

## NORMAL FUNCTION

### THEORY

CODE	MEDICAL PHYSIOLOGY	TOTAL HOURS = 40	
	SPECIFIC LEARNING OBJECTIVES	DISCIPLINE	TOPIC
F-P-001	Define Homeostasis Explain control system of body by giving examples Differentiate between Extracellular and Intracellular Fluids Explain the positive and negative feedback mechanisms with examples Explain the significance of feed forward/ adaptive control/delayed negative feedback mechanisms Explain the structure of cell membrane Enlist the types of cell membrane proteins Enumerate the functions of membrane proteins Define and enumerate the functions of cell Glycocalyx	Medical Physiology	Cell Biology
	Enlist membranous and non-membranous organelles Enlist the self-replicative organelles Differentiate between the functions of smooth and rough endoplasmic reticulum Explain the functions of Golgi apparatus Enlist the enzymes of lysosomes Explain the functions of lysosomes Enlist the enzymes of peroxisomes Explain the functions of peroxisomes Enumerate the components and functions of cytoskeleton Define and enlist types of endocytosis Explain the mechanism of pinocytosis Classify different transport mechanisms Compare the composition of Na (Sodium), K		

	<p>(Potassium) and Cl (Chloride) in extracellular and intracellular fluid</p> <p>Define and enlist different types of diffusion Explain the process of facilitated diffusion with the aid of diagram</p> <p>Define and classify different types of active transport</p> <p>Describe primary and secondary active transport with examples</p> <p>Explain voltage and ligand gated channels with examples</p> <p>Name Na, K channel Blockers.</p> <p>Discuss functions and significance of Na/K ATPase pump.</p>		
F-P-002	<p>Enumerate the functions of blood</p> <p>Explain the composition of blood</p> <p>Enumerate the plasma proteins</p> <p>Discuss functions of plasma proteins</p> <p>Describe the pathophysiology of edema</p>		Blood
F-P-003	<p>Discuss the characteristics of red blood cells</p> <p>Explain different types of Bone marrows Enumerate the different sites of erythropoiesis at different ages</p> <p>Explain the stages of erythropoiesis</p> <p>Enumerate factors that regulate erythropoiesis</p> <p>Discuss the site and role of erythropoietin in red blood cell production</p> <p>Explain the significance of vitamin B12 and folic acid in maturation of red blood cell</p>	Medical Physiology	Red Blood Cells
F-P-004	<p>Enumerate the types of normal hemoglobin in different ages of life</p> <p>Explain the role of Iron in Hemoglobin formation.</p> <p>Define blood indices, give their normal values &amp; enumerate the conditions in which these values are disturbed</p>	Medical Physiology	Hemoglobin

	Enlist the abnormal types of hemoglobin		
F-P-005	<p>Enumerate the types of white blood cells</p> <p>Describe the characteristics and functions of Neutrophils</p> <p>Explain the process of defense against invading agent by neutrophils</p> <p>Define leukocytosis and leukopenia</p> <p>Explain the effects of leukemia on body</p> <p>Explain the process of defense against invading agent by macrophages</p> <p>Discuss different lines of defense during inflammation</p> <p>Explain the functions of neutrophils and macrophages in spread of inflammation (walling off effect)</p> <p>Define the Reticuloendothelial system</p> <p>Enlist the different components of Reticuloendothelial system</p> <p>Explain the characteristics and functions of basophils</p> <p>Explain the characteristics and functions of eosinophils and enlist conditions in which these cells are raised.</p>	Medical Physiology	White Blood Cells
F-P-006	<p>Enumerate different blood group types.</p> <p>Explain the basis of ABO and Rh blood system</p> <p>Explain the Landsteiner law</p>	Medical Physiology	Blood Types
F-P-007	<p>Discuss Components of ANS (Autonomic nervous system)</p> <p>Explain the physiological anatomy of sympathetic and parasympathetic nervous system</p> <p>Describe the types of adrenergic and cholinergic receptors and their functions</p> <p>Explain the effects of sympathetic and parasympathetic on various organs/ system of body</p>	Medical Physiology Also integrate with Anatomy part of ANS	Autonomic nervous system

# PRACTICAL

CODE	PHYSIOLOGY	TOTAL HOURS = 12	
	SPECIFIC LEARNING OBJECTIVES	DISCIPLINE	TOPIC
F-P-008	Explain laboratory/clinical procedure to the subject. Obtain verbal consent from subject before starting a procedure. Reassure the subject after the procedure.	Medical Physiology	Consent
F-P-009	Determine Erythrocyte Sedimentation Rate and packed cell volume		RBCs (Red Blood Cells)
F-P-010	Determination of blood group		Blood Group
F-P-011	Interpret Total Leucocyte Count, Differential Leucocyte Count (normal & abnormal) in a CBC (Complete Blood Count) report generated by Automated Cell Counter  Identify various types of WBCs in a prepared DLC (Differential Leukocyte Count)		WBCs (White Blood Cells)

## THEORY

CODE	MEDICAL BIOCHEMISTRY	TOTAL HOURS = 36	
	SPECIFIC LEARNING OBJECTIVES	DISCIPLINE	TOPIC
F-B-001	Differentiate between different types of cells. Explain the concept of organization of cells to tissue, tissues to organ, organs to system. Differentiate between the eukaryotic and prokaryotic cells.	Biochemistry Cell Biology	Structure of cell
F-B-002	Describe the composition and structure of cell on biochemical basis and justify it as fluid mosaic model. Describe the structure and function of cell membrane with particular reference to the role of <ol style="list-style-type: none"> <li>1. Lipids</li> <li>2. Carbohydrates</li> <li>3. Proteins</li> </ol>		Cell Membrane

## NORMAL FUNCTION

### THEORY

CODE	MEDICAL PHYSIOLOGY	TOTAL HOURS = 20	
	SPECIFIC LEARNING OBJECTIVES	DISCIPLINE	TOPIC
HL-P-001	Define, classify and explain anemia on the basis of morphology and cause	Medical Physiology	Anemia
	Discuss the effects of anemia on the body		
HL-P-002	Define polycythemia		Polycythemia
	Explain types of polycythemias		
	Discuss the effects of polycythemia on the body		
HL-P-003	Define hemostasis		Hemostasis
	Describe the mechanisms by which hemostasis is secured		
HL-P-004	Discuss the characteristics and functions of platelets		Platelets
	Explain the mechanism of formation of platelet plug		
HL-P-005	Enlist the clotting factors in blood		Coagulation factors
	Explain the conversion of Prothrombin to Thrombin & formation of Fibrin Fibers		
	Explain the Intrinsic & extrinsic clotting pathway.		
	Name & explain the mechanism of anticoagulants used in laboratory.		
	Explain the factors that prevent intravascular coagulation		
	Explain the role of Calcium ions in Intrinsic and Extrinsic pathways		
	Enlist the vitamin K dependent clotting factors		
Explain the prothrombin time, International Normalized Ratio (INR), and its clinical significance.			

HL-P-006	Enlist and explain the conditions that cause excessive bleeding	Integrated with Medicine	Coagulation disorders
	Define thrombocytopenia		
	Enlist the causes and consequences of Thrombocytopenia		
HL-P-007	Define immunity	Medical Physiology	Immunity
	Classify immunity		
	Explain humoral immunity		
	Explain Innate immunity.		
	Elaborate cell mediated immunity.		
	Describe the structure of antigen and immunoglobulin		
	Describe the role of Helper T-cells in cell mediated immunity		
	Enlist the types of Immunoglobulins along with their functions		
	Explain the role of memory cells in enhancing antibody response (secondary response)		
	Describe the mechanism of action of antibodies		
Elaborate the complement system.			
HL-P-008	Elaborate Immune tolerance	Medical Physiology	Tolerance
	Explain the process of clone selection during T cell processing		
	Discuss the failure of tolerance mechanism		
HL-P-009	Discuss immunization.	Medical Physiology Integrate with Pediatrics	Immunization
	Define passive Immunity		Immunization
	Explain features and physiological basis of delayed reaction allergy.		
	Explain features and physiological basis of Atopic Allergy		
	Explain features and physiological basis of Anaphylaxis, urticaria and Hay fever.		

HL-P-010	Discuss the pathophysiology, features and treatment of ABO and RH incompatibility. Enlist the changes that take place in the stored Blood.	Medical Physiology	Blood group Incompatibility
HL-P-011	Discuss the features and complications of mismatched blood transfusion reaction Describe the Hazards of blood transfusion.	Integrate with Pathology	Blood mismatch Transfusion reactions
	Elaborate the Transplantation of Tissues and Organs		
HL-P-012	Explain the process of tissue typing	Medical Physiology Integrate with Nephrology	Transplantation of tissues
	Explain the prevention of Graft Rejection by suppressing immune system		
<b>THEORY</b>			
<b>CODE</b>	<b>MEDICAL BIOCHEMISTRY</b>		<b>TOTAL HOURS = 19</b>
	<b>SPECIFIC LEARNING OBJECTIVES</b>	<b>DISCIPLINE</b>	<b>TOPIC</b>
HL-B-001	Explain the steps of synthesis of hemoglobin and interpret Porphyrins on basis of sign symptoms and data. Discuss the biochemical role and types of hemoglobin 1. Differentiate Hemoglobin and myoglobin 2. Explain oxygen dissociation curve of hemoglobin and myoglobin and factors regulating them 3. Interpret Carbon monoxide (CO) toxicity on the basis of sign and symptoms 4. Explain the role of 2,3 Bisphosphoglycerate (2,3 BPG) in fetal circulation	Medical Biochemistry	Hemoglobin and its types/ RBCs
HL-B-002	Discuss haemoglobinopathies and their biochemical and genetic basis with special emphasis on sickle cell anemia, Thalassemia and methemoglobinemia a) Discuss the following types of anemia on the basis of signs and symptoms and laboratory data: 1. Hypochromic microcytic 2. Normochromic microcytic	Medical Biochemistry Integrate with Pathology	Hemoglobinopathies/ RBCs/ Homeostasis

HL-B-007	<p>Explain the structure and biochemical role of immunoglobulins</p> <ol style="list-style-type: none"> <li>Describe the production, structure and functions of B cells, plasma cells, and antibodies (IgA, IgD, IgE, IgG, and IgM).</li> <li>Discuss the functions of the cytokines (ILs, TNFs, IFs, PDGF, and PAF).</li> </ol> <p>Interpret multiple myeloma on basis of given data</p>		Immunoglobulins/ WBCs/ Immunity
HL-B-008	<p>Explain and interpret pedigree of single gene defect i.e. sickle cell anemia (Autosomal recessive) and Beta Thalassemia (X linked recessive)</p>		Genetics

## PRACTICAL

CODE	SPECIFIC LEARNING OBJECTIVES	TOTAL HOURS = 6+6=12	
		DISCIPLINE	TOPIC
HL-P-013	<p>Interpret the Red Blood Cell Count, Hemoglobin concentration, Hematocrit and RBC Indices by Automated Cell Counter</p> <p>Interpret the Total Leucocyte Count Differential Leucocyte Count Platelet Count by Automated Cell Counter.</p>	Medical Physiology	Bleeding/ Clotting time
HL-P-014	<p>Determine Bleeding Time. Determine Clotting Time.</p>		Jaundice & Anemias/ RBCs/ Homeostasis
HL-B-009	<p>Interpret types of jaundice on the basis of data Perform estimation of bilirubin</p>	Medical Biochemistry	Jaundice & Anemias/ RBCs/ Homeostasis



# PRACTICAL

CODE	HISTOLOGY	TOTAL HOURS = 08	
	SPECIFIC LEARNING OBJECTIVES	DISCIPLINE	TOPIC
MS-A-078	Draw and label the histology of skeletal muscle	Histology	Histology of Muscles
	Draw and label the histology of smooth muscle		
	Draw and label the histology of cardiac muscle		
MS-A-079	Draw and label the histological picture of compact bone	Histology	Histology of Bones
	Draw and label the histological picture of spongy bone		
MS-A-080	Draw and label the microscopic structure of hyaline cartilage	Histology	Histology of Cartilage
	Draw and label the microscopic structure of elastic cartilage		
	Draw and label the microscopic structure of fibro cartilage		
NORMAL FUNCTION			
THEORY			
CODE	MEDICAL PHYSIOLOGY	TOTAL HOURS = 32	
	SPECIFIC LEARNING OBJECTIVES	DISCIPLINE	TOPIC
MS-P-001	Explain the Physiological basis of membrane potential	Medical Physiology	Diffusion / Equilibrium Potentials
	Explain diffusion potentials of Na & K		
MS-P-002	Define Nernst potential		Nernst potential
	Explain Physiological Basis of Nernst potential		
	Write the Nernst equation.		
	Calculate Nernst potential for Na & K		
	Explain the effects of altering the concentration of Na <sup>+</sup> , K <sup>+</sup> , Ca on the equilibrium potential for that ion		

MS-P-003	Describe the normal distribution of Na <sup>+</sup> , K <sup>+</sup> , Ca and Cl <sup>-</sup> across the cell membrane		Goldman Equation
	Explain physiological basis of Goldman equation		
	Clarify the role of Goldman equation in generation of Resting Membrane Potential (RMP).		
MS-P-004	Describe the Physiological basis of generation of RMP.	Medical Physiology Integrate with Anesthesiology	Resting Membrane Potential in Neurons
	Explain the effects of hyperkalemia and Hypokalemia on the Resting Membrane Potential (RMP)		
	Name the membrane stabilizers		
	Explain the physiological basis of action of Local Anesthetics.		
MS-P-005	Describe the Physiological anatomy of Neurons		Neurons
	Discuss the axonal transport		
	Enlist & give functions of Neuroglial cells		
	Explain process of myelination in Central Nervous System (CNS) & Peripheral Nervous System (PNS)		
MS-P-006	Classify neurons functionally.		Classification of Neurons & Fibers
	Classify nerve fibers according to Erlanger & Gasser Classification		
MS-P-007	Define Action Potential	Medical Physiology	Action Potential of Neurons
	Enlist the Properties of action potential		
	Describe the ionic basis of an action potential.		
	Explain the phases of action potential.		
	Explain the effects of hyperkalemia and Hypokalemia on the action potential.		
	Draw monophasic action potential.		
	Explain absolute and relative refractory period		
MS-P-008	Explain the role of other ions in action potential.		Role of other ions in action potential
	Elaborate the effect of hypocalcemia on neuron		

	excitability.		
MS-P-009	Explain Physiological basis & properties of Graded potential		Local / Graded potentials
	Draw & explain Physiological basis & properties of compound action potential.		
	Contrast between action potential and graded potential		
	Describe the ionic basis of excitatory Post Synaptic Potential (EPSP), Inhibitory Post Synaptic Potential (IPSP), End Plate Potential (EPP).		
MS-P-010	Classify and explain Physiological basis of different types of synapses	Medical Physiology	Synapse
	Elaborate how signal transmission takes place across chemical synapse		
MS-P-011	Explain the mechanism of conduction of Nerve impulse in myelinated and unmyelinated nerve fibers.		Conduction of Nerve Impulse
	Elaborate significance of saltatory conduction		
MS-P-012	Enlist the types of nerve injury	Medical Physiology Integrate with Medicine	Nerve Degeneration
	Explain Wallerian degeneration.		
	Describe the process of regeneration of nerve fiber.		
	Describe the causes, features & pathophysiology of Multiple sclerosis, GB syndrome.		
MS-P-013	Discuss the physiological anatomy of skeletal muscles.	Medical Physiology	Skeletal muscle
	Differentiate b/w skeletal, smooth, and cardiac muscle		
	Describe the structure of Sarcomere		
MS-P-014	Differentiate between isometric and isotonic contraction by giving examples.	Characteristics of whole muscle contraction	
	Compare the fast and slow muscle fibers.		
MS-P-015	Explain the mechanism of summation and		Mechanics of

	Tetanization.	Medical Physiology	muscle contraction
	Describe staircase effect/Treppe phenomena		
	Discuss the mechanism of skeletal muscle fatigue.		
	Explain the remodeling of skeletal muscle to match the function. Describe the development of macro motor units in poliomyelitis.		
	Explain the physiological basis of rigor mortis	Medical Physiology Integrate with Forensic Medicine	
MS-P-016	Describe the physiological anatomy of Neuro Muscular Junction (NMJ)	Medical Physiology	Neuromuscular junction
	Mechanism of Neuromuscular transmission & generation of End Plate Potential		
	Explain features, pathophysiology & treatment of myasthenia Gravis	Medical Physiology Integrate with Medicine	
	Describe the enhancers or blockers of neuromuscular transmission at the neuromuscular junction.	Medical Physiology	
	Discuss the steps/ events of excitation contraction coupling in skeletal muscle.	Medical Physiology	
MS-P-017	Differentiate between types of smooth muscles.	Medical Physiology	Smooth Muscle
	Describe mechanism of smooth muscle contraction in comparison to skeletal muscle.		
	Explain the physiological anatomy of neuromuscular junction of smooth muscle		
	Explain the excitatory and inhibitory transmitters secreted at Neuro Muscular Junction (NMJ) of smooth muscles.		
	Explain the depolarization of multiunit smooth muscles without action potentials. Explain the local tissue factors and hormones that		

	can cause smooth muscle contraction without action potential.		
	Explain the regulation of smooth muscle contraction by calcium ions.		
	Explain membrane potential and action potentials in smooth muscles.		
	Explain the phenomena of stress relaxation and reverse stress relaxation in smooth muscles.		
	Explain the LATCH mechanism		
	Describe the significance of LATCH mechanism.		
	Explain the nervous and hormonal control of Smooth Muscle Contraction.		
<b>THEORY</b>			
<b>CODE</b>	<b>MEDICAL BIOCHEMISTRY</b>	<b>TOTAL HOURS = 30</b>	
	<b>SPECIFIC LEARNING OBJECTIVES</b>	<b>DISCIPLINE</b>	<b>TOPIC</b>
MS-B-001	Classify carbohydrates along with the structure and biomedical importance of each class	Biochemistry	Classification carbohydrates
MS-B-002	Explain the isomerization of carbohydrates	Biochemistry	Carbohydrates
MS-B-003	Describe the physical and chemical properties of carbohydrates	Biochemistry	Extracellular matrix
	Differentiate between proteoglycan and glycoproteins		
MS-B-003	Describe the components of extracellular matrix: 1. Describe structure, functions and clinical significance of glycosaminoglycans 2. Discuss structure and functions of Fibrous proteins (collagen and Elastin) 3. Interpret diseases associated with them on basis of sign/symptoms and data 4. Interpret the importance of vitamin C in collagen synthesis	Biochemistry	

	hydroxyl group containing amino acids with the products formed and enzymes and vitamins involved in them		
MS-B-011	Interpret the following on basis of given data: 1. Phenylketonuria 2. Tyrosinemia 3. Albinism 4. Homocystinuria 5. Maple syrup urine disease 6. Alkaptonuria	Biochemistry	Inborn errors of amino acid metabolism

## PRACTICAL

CODE	SPECIFIC LEARNING OBJECTIVES	TOTAL HOURS=06	
		DISCIPLINE	TOPIC
MS-P-018	Demonstrate and categorize the following movements: Pushing against the wall, Biceps curls, squats, yoga chair pose, standing on toes, running on an inclined treadmill, yoga tree pose, deadlift as isotonic and isometric skeletal muscle contraction.	Physiology	Locomotion
MS-B-012	Estimation of total proteins by kit method/dipstick methods.		Total proteins
MS-B-013	Estimation of albumin and globulin		Albumin/ globulin

### PATHOPHYSIOLOGY AND PHARMACOTHERAPEUTICS

#### THEORY

CODE	SPECIFIC LEARNING OBJECTIVES	TOTAL HOURS = 4+7=11	
		DISCIPLINE	TOPIC
MS-Ph-01	Explain the mechanism by which drugs can stimulate NMJ.	Pharmacology & Therapeutics	Drugs acting on Neuromuscular Junction (NMJ)
	Explain the mechanism by which drugs can block NMJ.		

	system (Lymph capillaries, Lymph vessels & Lymphatic duct)		System
<b>PRACTICAL</b>			
<b>CODE</b>	<b>HISTOLOGY</b>	<b>TOTAL HOURS = 03</b>	
	<b>SPECIFIC LEARNING OBJECTIVES</b>	<b>DISCIPLINE</b>	<b>TOPIC</b>
CV-A-018	Identify, draw and label histological structure of cardiac muscle	Histology	Histological features of Cardiac Muscle
CV-A-019	Identify, draw and label histological sections of elastic artery, muscular artery, arterioles, vein, capillaries and sinusoids	Histology	Histological features of Blood Vessels
<b>NORMAL FUNCTION</b>			
<b>THEORY</b>			
<b>CODE</b>	<b>MEDICAL PHYSIOLOGY</b>	<b>TOTAL HOURS = 68</b>	
	<b>SPECIFIC LEARNING OBJECTIVES</b>	<b>DISCIPLINE</b>	<b>TOPIC</b>
CV-P-001	Explain the physiological anatomy of cardiac muscle.	Physiology	Cardiac Muscle
	Explain the functional importance of intercalated discs.		
	Discuss the properties of cardiac muscles.		
	Describe and draw the phases of action potential of ventricle.		
	Describe and draw the phases of action potential of SA node along with explanation of the mechanism of self-excitation/ Auto rhythmicity of SA node.		
	Define and give the duration of the Absolute and relative refractory period in cardiac muscle.		
Describe the mechanism of excitation-contraction coupling and relaxation in cardiac muscle.			

	Draw & explain pressure & volume changes of left ventricle during cardiac cycle.		
	Explain & draw relationship of ECG (Electrocardiography) with cardiac cycle.		
	Explain & draw the relationship of heart sounds with cardiac cycle.		
	Enlist, draw, and explain the physiological basis of atrial pressure waves in relation to cardiac cycle.		
	Define & give the normal values of the cardiac output, stroke volume, end diastolic volume & end systolic volume	Integrate with Medicine	
CV-P-002	Describe the Frank Starling mechanism.	Physiology	Regulation of heart pumping
	Describe the autonomic regulation of heart pumping.		
	Describe the effect of potassium, calcium ions & temperature on heart function.		
	Define chronotropic effect- positive and negative.		
	Define the inotropic effect: positive and negative.		
	Define dromotropic effect: positive and negative		
	Describe the location of adrenergic & cholinergic receptors in heart.		
	Name the receptors present in coronary arterioles.		
	Explain sympathetic & parasympathetic effects on heart rate & conduction velocity		
CV-P-003	Draw and explain the conducting system of heart	Physiology	Conducting system of heart
	Describe the physiological basis and significance of AV nodal delay.		
CV-P-004	Explain the ectopic pacemaker	Integrate with Cardiology/Medicine	Fundamentals of ECG
	Enlist, draw, and explain the physiological basis & give durations of waves, intervals, and segments of normal ECG.	Physiology	
	Describe the standard limb leads, Augmented limb		



	leads & precordial leads.		
	Define Einthoven's Triangle & Einthoven's law.		
	Explain the physiological basis of upright T wave in normal ECG.		
	Describe the location and significance of J point in ECG.		
	Explain the physiological basis of current of injury.		
	Enlist the ECG changes in angina pectoris.	Integrate with Medicine	
	Enlist the ECG changes in myocardial infarction.		
	Plot the mean cardiac axis.	Physiology	
	Enlist the physiological & pathological causes of right axis deviation of heart.		
	Enlist the physiological & pathological causes of left axis deviation of heart		
	Describe the abnormalities of T wave and their causes	Integrate with Medicine	
CV-P- 005	Describe the effect of hypokalemia and hyperkalemia on ECG	Integrate with Biochemistry	Effect of electrolyte on ECG
	Describe the effect of hypocalcemia and hypercalcemia on ECG.		
CV-P- 006	Define tachycardia and enlist its causes.	Integrate with Medicine	Cardiac arrhythmia
	Define bradycardia and enlist its causes.		
	Classify arrhythmias	Physiology	
	Explain the physiological basis of sinus arrhythmia.		
	Explain the physiological basis of reflex bradycardia in Athletes.		
	Explain the carotid sinus syndrome.	Integrate with Cardiology/ Medicine	
	Enlist the causes of atrioventricular block.		
	Explain the types of atrioventricular blocks.		
	Explain the ECG changes in 1 <sup>st</sup> , 2 <sup>nd</sup> & 3 <sup>rd</sup> degree heart block.		
Explain the cause, physiological basis & ECG changes in Stokes Adam syndrome/ventricular	Physiology		

	escape.		
	Enlist the causes of premature contractions.	Integrate with Cardiology/ Medicine	
	Explain the causes and ECG changes of premature atrial contractions.		
	Explain the physiological basis of pulses deficit.	Physiology	
	Explain the causes and ECG changes in Premature Ventricular Contraction (PVC)	Integrate with Cardiology/ Medicine	
	Enlist the causes and ECG findings in Long QT syndrome.		
	Explain the causes, physiological basis, features, ECG changes & management of premature heartbeat.		
	Explain the causes, physiological basis, features, ECG changes & management of atrial fibrillation.		
	Explain the causes, physiological basis, features & ECG changes of ventricular fibrillation.		
	Explain the physiological basis, features & ECG changes of atrial flutter.	Physiology	
	Compare Flutter and Fibrillations	Physiology	
CV-P-007	Explain the functional parts of circulation (arteries, arterioles, capillaries, veins, venules).	Physiology	Organization of Circulation
CV-P-008	Explain the pressures in systemic & pulmonary circulation.	Physiology	Blood flow
	Explain the types of Blood flow and significance of Reynolds number.		
CV-P-009	Describe local control of blood flow according to tissue needs.	Physiology	Local & Humoral Control of Blood flow
	Discuss humoral control of local blood flow.		
	Explain long term control of local blood flow.		
	Describe vascular control by ions and other chemical factors.		
	Name the organs in which auto regulation of blood		

	flow occurs during changes in arterial pressure (metabolic & myogenic mechanisms).		
CV-P-010	Explain the role of autonomic nervous system for regulating the circulation.	Physiology	Nervous Regulation of circulation
	Explain the vasomotor center.		
	Explain the control of vasomotor center by higher nervous centers.		
	Explain emotional fainting/vasovagal syncope.		
	Identify vessels constituting micro-capillaries. Enumerate hydrostatic and osmotic factors that underlie Starling's hypothesis for capillary function.		
CV-P-011	Explain the role of nervous system in rapid control of arterial blood pressure.	Physiology	Rapid control of arterial blood pressure
	Explain the regulation of arterial blood pressure during exercise.		
	Enlist different mechanisms for short term regulation of arterial blood pressure.		
	Explain the role of baroreceptors in regulation of arterial blood pressure.		
	Explain the role of chemoreceptors in regulation of arterial blood pressure.		
	Make a flow chart to discuss the role of Atrial volume reflexes/ Bainbridge reflex in control of blood pressure.		
	Make a flow chart to show the reflex responses to increased blood volume which increase blood pressure and atrial stretch.		
	Describe the role of CNS ischemic response in regulation of the blood pressure.		
	Explain the Cushing reflex		
	Explain the role of abdominal compression reflex to increase the arterial blood pressure.		
CV-P-012	Make a flow chart to discuss the role of renin		Role of

	angiotensin system for long term control of blood pressure.	Physiology	kidneys in long term Regulation of Arterial Blood Pressure
	Make a flow chart to show the regulation of blood pressure in response to increase in ECF (Extra Cellular Fluid) volume.		
	Make a flow chart to show the regulation of blood pressure in response to increase in salt intake.		
CV-P-013	Define cardiac output, cardiac index & venous return with their normal values.	Integrate with Cardiology/ Medicine	Cardiac output
	Discuss the factors regulating cardiac output		
	Discuss factors regulating venous return	Physiology	
CV-P-014	Explain the regulation of skeletal muscle blood flow at rest & during exercise.	Physiology	Skeletal muscle circulation
CV-P-015	Explain the physiological anatomy of coronary circulation.	Physiology	Coronary circulation
	Explain the regulation of coronary blood flow.		
	Explain the physiological basis of angina, myocardial & subendocardial infarction		
CV-P-016	Define & enlist different types of shock.	Physiology	Circulatory shock
	Explain the causes, features, and pathophysiology of hypovolemic/hemorrhagic shock.		
	Explain the causes, features, and pathophysiology of septic shock.		
	Explain the causes, features, and pathophysiology of neurogenic shock.	Integrate with Pathology	
	Explain the causes, features, and pathophysiology of anaphylactic shock.		
	Discuss the treatment of different types of shock.	Integrate with Medicine	
	Explain the different stages of shock.		

	Explain the mechanisms that maintain the cardiac output & arterial blood pressure in non-progressive shock.	Physiology	
	Enlist different types of positive feedback mechanisms that can lead to the progression of shock.		
CV-P-017	Enlist the different types of heart sounds and explain the physiological basis of each.	Physiology	Heart sounds
	Enlist the causes of 3 <sup>rd</sup> and 4 <sup>th</sup> heart sounds.		
	Explain the causes & physiological basis of murmurs caused by valvular lesions.		
	Enumerate abnormal heart sounds and describe the physiological basis of each.	Integrate with Medicine	

### THEORY

CODE	MEDICAL BIOCHEMISTRY	TOTAL HOURS = 21	
	SPECIFIC LEARNING OBJECTIVES	DISCIPLINE	TOPIC
CV-B-001	Classify lipids	Biochemistry	Classification of lipids
CV-B-002	Discuss the biomedical functions & properties of lipids	Biochemistry	Functions of lipids & Properties of lipids
CV-B-003	Classify fatty acids. Discuss the role of trans saturated, saturated, poly- and mono-unsaturated fatty acids in diet on lipid profile.	Biochemistry	Classification of fatty acids
CV-B-004	Discuss lipid peroxidation and its significance	Biochemistry	
CV-B-005	Explain the biochemical and therapeutic roles of eicosanoids (prostaglandins, leukotrienes, thromboxane, and prostacyclin)	Biochemistry	Eicosanoids
CV-B-006	Interpret the disorders associated with impairment	Biochemistry	Hyperlipidemias
CV-B-007	of lipoprotein metabolism especially atherosclerosis and LDL (Low-Density Lipoprotein) oxidized	Biochemistry	Cholesterol

CV-B-008	Discuss the signs and symptoms of hyperlipidemia	Biochemistry	Type I to V hyperlipidemias
	Interpret data related to hyperlipidemia		
CV-B-009	Discuss the sources, biomedical importance, active states, deficiency and excess of fat-soluble vitamins: Vitamins A,D. E and K	Biochemistry	Fat soluble vitamins
CV-B-010	Discuss the sources, biomedical importance, active states, deficiency and excess of water-soluble vitamins: Vitamins B group	Biochemistry	Water soluble vitamins
CV-B-011	Discuss the sources, biomedical importance, active states, deficiency and excess of minerals and trace elements especially zinc, Mg, Na, K, I, Ca, P, Se, S, Cu	Biochemistry	Minerals and trace elements

## PRACTICAL

CODE	SPECIFIC LEARNING OBJECTIVES	TOTAL HOURS = 10+3=13	
		DISCIPLINE	TOPIC
CV-P-018	Record an electrocardiogram by correct lead placement and connections a to identify normal heart sound	Physiology	ECG
CV-P-019	Determine the effect of posture and exercise on blood pressure by auscultatory method.		Blood Pressure
CV-P-020	Measure the blood pressure of the subject by palpatory and auscultatory methods.		Blood Pressure
CV-P-021	Examine arterial pulse to recognize normal characteristics of pulse.		Arterial Pulse
CV-P-022	Examine neck veins to determine Jugular Venous Pulse (JVP)		JVP
CV-B-012	Perform cardiac markers Creatine Kinase and Lactate Dehydrogenase (CK and LDH) Interpret lab reports based on enzymes for diseases	Biochemistry	Performance Interpretation of Lab report

## NORMAL FUNCTION

### THEORY

CODE	MEDICAL PHYSIOLOGY	TOTAL HOURS = 45	
	SPECIFIC LEARNING OBJECTIVES	DISCIPLINE	TOPIC
Re-P-001	Enlist the muscles of inspiration and expiration in quiet breathing	Integrate with Anatomy	Breathing
	Enlist the muscles of inspiration and expiration in labored breathing		
	Explain the components of the work of breathing	Medical Physiology	
	Discuss the mechanics of pulmonary ventilation		
	Explain periodic breathing		
Explain the causes and pathophysiology of sleep apnea	Integrate with medicine		
Re-P-002	Define and explain lung compliance	Medical Physiology	Lung Compliance
	Enlist the factors that affect lung compliance		
	Draw the compliance diagram of air filled and saline filled lungs		
	Enlist the components of surfactant		
	Describe the role of surfactant in lung compliance		
Explain the role of surfactant in premature babies	Integrate with Pediatrics		
Re-P-003	Define the different lung volumes and capacities and their clinical significance	Medical Physiology	Lung volumes and Capacities
	Discuss Forced Expiratory Volume 1/ Forced Vital Capacity (FEV1/FVC) ratio and its clinical significance		
	Enlist the lung volumes and capacities that cannot be measured by spirometer.		
	Define dead space & explain its types	Integrate with Pulmonology	
	Discuss FEV1/FVC ratio in relation to Bronchial Asthma.		
Discuss FEV1/FVC ratio in relation to Chronic Obstructive Pulmonary disease/restrictive lung			

	diseases		
	Discuss Forced Expiratory Volume 1/ Forced Vital Capacity (FEV1/FVC) ratio in relation to pulmonary embolism	Integrate with medicine	
Re-P-004	Define alveolar ventilation.	Medical Physiology	Pulmonary ventilation
	Define minute respiratory volume		
	Describe the pressures in the pulmonary system.		
Re-P-005	Describe the blood volume of the Lungs	Medical Physiology	Pulmonary Circulation
	Describe the distribution and regulation of blood flow through the lungs.		
	Describe the mechanics of blood flow in the three blood flow zones of the lung		
	Describe the effect of heavy exercise on pulmonary arterial pressure.		
	Describe the function of pulmonary circulation when left atrial pressure rises as a result of left-sided heart failure.		
	Explain pulmonary capillary dynamics.		
Re-P-006	Discuss pathophysiology and common causes of pulmonary edema		Pulmonary Edema, and Pleural Fluid
	Explain the safety factors that prevent pulmonary edema.		
	Explain the physiological basis of the presence of fluid normally in the pleural cavity.		
	Define pleural effusion and give its causes.		
Re-P-007	Explain the ultrastructure of respiratory membrane	Medical Physiology	Principles of Gaseous Exchange
	Discuss the factors affecting diffusion of gases across the respiratory membrane		
	Explain the diffusion capacity of respiratory membrane for oxygen and carbon dioxide		
	Define alveolar, pleural and transpulmonary pressure.		
	Explain differences in the partial pressures of atmospheric, humidified, alveolar air and explain		



	physiological basis of change in each pressure		
Re-P-008	Explain the different forms of transport of oxygen in the blood		Transport of oxygen in the blood
Re-P-009	Draw and explain oxyhemoglobin dissociation curve	Medical Physiology	oxyhemoglobin dissociation curve
	Enlist the factors that cause the rightward shift of oxyhemoglobin dissociation curve		
	Enlist the factors that cause the leftward shift of oxyhemoglobin dissociation curve		
	Explain the Bohr's effect		Bohr's effect
	Define, enlist the types and causes of cyanosis	Integrate with Medicine	Cyanosis
Re-P-010	Enlist different forms in which Carbon dioxide CO <sub>2</sub> is transported in the blood	Medical Physiology	Transport of CO <sub>2</sub> in blood
	Explain carboxyhemoglobin dissociation curve		
	Explain the Haldane effect		
	Explain the chloride shift/Hamburger phenomenon		
	Define the respiratory exchange ratio (RER)		
Re-P-011	Explain the alveolar oxygen and carbon dioxide pressure when Pulmonary ventilation (V) and Perfusion (Q), VA/Q= infinity, zero, and normal	Medical Physiology	VA/Q (ventilation perfusion ratio)
	Explain the concept of physiological shunt when VA/Q ratio is above normal		
	Explain the concept of physiological dead space when VA/Q ratio is above normal		
Re-P-012	Enlist the respiratory and non-respiratory functions of the lung	Medical Physiology	Protective reflexes
	Explain the nervous control of bronchiolar musculature		
	Trace the reflex arc of cough reflex and sneeze reflex		
Re-P-013	Explain the principle means by which acclimatization occurs	Medical Physiology	Aviation and space
	Explain the events that occur during acute mountain sickness		
	Enlist the features of chronic mountain sickness		

Re-P-014	Explain the pathophysiology, features, prevention and treatment of decompression sickness.	Medical Physiology	Deep sea diving
Re-P-015	Draw and explain the effect of CO poisoning on oxyhemoglobin dissociation curve	Medical Physiology	Carbon monoxide poisoning
	Explain the pathophysiology, features, and treatment of CO poisoning.	Integrate with Medicine	
Re-P-016	Enumerate the components of respiratory centers and explain their functions.	Medical Physiology	Nervous regulation of respiration
	Explain the inspiratory RAMP signal		
	Explain the Herring Breuer reflex/lung inflation reflex and its clinical significance		
Re-P-017	Explain the location of chemo sensitive area (central chemoreceptors) and peripheral chemoreceptors	Medical Physiology	Chemical control of respiration
	Explain the effect of hydrogen ions & carbon dioxide on the chemo- sensitive area		
	Explain the role of oxygen in the control of respiration/peripheral chemoreceptors		
Re-P-018	Explain the regulation of Respiration during Exercise	Medical Physiology	Exercise and Respiration
Re-P-019	Enlist the effects of acute hypoxia	Medical Physiology	Hypoxia
	Explain the hypoxia inducible factor a master switch for body response to hypoxia		
	Define and explain different types of hypoxias	Integrate with Medicine	
Re-P-020	Explain the pathophysiology of Tuberculosis.	Integrate with Pathology	Tuberculosis
Re-P-021	Describe the pathophysiology of Pneumonia	Integrate with Pathology	Pneumonia
Re-P-022	Define Dyspnea	General Medicine	Dyspnea
	Enlist different causes of dyspnea		
	Differentiate between cardiac and respiratory dyspnea		
	Outline management strategies for dyspnea		
Re-P-023	Enlist the causes of Pneumothorax	Integration	Pneumothora

	defect i.e., Emphysema and cystic fibrosis (autosomal recessive)		
Re-B-002	Describe the biochemical basis of emphysema, Chronic obstructive pulmonary disease (COPD) and cystic fibrosis	Medical Biochemistry	Respiratory diseases
	Interpret Respiratory Distress syndrome on the basis of given data	Integrate with Physiology	
Re-B-003	Discuss the concept of acid base balance	Medical Biochemistry	Acid base balance
	Interpret metabolic and respiratory disorders of acid base balance on the basis of sign, symptoms and ABG findings		
	Describe the Clinical interpretation of acid base balance	Integrate with Medicine	

## PRACTICAL

CODE	SPECIFIC LEARNING OBJECTIVES	TOTAL HOURS = 10	
		DISCIPLINE	TOPIC
Re-P-039	Perform the clinical examination of chest for the respiratory system (inspection, palpation, percussion, Auscultation)	Medical Physiology	Clinical Examination of Chest
Re-P-040	Determine lung volumes and capacities with spirometer		Peak Expiratory Flow rate measurement
Re-P-041	Determine Blood Oxygen Saturation with finger Pulse Oximeter		Oxygen Saturation
Re-P-044	Perform Cardio pulmonary Resuscitation (CPR) on adult and infant.		CPR
Re-B-005	Determine the pH of the solution by pH meter	Medical Biochemistry	Determination of pH