

INTEGRAL UNIVERSITY, LUCKNOW

**INTEGRAL INSTITUTE OF MEDICAL
SCIENCES & RESEARCH**



**SYLLABUS
FOR**

**M.Sc. Medical Biochemistry
(EFFECTIVE FROM, 2019-20)**

**INTEGRAL UNIVERSITY, LUCKNOW
DASAULI, P.O. BAS-HA KURSI ROAD,
LUCKNOW – 226026**

Website: www.iul.ac.in

STUDY & EVALUATION SCHEME
M.Sc. Medical Anatomy
(w.e.f. July 2019)

Programme: M.Sc. Biochemistry

Year I

Sl. No	Course Code	Course Title	Periods			Evaluation Scheme				Total (Marks)
			L	T/S/D	P	Internal Assessment		External Assessment		
						Theory	Practical	Theory	Practical	
1	ANY101	Essentials of Anatomy I	03	01	-	30	-	70	-	100
2	ANY102	Essentials of Anatomy II	02	01	-	30	-	70	-	100
3	HPY104	Essentials of Physiology I	02	01	-	30	-	70	-	100
4	HPY105	Essentials of Physiology-II	02	01	-	30	-	70	-	100
5	BCY107	Essentials of Biochemistry I	01	01	-	30	-	70	-	100
6	BCY108	Essentials of Biochemistry-II	01	01	-	30	-	70	-	100
7	ANY103	Anatomy Practical	-	-	08	-	60		40	100
8	HPY106	Physiology Practical	-	-	06	-	60		40	100
9	BCY109	Biochemistry Practical	-	-	02	-	60		40	100
		TOTAL	11	06	16	180	180	420	120	900

L = Lecture
1L = 1hr

T = Tutorial
1T = 1hr

S = Seminar
1S = 1hr

D = Demonstration
1D = 1hr

P = Practicals
1P = 1hr

INTERNAL ASSESSMENT:

	Sessional			Average of Best Two	Continuous Assessment	Attendance	Total
	Terminal 1	Terminal 2	Pre Univ.				
THEORY	20	20	20	20	05	05	30
PRACTICALS	30	30	30	30	25	05	60

STUDY & EVALUATION SCHEME
M.Sc. Medical Anatomy
(w.e.f. July 2019)

Programme: M.Sc. Medical Biochemistry

Year II

Sl. No	Course Code	Course Title	Periods			Evaluation Scheme		Total (Marks)
			L	T/S/D	P	Internal Assessment	External Assessment	
1	BCY 201	Biochemistry -I	03	03	00	30	70	100
2	BCY 202	Biochemistry -II	03	03	00	30	70	100
3	TMY204	Teaching Methodology	02	00	00	30	70	100
4	RMV205	Research Methodology	02	00	00	30	70	100
5	FCY206	Fundamental of Computers	00	00	02	20	30	50
6	BCY 203	Biochemistry Practical	00	00	20	60	40	100
		TOTAL	10	06	22	200	350	550

L = Lecture
1L = 1hr

T = Tutorial
1T = 1hr

S = Seminar
1S = 1hr

D = Demonstration
1D = 1hr

P = Practicals
1P = 1hr

INTERNAL ASSESSMENT:

	Sessional			Average of Best Two	Continuous Assessment	Attendance	Total
	Terminal 1	Terminal 2	Pre Univ.				
THEORY	20	20	20	20	05	05	30
PRACTICALS	30	30	30	30	25	05	60

STUDY & EVALUATION SCHEME
M.Sc. Medical Anatomy
(w.e.f. July 2019)

Programme: M.Sc. Medical Biochemistry

Year III

S. No	Course Code	Course Title	Periods			Evaluation Scheme		Total (Marks)
			L	T/S/D	P	Internal Assessment	External Assessment	
1	BCY 301	Biochemistry -I	03	01	00	30	70	100
2	BCY 302	Biochemistry -II	02	01	00	30	70	100
3	BCY 303	Biochemistry -III	01	01	00	30	70	100
4	BCY304	Biochemistry Practical	-	-	24	60	40	100
5	BCY305	Dissertation	-	-	-	50	50	100
TOTAL			06	03	24	200	300	500

❖ Will be based on dissertation work, presentation, viva voce & discussion

L = Lecture

T = Tutorial

S = Seminar

D = Demonstration

P = Practicals

1L = 1hr

1T = 1hr

1S = 1hr

1D = 1hr

1P = 1hr

INTERNAL ASSESSMENT:

	Sessional			Average of Best Two	Continuous Assessment	Attendance	Total
	Terminal 1	Terminal 2	Pre Univ.				
THEORY	20	20	20	20	05	05	30
PRACTICALS	30	30	30	30	25	05	60

INTEGRAL UNIVERSITY, LUCKNOW
**INTEGRAL INSTITUTE OF MEDICAL SCIENCES
& RESEARCH**

SYLLABUS

FOR

**M.Sc. (MEDICAL BIOCHEMISTRY),
FIRST YEAR**

SESSION-2019-20

(DEPARTMENT OF BIOCHEMISTRY)

SUBJECT- ESSENTIALS OF ANATOMY-I
SUBJECT CODE- ANY101
(w.e.f July 2019)

L T P
3 1 0

COURSE CONTENTS:

I. BASICS OF GENERAL ANATOMY:

- Brief description of Anatomy, subdivisions of anatomy, Anatomical planes, terms of position and movements.
- Structure of Cell and cell organelles
- Introduction to basic tissues of the body.
- Skin – Structure and types
- Superficial and deep fascia- Definitions, functions and modifications.
- Skeletal system – Function, classification of bones, gross structure of a typical long bone, parts of a growing long bone. Cartilage- Definition, classification, functions & location.
- Joints – Definition, structural and functional classification, brief outline of synovial joint along with their classification
- Muscles – Basic properties of muscle, types of muscle and their features.
- Cardiovascular system- Components of cardiovascular system
- Lymphatic system – Lymph and lymphatic vessel, basic knowledge of lymphatic tissue.
- Nervous system – Definition, classification, structure of a neuron. Brief outline of sympathetic and parasympathetic nervous system.

II. BASICS OF GENERAL HISTOLOGY:

- Definition of histology, types of microscopes, components of Light microscope.
- Cell structure – Introduction, cell membrane, cell organelles and their function.
- Epithelium- Definition, function and classification of epithelium with examples,
- Glands- Definition and Classification
- Connective tissue –Basic framework, enumerate- fibres, cells and functions.
- Cartilage – Definition, outline of its components, brief description of different types of cartilage
- Bone – Definition, outline of its components, brief description of types of bones and their classification.

- Muscular tissue – Brief description of types of muscular tissue and their histological differences.
- Circulatory system – microscopic structure of arteries & veins.
- Nervous tissue- Structure of neuron, classification of neuron, microscopic structure of peripheral nerve.

III. BASICS OF GENERAL EMBRYOLOGY:

- Importance of embryology, Cell division –mitosis & meiosis.
- Spermatogenesis, Oogenesis,
- Menstrual cycle and its phases in brief.
- Concept of Fertilization, cleavage, morula, blastocyst,
- Formation of germ layers, notochord and neural tube, intraembryonic coelom, yolk sac, folding of embryo.
- Implantation, decidua, enumerate types of chorionic villi, functions of placenta.

IV. BASICS OF UPPER LIMB

- General orientation and different regions of superior extremity
- Pectoral region: Enumerate muscles and nerves, Clavipectoral fascia, Mammary gland in detail.
- Axilla: Boundaries of axilla and enumerate its contents, Enumerate branches of axillary artery, Axillary group of lymph nodes in brief, Brachial plexus in detail.
- Back and scapular region : Enumerate muscles and nerves of back and scapular region, Spaces of back- Boundaries and contents, Rotator cuff in brief, Anastomosis around scapula
- Arm : Enumerate compartments of arm, its muscles and nerves, Enumerate branches of brachial artery, Anastomoses around elbow joint, Cubital fossa in detail
- Forearm : Enumerate compartments of forearm, enumerate muscles and nerves, Flexor retinaculum and structures passing deep to it, Extensor retinaculum and structures passing deep to it
- Hand: Enumerate muscles of hand and their nerve supply.
- Joints: Enumerate and classify - joints of upper limb. Shoulder joint and Elbow joint in detail

V. BASICS OF LOWER LIMB:

- General orientation, different regions of inferior extremity,
- Deep fascia of thigh.
- Great Saphenous vein,
- Enumerate compartments of thigh, its muscles and nerve supply.
- Femoral Triangle in detail,
- Adductor canal in detail.
- Gluteal region- Enumerate muscles and their nerve supply
- Hamstring muscles in detail
- Popliteal fossa in detail.
- Compartmentalization of leg - Enumerate muscles and nerve supply,
- Extensor and flexor retinaculum, attachments and structures passing deep to it
- Enumerate and classify - joints of inferior extremity, Hip joint and Knee Joint in detail
- Enumerate muscles, vessels and nerves of Sole

RECOMMENDED BOOKS:

1. Clinical Anatomy for Medical Students, by: Richard S. Snell
2. General Anatomy, by: Vishram Singh
3. General Anatomy, by: B.D.Chaurasia
4. Embryology for Medical Students, by: Inderbir Singh
5. Text Book of Histology, by: Inderbir Singh

SUBJECT- ESSENTIALS OF ANATOMY-II
SUBJECT CODE- ANY102
(w.e.f July 2019)

L T P
2 1 0

COURSE CONTENTS:

I. BASICS OF THORAX:

- General orientation of thorax and thoracic cavity – Boundaries, inlet, outlet and wall,
- Intercostal space in detail,
- Pleura and its part, pleural cavity.
- Lung- external features
- Elementary idea of Trachea and tracheobronchial tree.
- Concept of Mediastinum, its subdivision and enumerate its content.
- Basic concept of Pericardium and its sinuses,
- External features and chambers of Heart with Right atrium in detail,
- Blood vessels of Heart in detail,
- Aorta and its branches,
- Enumerate and classify joints of thorax

II. BASICS OF ABDOMEN & PELVIS:

- General orientation of Abdomeno-Pelvic cavity,
- Surface landmarks, Concept of Regions and quadrants,
- Enumerate the layers of Anterior abdominal wall,
- Anterolateral abdominal muscles, external oblique, internal oblique and transversus abdominis in detail, Inguinal canal in detail
- Concept of Peritoneum- definition, parts, peritoneal cavity, retroperitoneal structures, nerve supply and functions,
- Liver, spleen, pancreas – location, borders & surfaces,
- Stomach- Location, Parts, Blood supply, Lymphatic drainage in detail,
- Enumerate the components of Extrahepatic biliary apparatus
- Kidney in detail
- Different parts of small and large Intestine, difference between small and large intestine
- Pelvis – true and false pelvis, inlet, outlet, cavity and enumerate its contents
- Detailed anatomy of Uterus
- Detailed anatomy of Urinary bladder
- Perineum- definition, boundaries and its subdivision.

III. BASICS OF HEAD AND NECK:

- General orientation of head and neck region, Surface landmarks,
- Scalp in detail,
- Facial artery and vein, enumerate muscles of facial expressions, nerve supply of face,
- Parotid gland in detail
- Deep Cervical fascia – enumerates different layers, enumerate boundaries and contents of anterior triangle, sternocleidomastoid muscle and Posterior triangle in detail
- Vertebral canal- boundaries and enumerate its contents
- Cranial cavity- enumerate layers of meninges, enumerate paired & unpaired dural venous sinuses and their location,
- Orbit- enumerate contents of orbit, enumerate extraocular muscle, nerve supply,
- Temporal and infratemporal fossa - boundaries and enumerate its contents,
- Muscles of mastication in detail.
- Submandibular salivary gland- location, borders & surfaces
- Enumerate suprahyoid muscles,
- Thyroid gland in detail,
- Oral cavity - General orientation of oral cavity and its contents, Tongue in detail.
- Palate - Enumerate the muscle of palate,
- Nasal cavity - General orientation of nasal cavity, Lateral wall of nose in detail
- paranasal sinuses - Enumerate paranasal sinuses, maxillary sinus in brief
- Pharynx - General orientation of pharynx, its subdivisions and enumerate circular and longitudinal muscles, Palatine Tonsil in brief.
- Larynx - General orientation of larynx, enumerate cartilages and muscles.

IV. Basics of Brain:

- Enumerate meninges of brain & its characteristics features in brief
- Enumerate subarachnoid space & cisterns
- Cerebrum - Poles, surfaces, borders & lobes of cerebral hemisphere, Enumerate Important sulci, gyri and functional cortical areas
- White matter of cerebrum, corpus callosum in brief, internal capsule in detail.

- External features of Midbrain, Pons, medulla oblongata and cerebellum.
- External features of spinal cord and formation of spinal nerve
- Elementary idea of Cavities of brain
- Enumerate Cranial nerves and their attachment on the surface of brain.

RECOMMENDED BOOKS:

1. Clinical Anatomy for Medical Students, by: Richard S. Snell
2. General Anatomy, by: Vishram Singh
3. General Anatomy, by: B.D.Chaurasia
4. Embryology for Medical Students, by: Inderbir Singh
5. Text Book of Histology, by: Inderbir Singh

SUBJECT- ANATOMY PRACTICAL
SUBJECT CODE- ANY103
(w.e.f July 2019)

L T P
0 0 8

COURSE CONTENTS:

- Identification, side determination and anatomical position of Bones of superior extremity, inferior extremity, Thorax, Abdomen & Pelvis and Head & Neck
- Identification and side determination of organs and viscera.
- Identification of muscles, Nerves and Blood vessels on prosections of different regions of body.

RECOMMENDED BOOKS:

1. Clinical Anatomy for Medical Students, by: Richard S. Snell
2. General Anatomy, by: Vishram Singh
3. General Anatomy, by: B.D.Chaurasia
4. Embryology for Medical Students, by: Inderbir Singh
5. Text Book of Histology, by: Inderbir Singh

SUBJECT- ESSENTIALS OF PHYSIOLOGY-I
SUBJECT CODE- HPY104
(w.e.f July 2019)

L T P
2 1 0

COURSE CONTENTS:

UNIT-I GENERAL AND CELLULAR PHYSIOLOGY: (08)

Cell as the living unit of the body, the internal environment, control system, homeostasis, organization of the cell, physical structure of the cell, transport across the cell membrane, resting membrane potential, Nernst equation, equilibrium potential, Goldman equation, composition of ECF and ICF.

UNIT-II NERVE AND MUSCLE PHYSIOLOGY: (12)

Neuron structure, function and classification, neuroglia, resting membrane potential of nerve and muscle, action potential, nerve conduction, classification of nerve fiber, degeneration and regeneration of nerve, functional anatomy of skeletal muscle, neuromuscular junction, transmission and its blockers. Excitation - contraction coupling, mechanism of muscle contraction, smooth muscle.

UNIT-III BLOODS: (24)

Function and composition of blood, Structure and function of RBC, formation of hemoglobin, Destruction and fate of RBC, Anemia, polycythemia, Leucocytes (WBC) general characteristics, genesis and life span of WBC, Classification and function of each type of WBC, leucocytosis, leucopenia, leukemia. Blood groups, classification, immunoglobins, antigenicity, agglutination, blood typing, transfusion, mismatched transfusion and its effects, Rh factor, Rh incompatibility, components of Hemostasis, coagulation factors, mechanism of coagulation, coagulation tests, anticoagulants, immunity innate and acquired immunity, allergic reactions, immunodeficiency.

UNIT –IV RESPIRATORY PHYSIOLOGY: (20)

Functional anatomy of respiratory system, pleura, mechanism of breathing, dead space, surfactants, dynamic and static lung. volume capacity, pulmonary and alveolar ventilation, principles of gas exchange, oxygen and carbon dioxide transport, surfactant, regulation of respiration, hypoxia, oxygen therapy and toxicity, artificial respiration, high altitude physiology, deep sea diving, abnormal breathing.

UNIT-V RENAL PHYSIOLOGY:

(18)

Functional anatomy of Kidney, Structure of nephron, functions of kidney, Juxtaglomerular apparatus, urine formation, counter current mechanism, acidification of urine, renal handling of glucose, sodium potassium bicarbonates and other substances. Regulation of acid base balance, Micturition, diuretics, renal function test, renal failure.

UNIT-VI GASTROINTESTINAL SYSTEM:

(18)

Functional anatomy, general principles and organization of GI functions, salivary glands secretion, function of saliva, deglutition, eosophageal motility, vomiting, functions of stomach, functions composition and regulation of gastric juices, gastric mucosal barrier, pancreatic juice composition secretion and functions, hepato biliary system functions of liver its physiological anatomy, bile composition and function, GIT motility, digestion and absorption functions of small and large intestines defecation reflex, GIT hormones.

RECOMMENDED BOOKS:

1. Guyton. A. Text Book of Medical Physiology, Elsevier Publication
2. Ganong, W.F. Reviews of Medical Physiology Lange Publication
3. Khurana I, Text Book of Physiology
4. Berne V Principal of Physiology Elsevier Mosby Publication
5. A. K. Jain Text Book of Physiology
6. A. K. Jain Practical Physiology
7. C. L. Ghai Practical Physiology
8. Neurophysiology Kandel
9. Human Physiology from cells to system aurelee Sherwood
10. Human Physiology Best and Tylor

SUBJECT- ESSENTIALS OF PHYSIOLOGY-II
SUBJECT CODE- HPY105
(w.e.f July 2019)

L T P
2 1 0

COURSE CONTENTS:

UNIT-I CARDIOVASCULAR PHYSIOLOGY: [24]

Cardiac muscle, physiological anatomy of heart and conduction system, cardiac action potential, Nutrition and metabolism of heart, generation and conduction of cardiac impulse, ECG, Arrhythmias, cardiac cycle, heart sound, cardiac output, principle of hemodynamic, neurohumoral regulation of cardiovascular function, microcirculation and lymphatic system, regional circulation; cardiac failure, circulatory shock.

UNIT-II CENTRAL NERVOUS SYSTEM: [26]

General organization of CNS and PNS, interneuronal communication, Classification of somatic senses, sensory receptors, sensory transduction information processing, structure of spinal cord, sensory modalities, sensory pathways, somatosensory cortex, association areas, pain, motor system (muscle spindle, golgi tendon organ, reflex arc, reflexes) motor cortex, corticospinal and extra pyramidal tracts, brain stem and cortical control of motor function, cerebellum, thalamus, hypothalamus, basal ganglia, maintenance of posture and equilibrium, limbic system, RAS higher function, sleep. Organisation of ANS, sympathetic and parasympathetic nervous system, Neuro transmitter, effects of sympathetic and parasympathetic stimuli.

UNIT -III SPECIAL SENSES: [12]

(Functional anatomy, refractive errors, visual pathway lesions of visual pathway rod and cone and there functions, dark and light adaptation, accommodation reflex,) Ear (functional anatomy middle ear and internal ear, mechanism of hearing, auditory pathway, deafness.) Taste and olfaction.

UNIT-IV ENDOCRINE SYSTEM: [24]

Classification of hormones, mechanism of hormones actions, pituitary gland, hypothalamus, thyroid glands, parathyroid glands ,calcitonin, vitD and calcium metabolism, adrenal gland, endocrine pancreas, Pathophysiology of diabetes, penial gland.

UNIT –V REPRODUCTIVE SYSTEM:

[14]

General organization of male and female reproductive system, male spermatogenesis and action of testosterone, male sex hormones, hyper and hypogonadism, menstrual cycle, female sex hormones, pregnancy and lactation, function of placenta, parturition, lactation.

RECOMMENDED BOOKS:

1. Guyton. A. Text Book of Medical Physiology, Elsevier Publication
2. Ganong, W.F.Reviews of Medical Physiology Lange Publication
3. Khurana I, Text Book of Physiology
4. Berne V Principal of Physiology Elsevier Mosby Publication
5. A. K. Jain Text Book of Physiology
6. A. K. Jain Practical Physiology
7. C. L. Ghai Practical Physiology
8. Neurophysiology Kandel
9. Human Physiology from cells to system aurelee Sherwood
10. Human Physiology Best and Tylor

SUBJECT- PHYSIOLOGY PRACTICAL
SUBJECT CODE- HPY106
(w.e.f July 2019)

L T P
0 0 6

COURSE CONTENTS:

I. HAEMATOLOGY:

- To study different parts of Compound Microscope and its uses
- To draw and study the different types of blood cells in a stained blood film.
- To do differential leucocyte count (DLC) of your own blood.
- To study haemocytometer and calculation for total leucocyte count and total RBC count.
- To do total leucocyte count (TLC) of your own blood.
- To do total RBC count of your own blood.
- Estimation of haemoglobin content of your own blood by sahli's method
- To calculate haematological indices of your own blood.
- To do reticulocyte count of your own blood.
- To do platelet count of your own blood.
- To find out the blood group of your own blood.
- To prepare haemin crystal of your own blood.
- To find out the bleeding time and clotting time of your own blood.
- To determine the erythrocyte sedimentation rate of the blood sample

II. EXPERIMENTAL LAB (STUDY THE GRAPHS):

- General apparatus used in experimental physiology lab.
- To study a simple muscle twitch and to find out the time interval of various phases of a simple muscle curve.
- To study the effect of temperature on the frog muscle nerve preparation.
- To study the effect of strength of stimuli on muscle contraction of sciatic nerve gastronemius muscle preparation of the frog.
- To study the effect of summation of stimuli..
- To study the effect of two successive stimuli in a m.n.p. resulting in summation of effect.
- To study the genesis of tetanus.
- To study freeload and afterload.
- To study the phenomenon of fatigue gastronemius muscle preparation of the frog.

- To study the conduction velocity of sciatic nerve in the frog.
- To study the normal cardiogram of frog and study the effect of temperature on it.
- To study the effect of drugs on frogs heart.
- To study the graph of extrasystole and compensatory pause.
- To study the graphs of properties of cardiac muscle: All or none law and threshold.
- To study the effects of sympathetic and parasympathetic stimulation on smooth muscle motility.

III. CLINICAL PHYSIOLOGY:

- Introduction to lab, general examination including vitals, communication skills and ethics.
- Examination of arterial pulse and study the effect of exercise on it.
- Recording of blood pressure.
- To study the effect of change of posture on blood pressure.
- To study the effect of exercise on blood pressure.
- Examination of cardiovascular system.
- Recording of Electrocardiogram.
- To record vital capacity using Vitalograph.
- Examination of respiratory system.
- Examination of abdominal system (basics).
- Examination of Nervous system: Higher functions, Cranial nerves, sensory and motor system examination, reflexes.

RECOMMENDED BOOKS:

1. Guyton. A. Rext Book of Medical Physiology, Elsevier Publication
2. Ganong, W.F.Reviews of Medical Physiology Lange Publication
3. Khurana I, Text Book of Physiology
4. Berne V Principal of Physiology Elsevier Mosby Publication
5. A. K. Jain Text Book of Physiology
6. A. K. Jain Practical Physiology
7. C. L. Ghai Practical Physiology
8. Neurophysiology Kandel
9. Human Physiology from cells to system aurelee Sherwood
10. Human Physiology Best and Tylor

SUBJECT- ESSENTIALS OF BIOCHEMISTRY-I
SUBJECT CODE- BCY107
(w.e.f July 2019)

L T P
1 1 0

COURSE CONTENTS:

1. Cell composition, subcellular organelles, nucleus, endoplasmic reticulum, Golgi apparatus, lysosomes, peroxisomes, mitochondria, fluid mosaic model, cytoskeleton, transport mechanisms, facilitated diffusion, Ion channels, active transport, sodium pump. [12]

2. Chemistry, basic properties, type, structure, classification and functions of carbohydrates, lipids, amino acids, proteins, nucleotides, nucleic acids, hormones, chemistry of blood, hemoglobin and plasma proteins, chemistry of respiration. [14]

3. Classification of enzymes, co-enzymes, mode of action of enzymes, Michaelis constant, enzyme kinetics, factors influencing enzyme activity, enzyme inhibition: competitive inhibition, non-competitive inhibition, suicide inhibition, Specificity of enzymes, Clinical enzymology. [14]

4. Calorific value of food, Basal Metabolic Rate, specific dynamic action, nutritional requirements, dietary fibres. Protein Energy Malnutrition, obesity. Fat soluble vitamins (A, D, E, K) – chemistry functions, requirements and deficiency manifestations. Water soluble vitamins (B, C) – chemistry functions, requirements and deficiency manifestations. Functions, requirements and deficiency manifestations of major and trace elements. [14]

5. Redox potential, Biological oxidation, high energy compounds, organization of electron transport chain, flow of electrons, Oxidative phosphorylation, Chemi-osmotic theory, ATP synthase, inhibitors of ATP synthesis, Uncouplers of Oxidative phosphorylation. Free radicals, Reactive oxygen species, free radical scavenger systems, Lipid peroxidation, Chain breaking anti-oxidants, Preventive anti-oxidants. [14]

6. Mechanisms of Acid-base balance, Henderson-Hasselbalch equation, buffers, Acidosis and Alkalosis. Electrolyte concentration of body fluid compartments, regulation of sodium and water balance, hypotonic contraction and expansion, isotonic contraction and expansion. [12]

RECOMMENDED BOOKS:

1. Lubert Stryer (Ed.), Biochemistry, W.H.Freeman & Company, New York.
2. Lehniger, Nelson & Cox (Ed.), Harpers Biochemistry, CBS Publishers & Distributors.
3. Murray R.K. & P.A. Mayes (Ed.) Harpers Biochemistry, D.K. Granner.
4. Thomas M. Devlin (Ed.), Text book of Biochemistry with Clinical Correlations, Wiley Liss Publishers.
5. Benjamin Lewin (Ed.), Genes VI, Oxford University Press.
6. Srivastava & Moudgal (Ed.), Text Book of Medical Biochemistry and Human Biology

SUBJECT- ESSENTIALS OF BIOCHEMISTRY-II
SUBJECT CODE- BCY108
(w.e.f July 2019)

L T P
1 1 0

COURSE CONTENTS:

1. Digestion and absorption of carbohydrates, proteins and lipids. Digestion of medium chain fatty acids, absorption of amino acids. [12]
2. Major and minor metabolic pathways of glucose: Glycolysis, Gluconeogenesis, Glycogen synthesis and breakdown. Hexose mono phosphates shunt pathways, Uronic acid pathway, galactose, mannose and fructose metabolism. Metabolism of fatty acids. Synthesis of triglycerides, Cholesterol, Lipoproteins and Amino acid metabolic, uric cycle. Citric acid cycle, significance of TCA cycle, amphibolic role, regulation, metabolic adaptations during starvation and metabolic profile in organs. Detoxification and biotransformation of Xenobiotics. [20]
3. Basics of purine and pyridine nucleotides metabolism. Basics of replication of DNA, transcription, post-transcriptional processing, genetic code, translation, post-translational processing. Recombinant DNA technology. Molecular biology techniques: blotting techniques, DNA finger printing, RFLP, DNA sequencing, PCR, hybridoma technology. [16]
4. Basics elements of Immunology, structure of immunoglobulins, classes of immunoglobulins, immunodeficiency states, molecular structure of antigens, HLA antigens, cytokines and lymphokines. [16]
5. Body fluids and its composition: milk, colostrums, Aqueous humor, cerebrospinal fluid, amniotic fluid, urine-normal and abnormal constituents. Tissue proteins in health and disease. Liver and gastric function tests: Makers of epatic dysfunction, tests for lever function tests for gastric function. Markers of obstructive liver disease, assessment of free and total acidity in gastric juice. [16]

RECOMMENDED BOOKS:

1. Lubert Stryer (Ed.), Biochemistry, W.H.Freeman & Company, New York.
2. Lehniger, Nelson & Cox (Ed.), Harpers Biochemistry, CBS Publishers & Distributors.
3. Murray R.K. & P.A. Mayes (Ed.) Harpers Biochemistry, D.K. Granner.
4. Thomas M. Devlin (Ed.), Text book of Biochemistry with Clinical Correlations, Wiley Liss Publishers.
5. Benjamin Lewin (Ed.), Genes VI, Oxford University Press.
6. Srivastava & Moudgal (Ed.), Text Book of Medical Biochemistry and Human Biology.

SUBJECT- BIOCHEMISTRY PRACTICAL
SUBJECT CODE- PHY109
(w.e.f July 2019)

L T P
0 0 2

COURSE CONTENTS:

1. Introduction: Handling of chemicals, preparation of reagents pipetting etc
2. Tests of carbohydrates
3. Tests for Lipids
4. Tests for proteins
5. Precipitation reactions of protein
6. Individual proteins – Albumin, Gloulin, Casein & Gelatin
7. Unknown protein identification
8. Milk analysis
9. Starch digestion by salivary amylase and products
10. Normal constituents of urine
11. Abnormal constituents of urine and reporting of abnormal urine
12. Estimation of free and total acidity in the gastric juice, gastric function test.
13. Glucose estimation in urine
14. Ascorbic acid (Vitamin C) estimation
15. Verification of Beer's Lambert Law. Principles of colorimetry and spectrophotometry in Quantitative analysis of biomolecules
16. Estimation of serum acids.
17. Estimation of total plasma protein and albumin levels and calculation of A/G Ratio
18. Estimation of Amino Acids
19. Estimation of Serum Urea level
20. Estimation of Serum Uric Acid level
21. Estimation of Serum Creatinine level
22. Estimation of Macro elements-Na, K, Copper
23. Estimation of Micro elements – Iron, Zinc, Copper
24. Vitamin - C saturation test
25. Estimation of RNA in terms of Ribose sugar
26. Estimation of DNA in terms of deoxy-ribose sugar

RECOMMENDED BOOKS:

1. Brutis & Ashwood W.B. (Ed.). Tietz Textbook of Clinical Chemistry, Saunders Company
2. Keith Wilson & John Walker (Ed.) Principles & Techniques of Practical Biochemistry, Cambridge University, Press.
3. Varley's Practical Clinical Biochemistry Vol. I & II.

INTEGRAL UNIVERSITY, LUCKNOW
**INTEGRAL INSTITUTE OF MEDICAL SCIENCES
& RESEARCH**

SYLLABUS

FOR

**M.Sc. (MEDICAL BIOCHEMISTRY),
SECOND YEAR**

SESSION-2019-20

(DEPARTMENT OF BIOCHEMISTRY)

SUBJECT- BIOCHEMISTRY-I
SUBJECT CODE- BCY201
(w.e.f July 2019)

L T P
3 3 0

COURSE CONTENTS:

Course Contents:

1. Definition of enzymes, co-enzymes and co-factors. Enzyme classification & nomenclature, mode of action, enzyme active centers, specificity of enzymes, key enzymes, multi-enzymes complexes. Isoenzymes and its diagnostic importance. General properties of enzymes, Michaelis-constant, enzyme kinetics, multi-substrate enzyme kinetics: Random, bi-bi and ping-pong reactions. Enzyme inhibitions – types and kinetics. Enzymes, activation and covalent modifications, repression & induction of enzymes, intra-cellular localization of enzymes, purification of enzymes & test for Homogeneity. Name of enzymes used for diagnostics & therapeutics. [40]
2. Digestion and absorption of carbohydrates, proteins & lipids, Malabsorption syndromes. Biological oxidation – Bioenergetics, Redox potential, Oxidation, cytochrome oxidase dehydrogenases, oxygenases, high energy compounds, organization of electron transport chain, NADH shuttle, malate aspartate shuttle, flow of electrons. Mechanisms of oxidative phosphorylation, inhibitors of ATP synthesis, uncouplers of oxidative phosphorylation, ionophores. Microsomal electron transport chain-mixed function oxidases, mono-oxygenases and dioxygenases. Introduction of free radicals, ROS (Reactive oxygen species): Generation, damage, Free radicals scavenger system. Preventive antioxidants, chain breaking antioxidants, lipid peroxidation. Free radical formation, initiation, propagation & termination phases. [50]
3. Biochemical assessment of organ function: Liver function test, kidney function test, thyroid function test, Gastric function test. Glucose tolerance test. Xenobiotics & their detoxification mechanisms. Acid-base balance, Acidosis and alkalosis. [10]
4. Hormones chemistry and mechanism of action of intracellular and extra cellular hormones: Hormone receptors, Signal transduction, G-proteins, Second messengers, Cyclic AMP, Cyclic GMP, protein kinases, Steroid receptors, Calmodulins and phosphatidylinositol Hormones classification, structure of peptide, polypeptide and steroid hormones and their mechanism

of action. Metabolic regulation by hormones, Hormonal regulation by Gene expression. Hormonal disorders, Biochemical investigation of endocrine disorders. Peptide hormones and their biochemical and metabolic action and function. Thyroid hormones, Synthesis, Secretion, Mechanism of action, Assessment of thyroid functions, Hyperthyroidism, Hypothyroidism. Polypeptide hormones and their biochemical and metabolic action and functions. Anti diuretic hormone, Oxytocin, Hypothalamic releasing factors, Growth hormone, Adrenocorticotropic hormone, Endorphin, Glycoprotein hormones, Thyroid stimulating hormone, Gonadotropins and hormones of pancreas Insulin & Glucagon, their structure and mechanism of action and their role on carbohydrate metabolism under fasting, fed and Diabetic conditions. Steroidal hormones and their biochemical and metabolic action and functions. Adrenal cortical hormones, Synthesis of steroid hormones, Assessment of glucocorticoid secretion and Assessment of mineralocorticoid function, Adrenal hyperfunction, Adrenal hypofunction, primary hyperaldosteronism, Adrenogenital syndrome, Ovarian hormones, Testicular hormones. [60]

5. Radio tracer technology: Applications of Radioactive isotopes in research & clinical biochemistry, detection & measurement of isotopes, Geiger Muller counter, liquid scintillation counter, autoradiography, X-ray crystallography, Biosensors, Basic techniques, enzyme electrode, microbial biosensors, effect of radiation on biological systems, Cerenkov radiation. Electrophoresis: Principles, techniques and applications: moving boundary and zone electrophoresis, capillary electrophoresis, paper and gel electrophoresis (PAGE, agarose and pulse field gel electrophoresis), Isoelectric focusing, isotachopheresis, centrifugation: Types of rotors, techniques and application, differential, zonal, density gradient and ultra centrifugation. ELISA, RIA, ERMA and Hybridoma Technology. [40]

6. Principles working and applications of colorimetry, Spectrophotometry, Ultrafiltration, ultracentrifugation, fluorescence, x-ray diffraction, ORD/ CD, Flame Photometry, Fluorometry, Auto-Analyser, Nuclear Magnetic Resonance, ESR Spectroscopy, Atomic absorption Spectroscopy, Plasma emission spectroscopy, chromatography: Absorption, paper-partition, ion-exchange, reverse phase, gel filtration, affinity, gas chromatography and HPLC & FPLC. [40]

RECOMMENDED BOOKS:

1. Lubert Stryer (Ed.), Biochemistry, W.H.Freeman & Company, New York
2. Lehninger, Nelson & Cox (Ed.), Principles of Biochemistry, CBS Publisher & Distributors
3. Murray R.K. & P.A. Mayes (Ed.), Harpers Biochemistry, D. K. Granner.
4. Thomas M. Delvin (Ed.), Textbook of Biochemistry with Clinical Cor relations, Wiley Liss Publishers.
5. Richard Harvey, Denise Ferrier (Ed.), Lippincott's Illustrates Reviews Biochemistry.
6. Voet & Voet Biochemistry (Ed.), John Wiley & Sons.
7. Keith Wilson & John Walker (Ed.), Principles & techniques of practical biochemistry, Cambridge University Press.
8. Burtis & Ashwood W.B. (Ed.), Teitz textbook of Clinical Chemistry, Saunders Company.
9. Upadhyay & Upadhyay (Ed.), Biophysical Chemistry – principles and techniques.

SUBJECT- METABOLISM & METABOLIC DISORDERS
SUBJECT CODE- BCY202
(w.e.f July 2019)

L T P
3 3 0

COURSE CONTENTS:

1. Glucose transporters, Major Metabolic pathways of glucose: Glycolysis in different tissues and cells, BPG shunt, Cori cycle Fate of pyruvate, Glycogen metabolism, Glycogen storage diseases. Gluconeogenesis & its regulation. Regulation of carbohydrate metabolisms and its integration. Hexose monophosphate shunt pathway, glucose-6-phosphate dehydrogenase deficiency. Uronic acid pathway, Essential pentosuria, polyol pathway, Fructose metabolism, Galactose Metabolism, hereditary fructose intolerance, Fructosuria, Galactosemia, metabolism of alcohol, Amino sugars, Glycoproteins, Blood group substances. [60]
2. Alpha, beta and omega fatty acid oxidation, Denovo synthesis of fatty acid, Chain elongation, Triacyl glycerol synthesis, Adipose tissue metabolism, Obesity, Fatty liver, Lipotropic factors, ketonegenesis, ketolysis and ketosis. Impaired oxidation of fatty acids – CPT-I and CPT-II deficiency diseases (Associated with hypoglycemia, coma and fatty liver), Jamaican vomiting sickness, Dicarboxylic aciduria, Refsum's disease and Zellwager syndrome. Lipid storage diseases. Biosynthesis of cholesterol and its regulation, cholesterol derived compound synthesis, transport of lipid and metabolism of Lipoproteins (CM, VLDL, LDL & HDL), Apolipoproteins, Dyslipoproteinemias, Lipid profile, Bile salt and other steroid hormone synthesis, Biosynthesis of Eicosonoid group of compounds: Prostaglandin, leukotrienes and thromboxane from polyunsaturated fatty acid, Biosynthesis and catabolism of compound lipids, lipid storage diseases. Heme synthesis and breakdown. Biosynthesis and catabolism of bile pigments. [70]
3. General reactions of Amino acid metabolism, Catabolism of Essential and non Essential amino acids, Biosynthesis of Non Essential Amino acids, Formation of Ammonia, Ammonia disposal, Urea cycle, Disorders of urea cycle, One carbon compounds and generation of one carbon group, amino acidurias and amino acid inborn error of metabolisms. [20]
4. Citric acid cycle reactions, Significance of TCA cycle, Amphibolic role, Regulations, Integration of metabolism, anaplerotic sequence in metabolism.

Metabolic profile in organs, Metabolic adaptations during starvation and fed states. Bioenergetics and Biological Oxidation: General concept of oxidation and reduction, redox potential, High energy compounds, Organization of Electron transport chain, NADH shuttle, Malate aspartate shuttle, Microsomal electron chain & its significance, mono-oxygenase and dioxygenase system. Oxidative phosphorylation, Chemo-osmotic theory, ATP, synthesis, inhibitors of ATP synthesis, Uncouplers of oxidative phosphorylation, Ionophores. [60]

5. Biosynthesis of Purines and Pyrimidines, Integrated regulation of Purine and Pyrimidine Nucleotide synthesis and Degradation of Nucleosides, Nucleotides and Nucleic acids, Salvage Pathway and inherited/ metabolic disorders of Purine and Pyrimidine Nucleotides. [30]

RECOMMENDED BOOKS:

1. Lehninger, Nelson & Cox (Ed.), Principles of Biochemistry, CBS Publishers & Distributers.
2. Lupert Stryer (Ed.), Biochemistry, W.H. Freeman & Company, New York.
3. Thomas M. Devlin (Ed.), Text book of Biochemistry with clinical Correlations, Wiley Liss Publishers.
4. Murray R.K. & P.A. Mayes (Ed.), Harpers Biochemistry, D.K. Granner.
5. Richard Harvey, Denise Ferrier (Ed.), Lippincott's Illustrated Reviews Biochemistry.
6. Srivastava & Moudgal (Ed.), Text book of Medical Biochemistry & Human Biology.

SUBJECT- MEDICAL BIOCHEMISTRY PRACTICAL
SUBJECT CODE- BCY203
(w.e.f July 2019)

L T P
0 0 20

COURSE CONTENTS:

1. Specimen collection, handling and storage of sample.
2. Methods of standardization and calibration.
3. Methods of quality control and assessment.
4. Normal and Abnormal constituents of urine.
5. Diagnostic enzymology-
 - a. Plasma enzyme levels in liver disease: SGOT, SGPT and ALP
6. Plasma enzymes levels in Cardiac diseases: CPK, LDH
7. Preparation of RBC Hemolysate and Estimation of catalase, peroxidase activities.
8. Serum acid phosphatase and amylase/ lipase activities.
9. Serum bilirubin estimation.
10. Estimation of LDH and isoenzymes.
11. Estimation of Amylase.
12. Estimation of iron and iron binding capacity.
13. Estimation of serum GGT.
14. Estimation of Serum lipase.
15. Paper electrophoresis for serum proteins.
16. Agarose gel electrophoresis for (i) protein (ii) hemoglobin (iii) lipoproteins
17. Polyacrylamide gel electrophoresis
18. Paper chromatography of amino acids.
19. Thin layer chromatography of amino acids.
20. HPLC
21. Ion exchange chromatography.

RECOMMENDED BOOKS:

1. Keith Wilson & John Walker (Ed.), Principles & Techniques of practical Biochemistry, Cambridge University, Press.
2. Burtis & Ashwood W.B. (Ed.)Tietz Textbook of Clinical Chemistry, Saunders Company.
3. Sadasivam (Ed.), Biochemical methods.
4. Plumer (Ed.), Practicals.

SUBJECT- TEACHING METHODOLOGY
SUBJECT CODE- TMY204
(w.e.f July 2019)

L T P
1 1 0

COURSE CONTENTS:

1. Challenges for teachers in medical Education
2. Teaching strategies
 - Lecture method
 - Small group teaching
 - Inquiry and problem solving methods
 - Case study Team project
 - Presentation
 - Seminar
 - Field visit
 - Simulation
 - Computer based instructions
 - Bed side learning
 - One to one teaching
 - Self directed teaching
3. Preparation of lesson
4. Selection of teaching methods
5. Identification and review of literature
6. Identification of teaching resources
7. Developing teaching aids for instructional activities that link research and theory to practice
8. Contact development: key element of curriculum design and evaluation
9. Implementation and monitoring of curriculum transaction and student's evaluation
10. Student feedback: designing and implementation
11. Research paper writing

SUBJECT- RESEARCH METHODOLOGY
SUBJECT CODE- RMY205
(w.e.f July 2019)

L T P
1 1 0

COURSE CONTENTS:

1. Methods of collection of data, classifications and graphical representation of data. Binomial and normal probability distribution. Polygon, histogram, measure of central tendency. Signification of statistical methods, probability, degree of freedom, measure of variation – Standard deviation, Standard error.
2. Sampling, sample size and power. Statistical inference and hypothesis. Tests for statistical significance: t-test, Chi-square test, confidence level, Null hypothesis.
3. Linear regression and correlation. Analysis of variance (one way and two ways) Factorial designs (including fraction factorial design). Theory of probability, Permutation and Combination, Ratios, Percentage and Proportion. Two ways ANOVA and Multiple comparison procedures.
4. Non-parametric tests, Experimental design in clinical trials, Statistical quality control, validation, optimization techniques and screening design. Correlation and regression, least square method, significance of coefficient of correlation, nonlinear regression.
5. Report Preparation: Types and Layout of Research Report, Precautions in Preparing the Research Report. Bibliography and Annexure in the Report: Their Significance, Drawing Conclusions, Suggestions and Recommendations to the Concerned Persons. Use of SPSS in Data Analysis.

RECOMMENDED BOOKS:

1. Cooper & Schindler, Business Research Methods, Tata McGraw Hill
2. Saunders Research Methods for Business Student, Pearson Education
3. Malhotra Naresh K., Marketing Research, Pearson Education.
4. Fisher, R.A., Statistical Methods for Research Works, Oliver & Boyd, Edinburgh.
5. Chow, Statistical Design and Analysis of Stability Studies, Marcel Dekker, New York.
6. Finney, D.J., Statistical Methods in Biological Assays, Hafner, New York.
7. Montgomery, D.C., Introduction to Statistical Quality Control, Willy.
8. Lipschutz, Introduction to Probability and Statistics, McGraw-Hill.

SUBJECT- FUNDAMENTALS OF COMPUTER
SUBJECT CODE- FCY206
(w.e.f July 2019)

L T P
0 0 2

COURSE CONTENTS:

1. Basic computer organization functionally computer codes computer classification Boolean algebra, primary storage, secondary storage devices, input-output device, computer software, computer languages, operating system, business data processing concepts, data communication and networks and advances.
2. Planning the computer program, algorithm, flowcharts and decision tables.
3. Writing simple programs in 'C', Numeric constants and variables. Arithmetic Expressions, Input & Output in 'C' Programs, conditional statements, implementing loops in programs, arrays, logical expressions and control statements such as switch, break and continue functions, processing character strings, files in 'C'.
4. MS Office (Word, Excel, Power Point), Basic Database concept and classification, operations performed on database, using MS Access. Internet Features.
5. Computer applications in Biochemistry and clinical studies.

RECOMMENDED BOOKS:

1. Sinha, R.K. Computer Fundamentals, BPB Publications
2. Raja Raman, V, Computer Programming in 'C', PHI Publication
3. Hunt N & Shelley J., Computers and Common Sense, PHI Publication

INTEGRAL UNIVERSITY, LUCKNOW
**INTEGRAL INSTITUTE OF MEDICAL SCIENCES
& RESEARCH**

SYLLABUS

FOR

**M.Sc. (MEDICAL BIOCHEMISTRY),
THIRD YEAR**

SESSION-2019-20

(DEPARTMENT OF BIOCHEMISTRY)

SUBJECT- BIOCHEMISTRY-I
SUBJECT CODE- BCY301
(w.e.f July 2019)

L T P
3 3 0

COURSE CONTENTS:

1. Basic concepts : Health and disease: Normal and pathological changes affecting cells in the body. Cell death and physiological causes. Physical, chemical and biological agents. Body fluids: urine normal and abnormal constituents, CSF composition, Gastric juice, Pleural fluid, peritoneal fluid, synovial fluid composition. Extra cellular and intracellular fluid composition. Their normal and abnormal variations under physiological and pathological conditions. [60]
2. Plasma enzyme and Iso enzyme levels in Health and Diseases – CPK, Cardiac troponin, LDH, Markers of Cardiac diseases. Enzyme markers of liver functions: SGOT, SGPT. ALP, ACP5-Nucleotidase, GGPT levels in liver diseases, Plasma enzyme levels CE, G-6-PDH, aldolase and enolase in health and diseases. Amylase and lipase in pancreatic diseases. ACP and its isoenzymes in Prostatic diseases. Therapeutic enzymes. Primary nutritional diseases: PEM, starvation, Obesity, Vitamin deficiency disorders and biochemical basis of causation and diagnosis of nutritional anemia. Food toxins, Botulism and allergy. [30]
3. Neurological disorders: migraine, epilepsy, stroke, movement disorder, Benign essential tremor, Parkinson's, Huntington's diseases, multiple sclerosis, motor neuron disease, Myasthenia Gravis. Biochemical indices of hepatobiliary diseases. Bile pigments- formation of bilirubin, Urobilinogen, bile acids, prehepatic, hepatic and posthepatic diagnosis, liver function tests. [30]
4. Diseases of kidney: Assessment of renal function-creatinine clearance, renal calculi, uremia and glomerulonephritis. Biochemical investigation of gastric function, malabsorption disorders. Biochemical basis of diseases: Carcinogenesis, Diabetes Mellitus, Atherosclerosis, Cushing syndrome and Myocardial infarction. AIDS: HIV. genes and gene products, diagnosis, precautions, Microcytic anemia, Macrocytic anemia, Sickle cell anemia and Thalassemia. [70]

5. Porphyrrias, Hyperbilirubinemias, Congenital Hyperbilirubinemia, Hemolytic jaundice, Hepatocellular jaundice, Obstructive Jaundice, Differential diagnosis of jaundice, diseases of the liver – hepatitis, cholestasis, cirrhosis, gallstone. Laboratory management: Precision, accuracy, specificity, sensitivity, percentage error, quality control, precautions in handling hazardous materials, Pre-analytical variations. Lab accreditation – NABL. [50]

RECOMMENDED BOOKS:

1. Lehninger, Nelson & Cox (Ed.), Principles of Biochemistry, CBS Publisher & Distributers
2. Lubert Stryer (Ed.), Biochemistry, W.H. Freeman & Company, New York
3. Thomas M. Delvin (Ed.), Textbook of Biochemistry with Clinical Correlations, Wiley Liss Publishers.
4. Murray R.K. & P.A. Mayes (Ed.), Harpers Biochemistry, D. K. Granner.
5. Gornal A.G. (Ed.), Applied Biochemistry of clinical disorders.
6. Latner (Ed.) Clinical Biochemistry
7. Burtis & Ashwood W.B. (Ed.), Teitz textbook of Clinical Chemistry, Saunders Company.

SUBJECT- BIOCHEMISTRY-II
SUBJECT CODE- BCY302
(w.e.f July 2019)

L T P
3 3 0

COURSE CONTENTS:

1. DNA structure, functions, replication, mutation and repair of DNA. Sequencing of nucleotides in DNA, mitochondrial DNA, RNA-composition, types, structure and functions. Fine structure of gene, Eukaryotic genomic organization (structure of chromatin, coding and non coding sequences and satellite DNA), Regulations of gene expression, concept of operon: Lac, Trp, Ara operons, significance of repressor. Transcription: Details of transcription, transcriptional control of gene expression, Operon concept, promoters, Enhancers, Silencer, Hormone Responsive Element, Transcription factors, Post transcriptional modifications of RNA, exons, Introns, Splicing, Ribozymes, Protein biosynthesis, Post translation modifications, Inhibitors of translation, Signal sequence, Chaperones and heat shock proteins. Effect of anti biotics on prokaryote and eukaryote protein biosynthesis. [50]
2. Cell cycle, Check point, Cell cycle regulation, Oncogenes, Tumor suppressor genes and growth proteins, Apoptosis. Interaction and communication between the cells, cell-cell adhesions, cell junctions, extra cellular Matrix-collagen, elastin, fibronectin. Principles of mendelian inheritance, Linkage and genetic mapping; Extra chromosomal inheritance, Sex linked inheritance and genetic disorders, Somatic cell genetics, Population genetics. Genetic polymorphism. [35]
3. Role of nucleic acids in diagnosis of molecular diseases and infections diseases. Gene therapy, nuclei acid hybridization and DNA probes, Microarray of gene probes. Tumor markers and growth factors. Basic techniques in genetic engineering: Isolation and Purification of DNA. Methods of DNA assay, Blotting techniques – Southern, Northern and Western blotting, Polymerase chain reaction and its applications, Ligase chain reactions and its application. The Human genome Project: Genetic Testing – DNA fingerprinting, human gene therapy, Diversity – conservation genetics, Legal and Ethical issue in genetics, Genetic Counseling. Genetic polymorphism of certain key enzymes involved in complications of diseases. Etiology of Cancer: Chemical Carcinogenesis, Biochemistry and Molecular biology of

cancer, Genes that influence Cancer: Oncogenes and tumor suppressor genes, Hormonal imbalances and cancers, Apoptosis. [40]

4. Corrosives and irritants, Organic irritant poisons, neurotoxins, heavy metal poisons, lead mercury, aluminium, arsenic, pesticides and insecticides, organophosphorus compounds, industrial hazards, air pollutants, nitrogen dioxide, sulphur dioxide, indoor exposure, toxic substances in foodstuffs, lathyrism. Introduction to free radicals, classification, physical and chemical properties, generation of free radicals, factors responsible – environmental and biological. Pro-oxidants, antioxidants, nutritional antioxidants, sources of antioxidants, role of free radicals in development of diseases, mechanism of macro biomolecule oxidation in development of diseases: inflammation, respiratory diseases, retro lentil fibroplasia, reperfusion injury, Atherosclerosis, skin diseases. [35]
5. Age related diseases, lipid peroxidation, initiation, propagation and termination phases, preventive antioxidant, chain breaking antioxidant. Defense mechanisms against free radicals: Role of antioxidants in the prevention of diseases. First line of defense: Superoxide dismutase (SOD), catalase, glutathione peroxidase, glutathione reductase and xanthine oxidase, second line of defense: glutathione (GSH), vitamin C, uric acid, albumin, bilirubin, vitamin E, carotenoids, flavonoids and ubiquinol. [30]

RECOMMENDED BOOKS:

1. Benjamin Lewin (Ed.), genes, Jones & Barlett.
2. Lodish, Matsudaria (Ed.), Molecular Cell Biology, W. H. Freeman.
3. T. A. Brown (Ed.), Gene cloning and DNA analysis, Wiley Blackwell.
4. Lehninger, Nelson & Cox (Ed.), Principles of Biochemistry, CBS Publisher & Distributers.
5. Thomas M. Delvin (Ed.), Textbook of Biochemistry with Clinical Correlations, Wiley Liss Publishers.
6. Gardener (Ed.), principles of genetics.
7. Tom Strachan, Andrew Read, Andrew P. Read (Eds.), Human Molecular Genetics.
8. Ricki Lewis (Ed.), Human Genetics: concepts and applications.
9. William S. Klug, Michael R. Cummings (Eds.), Concepts of Genetics.
10. Veres Ricki Lewis (Ed.), Genetics: from genes to genomes.
11. Milan Lazar (Ed.), Free radicals in chemistry and biology.
12. Barry Halliwell, John Gutteridge (Ed.), Free radicals in biology and medicine.
13. A. F. Parsons (Ed.), An introduction to free radical chemistry.

SUBJECT- BIOCHEMISTRY-III
SUBJECT CODE- BCY303
(w.e.f July 2019)

L T P
1 1 0

COURSE CONTENTS:

1. Restriction endonucleases: Class I, II and III restriction enzymes, Nomenclature, unit of restriction enzymes, Restriction digestion: Partial and complete, star activity; homopolymer tailing, Synthetic linkers, adaptors; roles of DNA ligase, T4 DNA polymerase, alkaline phosphatase, Reverse transcriptase in cloning. Plasmid incompatibility, Plasmid host range, mobilizable plasmids and triparental mating, Plasmid as cloning vectors, transcriptional fusion vectors; Selectable markers, reporter genes. Phage as a cloning vector: Advantage of using phage as lambda vector, genome map of phage lambda, in vitro packaging, insertional and replacement vectors, cosmid vectors, M13 phage, yeast as cloning vector, Artificial chromosomes: YACs, BACs and PACs. [20]
2. Genome library and cDNA library construction: overview of techniques for recombinant selection and screening Functional and nutritional complementation, colony hybridization, Immunological screening, HART, HAT. Rapid DNA and RNA sequencing techniques: Sanger method, Maxam and Gilbert procedure, Automated DNA sequencing, pyrosequencing , High thought put sequencing: shot gun cloning, Principles and applications of PCR: Inverse PCR, nested PCR, Multiplex PCR, DD-RTPCR, degenerate PCR, Real time PCR, Applications of PCR in gene cloning, Site directed mutagenesis, antisense RNA technology and its applications. [15]
3. Infection, Immunity, Types of Immunity: Innate and adaptive, Phagocytosis and extra cellular killing, humoral immune response, cell mediated immune response. Immune systems: Cells and organs of immune system: Primary lymphoid organs, Secondary lymphoid tissues, Immuno reactive cells – T & B lymphocytes, macrophages, granulocytes and NK cells. Antigens, immunogens, Haptens, Mitogens, Superantigens, Tolerance epitope, Paratope and antigens determinants. Basic of antigen specificity. Antigen receptors: Cell surface proteins of Major Histocompatibility Complex (MHC): types, class I, II and III distribution and function, MHC in relation to

transplantation and HLA typing. T cell receptor complex (TCR). Structure and Types of immunoglobulin molecules, Biological and chemical properties of immunoglobulins. Cytokine, Antigen-antibody reaction: forces, affinity, avidity and specificity. Complement system: classical and alternate pathways. Basic idea of Immunodiffusion, agglutination, ELISA, Immuno-electrophoresis, RIA and hybridoma technology. [30]

4. Hypersensitivity reactions (type I, II, III, IV). Regulation of immune response: various events induction of immune response. Means of immunosuppression: physical, chemical and biological. Tolerance: auto and acquired. Immunopotential. Active and Passive Immunization, Prophylaxis vaccines: Heat killed, attenuated, rDNA vaccine, synthetic peptide vaccine, plasma derived vaccine, anti idiotypic vaccine and DNA vaccine. Immunologic mechanism of tissue damage, Autoimmune diseases. [15]

RECOMMENDED BOOKS:

1. Donald M. weir, john steward (Ed.), Immunology.
2. Ivan M. Roit (Ed.), Essential Immunology.
3. Jacqueline Sharon (Ed.), Basic Immunology.
4. Paul (Ed.), Fundamental Immunology.
5. Pathal (Ed.), Immunology.
6. Benjamin Lewin (Ed.), Genes, Jones & Bartlett.
7. A Brown (Ed.), Gene Cloning and DNA analysis, Wiley Blackwell.
8. Freifelder, DM (Ed.), Molecular Biology.
9. Watson, JD (Ed.), Molecular Biology of the Cell.
10. Old and Primrose (Ed.), Principles of Gene Manipulation.

SUBJECT- MEDICAL BIOCHEMISTRY PRACTICAL
SUBJECT CODE- BCY304
(w.e.f July 2019)

L T P
0 0 24

COURSE CONTENTS:

To identify sensitivity of antigen and antibody by Single Radial Immunodiffusion.

1. To identify sensitivity of antigen and antibody by Double Immunodiffusion.
2. Rocket Immuno-electrophoresis
3. Blood group determination.
4. Genomic and Plasmid DNA isolation.
5. Western Blotting.
6. Southern Blotting.
7. Northern Blotting.
8. Isolation of Genome DNA
9. Restriction Digestion of DNA.
10. Ligation.
11. PCR.
12. Affinity chromatography.
13. Protein fractionation.
14. Enzyme linked Immunosorbant Assay (ELISA)
15. Comparative evaluation of different methods of protein analysis: UV, lowry, Biuret, Bradford.
16. Estimation of DNA by diphenyl amine method.
17. Isolation and estimation of RNA in animal liver in terms of ribose sugar.
18. Isolation of enzyme and determination of enzyme activity.
19. Study of the effect of varying substrate concentration and pH on the enzyme activity and determination of K_m .

RECOMMENDED BOOKS:

1. Keith Wilson & John Walker (Ed.) Principles & Techniques of Practical Biochemistry, Cambridge University, Press.
2. Brutis & Ashwood W.B. (Ed.). Tietz Textbook of Clinical Chemistry, Saunders Company.
3. Sadasivam (Ed.), Biochemical Methods.
4. Plumer (Ed.), Practicals.

SUBJECT- DISSERTATION
SUBJECT CODE- BCY305
(w.e.f July 2019)

COURSE CONTENTS:

Course BCY-305 consists of dissertation. Students are allocated individually to internal, external faculty or research scientist. The format for dissertation is similar to the thesis style incorporating introduction, materials & methods, results, discussion and bibliography. A candidate will select a topic on current researches in the field of Medical Biochemistry at the beginning of Year III. A candidate has to get approved the short synopsis and title to the dissertation/ research project within the first six months. The research project work has to be completed within the last six months of Year III. The dissertation will be submitted in a type written and bound form and a copy of each dissertation is submitted to the department for permanent record towards the end of the Year III.