

Paper name	content	Course out come	Programme outcome
Semester-I			This course provides a understanding of the human body functions at the cellular, tissue, organ and system levels. It also provides how diseases disrupt normal physiology. It integrates knowledge from different biological disciplines like biochemistry, biophysics, anatomy, histology, sports physiology, nutrition, microbiology, immunology, molecular biology, providing a comprehensive view of the body's functioning.
MJC:CellularBasis ofPhysiology CourseCode:PHS L1011	THEORY <ol style="list-style-type: none"> 1. Introduction Contribution of Indian Scientists in the field of Physiology and allied health sciences: Subodh Chandra Mahalanobis, Sacchidananda Banerjee, DilipMahalanabis, Autar Singh Paintal, John Burdon Sanderson Haldane, Ronald Ross, UpendraNathBrahmachari, SubhashMukhopadhyay. 2. Generalconceptofthebasicanatomicalorganizationofhuman body. 3. Structure and Function of Cell Organelle – Plasma membrane, nucleus, mitochondria, ribosome, lysosome, Golgi body, endoplasmic reticulum, peroxisomes, cytoskeletal elements and centrosomes. 4. Transport Across Cell Membranes –Passive, active, carrier mediated,uniport, symport and antiport. 5. Intercellular Communication – Gap junction, tight junction, intercalated disc, desmosomes and cell adhesion molecules. Extracellular matrix components. 6. Tissue, Organ and Systems – General classification, special emphasis on connective tissue and epithelial tissue. Brief idea on organs and systems. 7. Cell Cycle – Definition, different phases of cell cycles, regulation and check points of cell cycle. 8. Celldivision <ol style="list-style-type: none"> a) Mitosis –Phasesand 	<ul style="list-style-type: none"> • Thiscoursegivesawideknowled geaboutstructureandfunctionso fcell organelle. • Fromthiscoursestudentswillgat hertheknowledgeaboutthecell,t issue,organand systems. • Thecoursewouldfortifytothestu dentstoacquiretheknowledgeab outtransportacrosscell • membranessandintracellularco mmunications. • Theyacquireaconceptaboutcell cycle,celldivision,homeostasis andanginprocess. 	

	<p>significance.</p> <p>b) Meiosis– Phasesandsignificance.</p> <p>9. Special emphasis on homologous, heterologous, chiasma formation, crossing over, recombination and disjunction of chromosome.</p> <p>10. Apoptosis and Necrosis -Basic concept and mechanism.</p> <p>11. Aging– Etiology, theories of aging, metabolic changes and management.</p>		
	<p>PRACTICAL</p>		
	<ol style="list-style-type: none"> 1. Introduction on: Principle, working procedure and function of different components of microscope. 2. Introduction on permanent slides -Applied value. 3. Study and identification of stained sections of different mammalian tissues and organs: Bone, cartilage, trachea, lungs, spleen, lymph gland, tongue, oesophagus, stomach, small intestine 9 duodenum, jejunum, ileum, large intestine, liver, salivary glands, pancreas, adrenal gland, thyroid gland, kidney, ureter, testes, ovary, uterus, spinal cord, cerebral cortex, cerebellum, skin, cardiac muscle, skeletal muscle, smooth muscle, artery and vein. 4. Examination and staining of fresh squamous epithelium by methylene blue stain. 5. Staining of adipose tissue using Sudan III or I V. 	<ul style="list-style-type: none"> • From this course students will gather knowledge about various parts of microscope. • This practical course will provide wider range of knowledge about histological structure of different organs and glands. • They will gather knowledge about structural morphology of different types of fresh tissue. 	
<p>MD: Nutrition and Dietetics</p>	<p>THEORY</p>		

<p>etetics</p> <p>Course Code:PH SL1031</p>	<ol style="list-style-type: none"> 1. Classificationofnutrients,Carbo hydrate,protein,fat,vitamin,min eralandwater.[2hours] 2. Macroand micro-elements, deficiency symptoms of vitamins. 3. Composition and nutritional value of common Indian foodstuffs – rice, wheat, pulses, egg,meat, fish and milk. 4. Dietaryfibers. Calorie requirement.Concept of ACU. 5. Principleofbalanceddiet. 6. Dietsurvey. 7. Malnutrition and its causes - PCM, marasmus, kwashiorkortheirpreventio n. Iron and iodine deficiency. 8. Role of nutrients and food on health management and disease prevention - Hypertension, diabetes, cardiovascular disease, obesity, immunodeficiency disease, anaemia, undernutrition. <p>Conceptof health,food hygiene,foodstyle,lifestylefor diseaseprevention.</p>	<ul style="list-style-type: none"> • Fromthiscoursestudentswillg athertheknowledgeaboutthero ledifferentnutrientsand food on health management and disease prevention. • Thecoursewouldfortifytothest udentstoacquiretheknowledg eabout hygieneand health maintenance. • Fromthiscoursestudentswillg athertheknowledgeaboutthest udyofhealthbystudying malnutrition and undernutrition • Fromthiscoursestudentswillgat hertheknowledgeabout vitamin deficiency 	
<p>SKILLE NHANCE MENTC OURSE (SEC):Hematologic alTechniq ues(PRACTICAL) CourseCo de:PHSL1 051</p>	<ol style="list-style-type: none"> a) Preparationandstainingofblood filmwith Leishman’s stain. b) Identificationofthebloodcorpus cles. c) DifferentialcountofWBC. d) TotalcountofRBCandWBC. e) Bleedingtimeandclottingtime. f) Hemoglobinestimation. g) Preparationofhaemincrystals. h) Preparationandstainingofbone marrow. i) Measurementofdiameterof megakaryocyte. j) Reticulocytstaining k) Bloodgroupdetermination. 	<ul style="list-style-type: none"> • Thiskillenhancementcour selearnerwillgaintheirknow ledgeabout preparationofbloodsmear, stainingalongwithidentific ationofblood cells. • Fromthispaperstudentswillincr easetheirknowledgeandtechniq ues <ul style="list-style-type: none"> ○ abouttotalcountofRBC andWBC. • From this paper students will increase their knowledge about occurrence of anaemia 	

SEMESTER-II			
MJC:Circulating Body Fluid Course Code:PHSL2011	<ol style="list-style-type: none"> 1. Introduction. 2. Blood–Componentsand generalfunction. 3. Plasma-Compositionand function. 4. Plasmaproteins- Origin,synthesis,classificatio nandfunction. 5. Bloodvolumeandmeasuremen tofbloodvolume. 6. BoneMarrow–Redandyellow. 7. BloodCells- theirmorphologyandfunctions . [4hours] 8. RedBloodCells– Erythropoiesis;hemoglobin- types,synthesisand fate. <ol style="list-style-type: none"> i. BriefideaonAnaemia, polycyt hemiaandhemoglobinopathie sandThalassemia. i. BriefideaonMCV, MCH. MCHCand colourindex. 9. White Blood Cells – 10. Platelets-Formationandfate. 11. Hemostasis– Definition,factors,modern conceptandabnormalities inhemostasis.Anticoagula nts used in different purposes. 12. Blood Grouping- ABOand Rh typing.Cross matching (Major and minor cross matching),blood transfusion and transfusion related hazards. 13. Lymph– Formation,circulationandfunc tion. [3hours] 14. Separationofdifferentcompon 	<ul style="list-style-type: none"> • Fromthiscoursestudentswillgai ntheknowledgeaboutbloodandi tscomponents. • This course will enrich the learner about the morphology, classification and important functionof formed elements. • Student will acquire the knowledge on hemostatic mechanism and the clinical aspects of blood coagulation. • The students will gain their knowledge on blood group, blood transfusion and its related health hazards. • Understandingofpre- maritalcounsellingonthebasisof knowledgeofbloodgroup 	

	<p>ents of blood in blood bank and their clinical importance.</p>		
	<p>PRACTICAL</p>		
	<ol style="list-style-type: none"> 1. Preparation and staining of blood film with Leishman's stain and identification of blood cells. 2. Differential count of WBC. 3. Total count of RBC and WBC. 4. Bleeding time and clotting time. 5. Hemoglobin estimation by Sahli's method. 6. Preparation of haemincrystal. 7. Blood group determination and Rh typing. 8. ESR measurement by Wintrobe's or Western green method. 9. Determination of haematocrit, MCV, MCH, MCHC, bleeding time and clotting time. 	<ul style="list-style-type: none"> • The course content will develop skills of four students on hematological techniques. • Student will gain the knowledge on total count of RBC and WBC. • They will increase their skill on blood film preparation and stain in procedure. • Student will develop their knowledge on blood group detection and Rh typing. 	
<p>MINOR COURSE MIN: Circulating Body Fluids Course Code: PHSL2021</p>	<ol style="list-style-type: none"> 1. Introduction. 2. Blood – Components and general function. 3. Plasma – Composition and function. 4. Plasma proteins – Origin, synthesis, classification and function. 5. Blood volume and measurement of blood volume. 6. Bone Marrow – Red and yellow. 7. Blood Cells – their morphology and functions. 8. Red Blood Cells – Erythropoiesis; hemoglobin types, synthesis and fate. 9. Brief idea on Anaemia, polycythemia and hemoglobinopathies and Thalassemia. 10. Brief idea on MCV, MCH, MCHC and colour index. 11. White Blood Cells - 	<ul style="list-style-type: none"> • From this course students will gain the knowledge about blood and its components. • This course will enrich the learner about the morphology, classification and important function of formed elements. • Student will acquire the knowledge on hemostatic mechanism and the clinical aspects of blood coagulation. • The students will gain their knowledge on blood group, blood transfusion and its related health hazards. • Understanding of pre-marital counselling on the basis of knowledge of blood group 	

	<p>Morphology, classification, lifecycles, functions, Human leucocyte antigen (HLA). Leucopoiesis, Arneeth index.</p> <p>12. Platelets-Formation and fate.</p> <p>13. Hemostasis– Definition, factors, modern concepts and abnormalities in hemostasis. Anticoagulants used in different purposes.</p> <p>14. Blood Grouping- ABO and Rh typing. Cross matching (Major and minor cross matching), blood transfusion and transfusion related hazards.</p> <p>15. Lymph-Formation, circulation and function.</p> <p>16. Separation of different components of blood in blood bank and their clinical importance.</p>		
	PRACTICAL		
	<ol style="list-style-type: none"> 1. Preparation and staining of blood film with Leishman's stain and identification of blood cells. 2. Differential count of WBC. 3. Total count of RBC and WBC. 4. Bleeding time and clotting time. 5. Hemoglobin estimation by Sahli's method. 6. Preparation of haemincrystal. 7. Blood group determination and Rh typing. 8. ESR measurement by Wintrobe's or Western green method. 9. Determination of haematocrit, MCV, MCH, MCHC, bleeding time and clotting time. 	<ul style="list-style-type: none"> • The course content will develop skills of four students on hematological techniques. • Student will gain the knowledge on total count of RBC and WBC. • They will increase their skill on blood film preparation and staining procedure. • Student will develop their knowledge on blood group detection and Rh typing. 	
MULTI/INTERDISCIPLIN	<ol style="list-style-type: none"> 1. Basic concept of environment and its components. Interrelationship of different 	<ul style="list-style-type: none"> • This course will help our students to enhance their skill to measure 	

<p>ARYCOURE MD:Environmental Physiology and Human Health Course Code: PHSL2031</p>	<p>components of an environment.</p> <ol style="list-style-type: none"> 2. Pollutants: Definition and types. 3. Air pollution: Definition, source, effects of air pollutant (SO_x, NO_x, CO_x and particulate matter) on human health and their control in brief. 4. Water Pollution: Definition, types, water pollutants-sources, health hazards, preventive measures. Biological Oxygen Demand (BOD), concept of safe drinking water standards. 5. Pesticides, fungicides and herbicides and human health. 6. Heavy metals (arsenic, fluoride, mercury and lead) and halide (fluoride) pollution and effect on human health. 7. Sound Pollution: Definition, concept Of noise, source of sound pollution, effects on human health, preventive measures of sound pollution, noise index and noise standards. 8. Soil Pollution: Causes, health hazards, control of soil pollution, solid waste management- Bioremediation and Phytoremediation. 9. Radioactive Pollution: Ionizing radiations, effects of ionizing radiation on human health, permissible doses and controlling measure. 	<p>issolved oxygen in water sample.</p> <ul style="list-style-type: none"> • They will be able to measure relative humidity and suspended particulate matter in air. • Learner will also get their skill to measure noise and light intensity of different working places. • From this discipline specific elective course student will also develop their ability to measure the soil pH in different climatic areas. 	
<p>SKILL ENHANCEMENT COURSE SECP-2: Clinical Biochemistry (PRACTICAL)</p>	<ol style="list-style-type: none"> 1. Discussion on Principle and application of colorimeter and spectrophotometer. 2. Discussion on Pathophysiological significance of blood parameters—Glucose, serum protein, albumin, urea, creatinine, uric acid, bilirubin and ketone bodies. 	<ul style="list-style-type: none"> • Student will be developing their hands on knowledge on principle and application of colorimeter and spectrophotometer. • Learner will gain their idea on pathophysiological significance of 	

Course Code: PHSL2051	<ol style="list-style-type: none"> 3. Discussion on Alteration of lipid and thyroid profile in health and disease. 4. Discussion and Demonstration on Strength of solution: Normality and molarity with calculation. 5. Discussion on Pathological significance of some enzymes and proteins: Lactate dehydrogenase, glucose-6-phosphate dehydrogenase, creatin kinase, amylase, ACP, ALP, Beta-glucuronidase, ALT, AST, Lipase, Gamma-glutamyl transpeptidase, cardiac troponins and CRP. 6. Estimation of 7. Blood glucose by GOD-POD method. 8. Serum cholesterol. 9. SGPT, SGOT 10. Serum alkaline phosphatase by standard biochemical kit. 	<p>blood parameters.</p> <ul style="list-style-type: none"> • From this course learners will acquire their knowledge on pathological significance of some enzymes and proteins. 	
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SEMESTER-III

Major course (MJC): GASTROINTESTINAL FUNCTION Course Code- PHSL-3011	THEORY		
	<p>A. <u>Digestion & Absorption</u></p> <ol style="list-style-type: none"> 1. Introduction, Anatomy and histology of alimentary canal, Deglutition and Movements of alimentary canal and their regulations. 2. Carbohydrates Proteins & Nucleic acids Lipids Absorption of Water & Electrolytes 3. Absorption of Vitamins & Minerals. <p>B. <u>Regulation of Gastrointestinal Function</u></p> <ol style="list-style-type: none"> 1. Introduction 2. Digestive glands – histological structures of salivary glands, pancreas and liver. 3. General Considerations 4. Composition, functions and regulation of the secretion of salivary, gast 	<ul style="list-style-type: none"> • After successful completion of course, students will have ability to learn the anatomy and histology of alimentary canal, movements of alimentary canal and their regulations. • Understand the digestion and absorption of various food stuffs. • Describe the major anatomical characteristics of the enteric nervous system and the major cellular division of enteric ganglia. • They understand about the histological structure of digestive glands 	

	<p>ric,pancreaticand intestinal juices and bile. Synthesis of Bile acids. Enterohepatic circulation, Feces and defecation. GALT, MALT. Basic concepts of Peptic Ulcer, Jaundice and Gall-stones Cholelithiasis.</p> <p>5. Gastrointestinalhormones Mouth & Esophagus Stomach</p> <p>6. ExocrinePortionofthePancreas Liver & Biliary System</p> <p>7. SmallIntestine Colon</p>		
	PRACTICAL		
	<p>1. Kymographicrecordingofnormal movementsof rat's intestine in Dale's apparatus.</p> <p>2. Effectsof hypoxia, acetylcholine and adrenaline on normal intestinal movements</p>	<ul style="list-style-type: none"> • After successfully completion of course student will have ability to : • How to do hands on practical with isolated intestine. • The course content will develop skill of our students on recording techniques of normal movements of rats intestine. • Student practically learn the effect of hypoxia, acetylcholine and adrenaline on normal intestinal movements. 	
Major course (MJC): chemistry of biomolecules Course Code- PHSL-3012	THEORY		
	<p>1. Carbohydrates Classification of Carbohydrates Definition and classification of Carbohydrates Structure of Carbohydrates Cyclic structures- Pyranose and furanose forms, structure of disaccharides and polysaccharides. Properties of Carbohydrates stereoisomerism, optical isomerism, optical activity, epimerism,</p>	<ul style="list-style-type: none"> • This core course helps the student to acquire basic conceptual knowledge about the classification, structure, properties of carbohydrates, proteins and Lipids and their important functions. • Students are helped to acquire ideas about basic biochemistry of all kinds of carbohydrates, lipids, proteins and nucleic acids. • Student will acquire the knowledge on structure and function 	

<p>anomerism, mutarotation and its mechanism. Chemical reactions of monosaccharides (Glucose & Fructose) – Reactions with concentrated mineral acids, alkali, phenyl hydrazine and their biochemical importance Function of Carbohydrates Derivatives of monosaccharides --Aminosugars, deoxy sugars, sugar alcohols, sugar acids, sugar esters, their biochemical and physiological importance.</p> <p>2. Proteins and Lipids Classification of Proteins and lipids Definition and classification of proteins and Fatty acids- Classification, systematic nomenclature. Mono, Di and Triglycerides. Classification, Structure, Nomenclature of proteins and amino acids. Structure of Proteins and lipids Structure and properties of peptide bonds-- Phi and Psi angles. Different levels of protein structure--Primary, Secondary (α-helix and β-pleated sheet), Tertiary and Quaternary. Forces stabilizing the structures. Lipoproteins- Structure and classification. Properties of Proteins and lipids Properties of Fat and Fatty acids-- Hydrolysis, Saponification, Saponification number, Iodine number, Acetylation- Acetyl number, Hydrogenation, Rancidity-Acid number, Reichert-Meissl number. Cis- trans isomerism. Eicosanoids, Phospholipids, Glycolipids, Sphingolipids, Cholesterol & its ester-their structure and physiological importance. Protonic equilibria of Amino acids-- Zwitterions, Isoelectric point, titration curve of amino acids. Reactions with ninhydrin and formaldehyde. Reactions with Sanger's and Edman's reagent. Biuret reaction. Denaturation and Renaturation.</p>	<p>of DNA and RNA</p> <ul style="list-style-type: none"> • Also learn about the properties of different biomolecules.
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	<p>Functions of Proteins and lipids Physiological importance of proteins and lipids</p> <p>3. DNA and RNAs Structure of DNA and RNA Types of DNA and RNA Functions of DNA and RNA</p>		
	PRACTICAL		
	<p>1. Qualitative Experiments: Qualitative tests for identification of starch, dextrin, lactose, sucrose, glucose, fructose, albumin, gelatin, pepsin, lactic acid, hydrochloric acid, uric acid, acetone, glycerol, bile salts, urea.</p> <p>2. Quantitative Experiments: Quantitative estimation of glucose by Benedict's method. Quantitative estimation of amino-nitrogen by Sorensen's formol titration method. Percentage and total quantity to be done.</p>	<ul style="list-style-type: none"> • Students gain practical knowledge about identification of different biomolecules through experiments. • The course content will develop skill of students on qualitative tests for identification of carbohydrates/proteins/lipids and also lactic acid, hydrochloric acid, uric acid, acetone, bile salts and urea. • Student will gain the knowledge on quantitative estimation of glucose and amino-nitrogen. • They will develop their skill on preparation of different reagents for such qualitative test and quantitative estimation • Students also learn how to measure the quantity of a biomolecule present in a solution. 	
<p>MULTI/INTERDISCIPLINARY COURSE CODE: HEART AND BLOOD Course Code-</p>	<p>Heart</p> <ol style="list-style-type: none"> 1. Anatomy and histology of the heart. 2. Cardiac cycle: events. Heart sounds. Heart rate. Cardiac output: factors affecting, regulation. 3. Pulse-arterial and venous. 4. Blood pressure, SP, DP, MP, 	<ul style="list-style-type: none"> • This course helps the student to acquire knowledge on anatomy, histology of heart and heart muscle. • Also learn different physiological parameters like blood pressure, radial pulse etc. • This course will enrich the learner about the morphology, etc. 	

<p>PHSL-3031</p>	<p>PP.Methodsof measurementof bloodpressure.</p> <p>Blood</p> <ol style="list-style-type: none"> 1. Blood:composition andfunctions. 2. Bonemarrow. Formed elementsofblood-theirmorphologyand functions. 3. Hemoglobin:differenttypesofc ompoundsandderivatives.Functions.Abnormalhaemoglobins- thalassemia and sickle-cell anaemia. 4. Coagulationofblood:mechanism,factorsaffecting,procoagulants,anticoagulants,anddisorders of coagulation. 5. Bloodgroups-ABO andRh.Bloodtransfusion-precautionandhazards. Immunologicalbasisof identification of ABO and Rh blood groups. 6. Anaemia-types(definitionandcauses). 	<p>assificationandimportant functions of blood and its formed elements.</p> <ul style="list-style-type: none"> • Studentwillacquiretheknowledgeonhemostaticmechanism andtheclinicalaspectsof blood coagulation. • Thestudentswillgaintheirknowledgeonbloodgroup,bloodtransfusionanditsrelated health hazards. • Thiscoursewillenrichstudentsabouttheoccurrence ofanemiaandit'stheclinical aspects 	
<p>SKILL ENHANCEMENT COURSE SECP-3:HISTOLOGICAL TECHNIQUES (PRACTICAL) CourseCode:PHSL3051</p>	<ol style="list-style-type: none"> 1. Examinationandstainingoffresh tissues(otherthanblood)squamous ,ciliatedand columnar epithelium, skeletal muscle, cardiac muscle by methylene blue stain. 2. StainingofadiposetissuebySudanIIorIV. 3. Fixativesandfixation,blockpreparationand tissuesections,H&Estainingof tissuesections. 4. Preparationandstainingofbonem arrowsmear,measurementofdiameterofmegakaryocyte, reticulocyte staining, staining of collagen in tissue sections. 	<ul style="list-style-type: none"> • Thecoursecontentwilldevelopskill offourstudentsonhistologicaltechniques. • Theywillincreasetheirskillonstainingofdifferentfreshtissues,skeletal muscle,cardiacmuscle and adipose tissue. • Studentwilldeveloptheirknowledgeonfixatives,fixation, andblockpreparationwith,block cutting, film making, staining for permanent slides. • Theywillincreasetheirskillonpreparationandstainingofbonem arrowsmear,measurementof diameter of megakaryocyte, reticulocyte, staining of collagen in tissue sections. 	

