronic kidney disease. Other excretory organs: Skin, Liver, Large intestine, and Lungs.

M 2P- PHYSIOLOGICAL CHEMISTRY, GASTROINTESTINAL AND NUTRITIONAL PHYSIOLOGY AND EXCRETION 2 Credits

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.

Study and Identification of Stained Sections of Different Mammalian Tissues and Organs- Tongue, Salivary Glands, Esophagus, Stomach, Duodenum, Jejunum, Ileum, Large intestine, Liver, Pancreas, Kidney.

Demonstration: Identification of normal and abnormal constituents of urine. Quantitative estimation of glucose and sucrose and lactose by Benedict's method. Quantitative estimation of amino nitrogen [Sorensen's formol titration method (percentage as well as total quantity)], Urine albumin-creatinine ratio (ACR).

SEMESTER III PHYSIOLOGY MINOR

M 3 T- NERVE - MUSCLE PHYSIOLOGY & NERVOUS SYSTEM 3 Credits (1+1+1)

Nerve Physiology

Introduction, Ionic basis of Excitation & Conduction, Properties of Mixed Nerves, Nerve Fiber Types, Synapses: Structure, Types, Properties, Mechanism of Synaptic Transmission through Electrical & Chemical Synapses, Neurotransmitters,

Neuromodulators & Neurotrophins, Structure of Neuromuscular Junction, Mechanism of Transmission through Neuromuscular Junction.

Muscle Physiology

Introduction, Structure & Properties of Skeletal, Cardiac & Smooth Muscles, Mechanism of Skeletal, Cardiac & Smooth Muscle Contraction & Relaxation, Chemical Changes during Muscle Contraction, Isotonic & Isometric Muscle Contraction.

Nervous system

Brief Anatomy of Brain & Spinal Cord. Corticospinal tract. Structure & Functions of Central, Peripheral and Autonomic Nervous Systems. Structure of Reflex Arc. Brief Anatomy, Structure & Functions of Cerebral Cortex, Cerebellum, Thalamus, Hypothalamus, Basal Ganglia, Limbic System, Physiological Basis of Sleep, Insomnia. The Electroencephalogram. Special Senses- Vision, Audition, Olfaction & Taste.

M 3 P - NERVE - MUSCLE PHYSIOLOGY & NERVOUS SYSTEM 2 Credits

Study & Identification of Stained Sections of Different Mammalian Tissues and Organs: Skeletal Muscle, Cardiac Muscle , Smooth Muscle, Spinal Cord, Cerebral Cortex, Cerebellum, Skin, Tongue.

Measurement of Grip Strength. Determination of Visual Acuity by Snellen's Chart. Determination of Colourblindness by Ishihara Chart. Reaction Time by Stick Drop Test. Short Term Memory Test (Shape, Picture, Word). Two Point Discrimination Test. Experiments on Superficial (Plantar) and Deep (Knee Jerk) Reflex.

SEMESTER IV PHYSIOLOGY MINOR

M 4 T-ENDOCRINOLOGY & REPRODUCTION 3 Credits(1+1+1)

Endocrine Functions of Pituitary, Thyroid & Pancreas

Pituitary Gland- Histological Structure of Anterior & Posterior Pituitary. Functions of Growth Hormone, ACTH, TSH, Pituitary Gonadotropins, Prolactin, Posterior pituitary hormones (Oxytocin, Vasopressin), Pituitary hyper- and hypo-function. **Thyroid Gland-** Histological structure of thyroid gland, Secretion of Thyroid Hormones, Transport of Thyroid Hormones, Effects of Thyroid Hormones, Hyper- and hypo-function of thyroid gland. Calcitonin: Role on Calcium Metabolism. **Endocrine Functions of the Pancreas-** Histological structure of pancreas, Secretion of Insulin, Effects of Insulin, Insulin resistance, Glucagon, Hypoglycemia & Diabetes Mellitus.

Endocrine Functions of Adrenal, Parathyroid, Kidneys, Heart & Pineal

Adrenal Gland- Histological Structure of Adrenal gland, Adrenal Medulla, Function of Medullary Hormones, Adrenal Cortex, Effects of Adrenal Androgens & Estrogens, Physiologic Effects of Glucocorticoids, Effects of Mineralocorticoids, Summary of the effects of Adrenocortical Hyper & Hypofunction. **Parathyroid Glands**- Parathormone functions: role on Calcium & Phosphate Metabolism. **Endocrine Functions of the Kidneys, Heart, & Pineal Gland-** The Renin-Angiotensin System, Erythropoietin, Atrial Natriuretic Peptide, Melatonin.

Reproduction

The Male Reproductive System: Structure, Gametogenesis, Endocrine Function of the Testes, Control of Testicular Function, Abnormalities of Testicular Function **The Female Reproductive System**: The Menstrual Cycle, Ovarian Hormones, Control of Ovarian Function, Abnormalities of Ovarian Function. Mammary Gland- Structure, Development, Functions, and Mammography. Pregnancy: Physiological changes during pregnancy. Placenta: Structure & functions. Puberty, Precocious & Delayed Puberty, Menopause. Polycystic ovary syndrome (PCOS), In vitro fertilization (IVF), Intrauterine insemination (IUI).

M4P - ENDOCRINOLOGY & REPRODUCTION **2 Credits**

Study and Identification of Stained Sections of Different Mammalian Tissues and Organs: Pituitary Gland, Pancreas, Adrenal gland, Thyroid gland, Kidney, Pineal Gland Testes, Ovary.

Demonstration: Pregnancy test from human urine by kit method. Staining (H&E) of tissue slides.

M5T- Sports and Exercise Physiology

Sports and Exercise Physiology

Importance of regular exercise in health and wellbeing. Basic concept of Bioenergetics, Energy sources during exercise (Phosphagen, Anaerobic system and Aerobic system). Cardio-respiratory responses during different grades of exercise. Concept of excess post exercise oxygen consumption (EPOC), physiological fatigue and recovery. Aerobic work Capacity: Measurement, physiological factors and applications. Training: Principles of physical training, Training to improve aerobic and anaerobic power. Effect of overtraining and detraining. Nutritional supplements and ergogenic aids. Sports injury and its' management. Basic idea sports rehabilitation and sports medicine.

M5P- Sports and Exercise Physiology

Measurement of blood pressure before and after exercise. Recording of recovery heart-rate after standard exercise. Determination of VO2max by queens college step test. Measurement of body fat percentage. Six minute walk test. Measurement of hand grip strength and endurance by hand grip dynamometer. Modified Harvard step test and determination of physical fitness. Field visit: Gymnasium with all the modern fitness equipment.

M6T- Public Health and Community Nutrition, and Environmental Physiology

Public Health and Community Nutrition

Definition: hygiene, health and public health. Basic idea about community health and public health issues. Vector Borne Epidemic Diseases: Malaria and Dengue etiology

and control. Dietary fibers. Calorie requirement. Basic idea on PEM, marasmus, kwashiorkor and their prevention. Recommended dietary allowances, malnutrition, LBW, Xerophthalmia, Iodine deficiency disorders (IDD), Iron deficiency, micronutrient disorders. Food allergy. Food toxicity, Food Borne Diseases: causes, symptoms and control. Effect of processing on nutritive values of foods. Food Additives and Adulterants: definition, examples and human health hazards. Antioxidants. Nutritional genomics. Nutraceuticals.

Environmental Physiology

Air Pollution: definition, sources, air pollutants, effects of air pollution on human health, concept of ozone hole, green house effects and global warming. Water Pollution: definition, types, health hazards, water pollutants, concept of safe drinking water standards. Soil Pollution: causes, health hazards, solid waste management, bioremediation, phytoremediation. Sound Pollution: definition, concept of noise, source of sound pollution, effects of sound pollution on human health. Radionuclide Pollution: ionizing radiations, effects of ionizing radiation on human health, permissible doses.

M6P- Public Health and Community Nutrition, and Environmental Physiology

Survey on the status of dietary intake in the surrounding area through visits. Real-time hands-on session on National Air Quality Index available on official website of Central Pollution Control Board, Govt. of India.

Demonstration: Formulation of balanced diets for growing child, adult man and woman, pregnant and lactating woman. Diet management of obese, diabetic, hypertensive persons and athletes.

PHYSIOLOGY SPECIAL MINOR 1 (SM1) COURSE

SM1T: SPORTS PHYSIOLOGY & ERGONOMICS 3 Credits

Sports Physiology

Physical Work- Its Definition & Nature. Importance of regular exercise in health and wellbeing. Energy sources during exercise (Phosphagen, Anaerobic system and Aerobic system). Cardio-respiratory responses during different grades of exercise. Concept of excess post exercise oxygen consumption (EPOC) & VO2 max. Physiological fatigue and recovery. Training: Principles of physical training. Cardiovascular & Respiratory Adaptation to Training. Effect of overtraining and detraining. Brief Idea about nutritional aspects of Sports. Sports injury and its' management. Basic idea of sports rehabilitation and sports medicine.

Ergonomics

Basic Concept of Ergonomics. Musculo-Skeletal Systems and Human Locomotion. Occupational Health and Application of Ergonomics to restrict Occupational Health Hazards. Guideline for Handtool design, task, posture, safety guidelines for tool use. Ergogenic aids. Exercise inducing equipment- Bicycle Ergometer, Treadmill, Stepping Stool. Advantages of Ergonomics. Cognitive Ergonomics. Personal Protective Device (PPD).

SM1P: SPORTS PHYSIOLOGY & ERGONOMICS 2 Credits

Measurement of blood pressure before and after exercise. Recording of recovery heart-rate after standard exercise. Measurement of Oxygen Saturation by Pulse Oximeter before and after exercise. Determination of VO2max by Queen College Step test. Six minute walk test. Determination of endurance time by hand grip dynamometer.

Basic Anthropometric Measurements and Determination of Body Surface Area (BSA) & Body Mass Index (BMI). Measurement of body fat percentage. Experiments on Respiratory Rate, Pulse Rate and Blood Pressure in relation with Posture.
